Developing Small-Scale Industries in India: An Integrated Approach

by: Marilyn Carr

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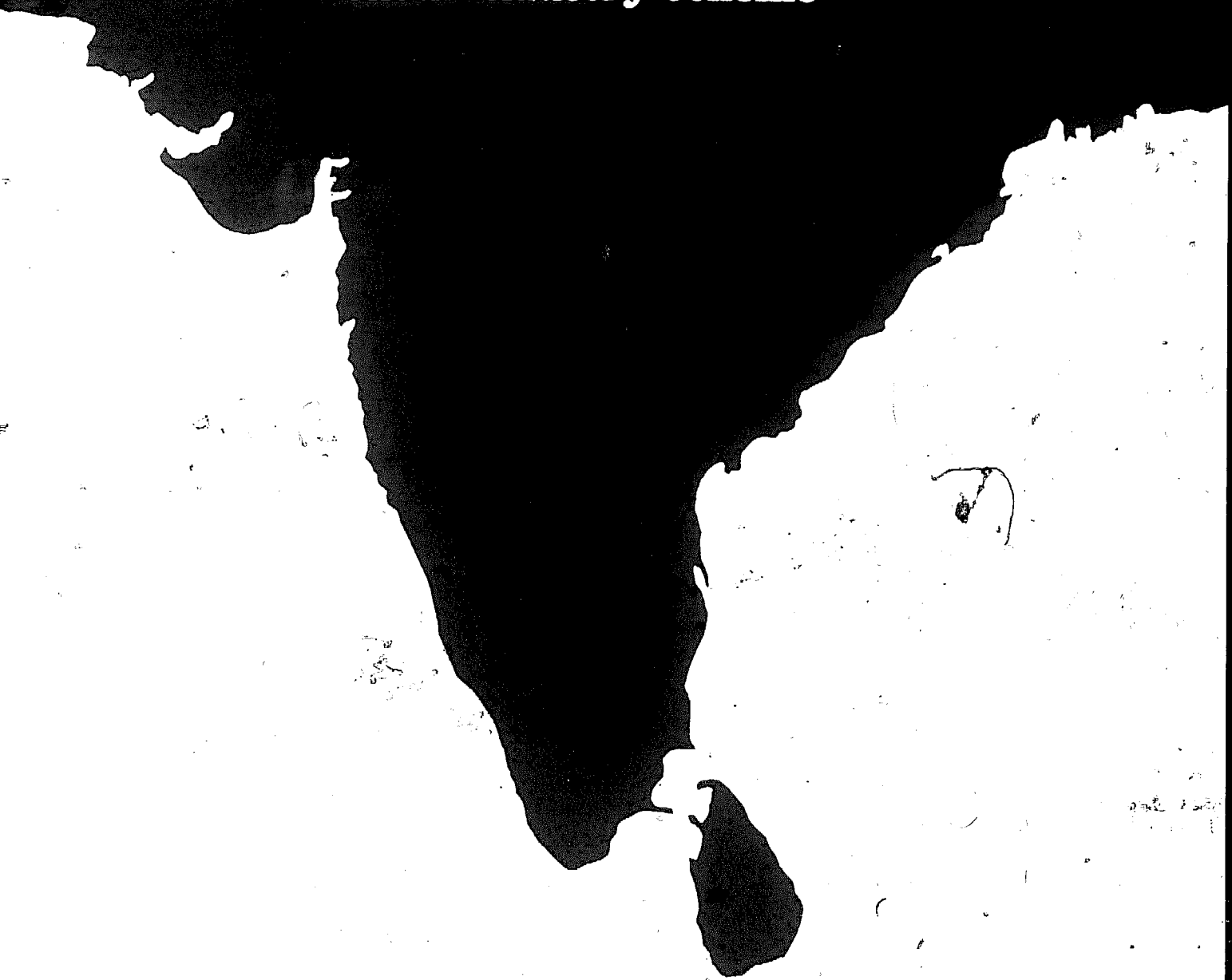
An Integrated Approach

The experience of the Birla Institute of Technology's small industry scheme



By Marilyn Carr

The Birla Institute of Technology, whose small industries scheme is described here, shows that a university of high academic standing, can, by making use of Government sponsored programmes and by collaboration with state schemes and financial institutions, assist in developing and promoting small industries.

This book provides a clear insight into the workings of a unique and successful scheme which entrepreneurs with the necessary training, financial backing and the right product have launched into small industries with considerable success.

Thanks to the enthusiasm, commitment, and ability of members of Birla staff, carefully selected entrepreneurs are assisted in obtaining loans, selecting the right product, producing and marketing it, in response to the perceived needs of the area. The book demonstrates how an outside agency can act as a catalyst in helping to bring Government schemes to fruition. Businessmen, academics, and all those concerned with the development of small industries could benefit from Birla Institute's experience.

Marilyn Carr, the author, is an economist with the Intermediate Technology Development Group. She has wide experience of appropriate technology and small industry programmes in developing countries and has written several publications on these topics. She has carried out several consultancies for the U.N. and the World Bank.

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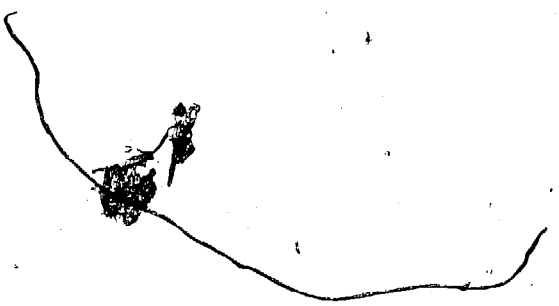
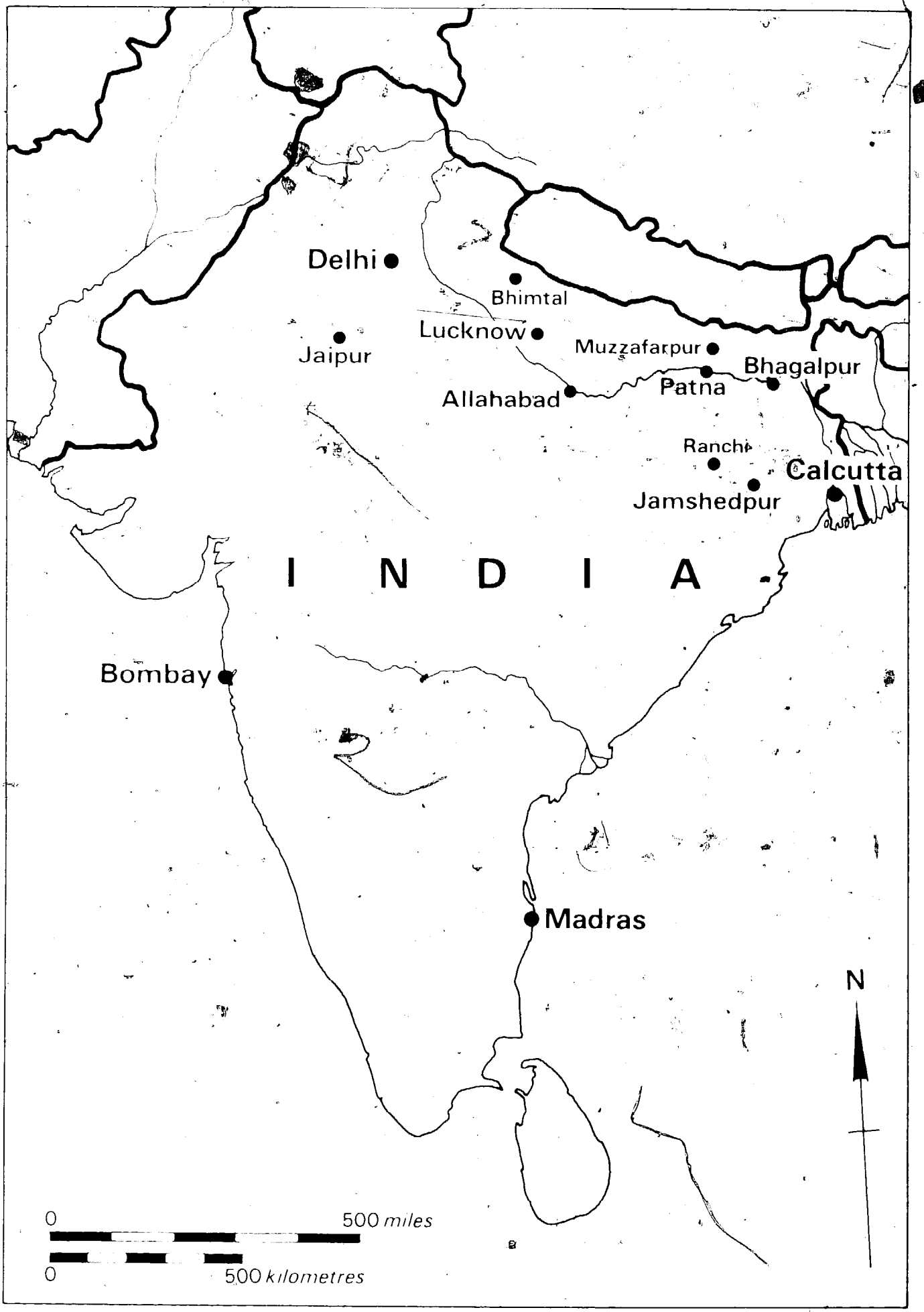
TABLE OF CONTENTS

Acknowledgements		viii
Preface		ix
Map		vii
1	INTRODUCTION	1
2	THE ENVIRONMENT FOR SMALL-SCALE INDUSTRIALIZATION IN BIHAR STATE	3
	Background	3
	Policies for the promotion of small-scale industries	4
3	DEVELOPMENT OF SMALL-SCALE INDUSTRIES – AN INTEGRATED APPROACH	10
	History and growth	10
	Objectives and methodology	18
4	CASE STUDIES	24
	Material-handling and fabrication industries	24
	Metal-processing industries	28
	Electronic control industries	38
	Electrical power industries	42
	Pharmaceutical and chemical industries	46
	A sick industry	49
	A convalescent industry	52
5	EVALUATION OF THE SMALL-SCALE INDUSTRY SCHEME	56
	General overview	56
	Factors in Success – and problems	64
6	AN APPROACH TO RURAL INDUSTRIALIZATION AND RURAL DEVELOPMENT	70
	Introduction	70
	Rural industries	70
	Rural artisan training	71
	Rural development	73
	Future directions	73
	Summary	75
7	SUMMARY AND CONCLUSIONS	76

ANNEX 1	List of machinery and equipment in central service facility	77
ANNEX 2	Products and processes developed for entrepreneurs	78
ANNEX 3	List of projects undertaken on behalf of local industries	79
ANNEX 4	List of machinery and equipment installed in small industries studied	80
ANNEX 5	Banking procedures	82
ANNEX 6	Open Market Prices of Raw Materials: 1972 - 1980	84
ANNEX 7	Profiles of selected entrepreneurs sponsored by the BISR centre at Jaipur	85
ANNEX 8	Tool kits given to rural artisans after training	86
BIBLIOGRAPHY		87

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LIST OF DIAGRAMS

1 Structure of central and state-level assistance to small-scale industries in Bihar
2 Agencies involved in the Ranchi scheme and related small-scale industry development and promotion centres
3 SIRTDO staff and their functions
4 Activities involved in the Ranchi small industry scheme

LIST OF PHOTOGRAPHS

1 The main administrative building and central workshop of the Ranchi Small Industry Scheme
2 The 'nursery' estate
3 Reciprocal coal feeder: laboratory and commercial prototypes
4 Precision Foundry
5 Gravity die-casting of transmission clamps
6 Mercurium's improved draw-bench for correcting diameter of the bar
7 Power press for steel balls at Perfect Forgings
8 Meditron's electronic control panel for plano-miller
9 Transgietz's dry-type transformer, with a burnt-out transformer imported from Europe
10 Metal housing for transformers
11 Ranchi Rolling Mill
12 Indigenous medicinal plants
13 Solar energy devices

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My thanks are also due to the entrepreneurs mentioned in the case studies, who somehow found the time to sit down with me and provide so much information about their businesses and themselves.

Finally, my thanks go to several of my colleagues at the Intermediate Technology Development Group ITDG - especially Dennis Frost, Frank Solomon, Richard Whitcombe, David Wright, Ken Marshall and Gary Whitby - for their comments and advice in preparing the final manuscript. Thanks are also due to Malcolm Harper for his valuable comments and for providing the preface to the report.

PREFACE

If success is measured in terms of high level pronouncements, prestige publications, paragraphs in development plans and the establishment of ambitious national institutions, the battle for small enterprises has been won. When we look, however, at the effects of all this on existing small businesses, or on the number of viable new businesses which are started, we may sometimes conclude that the battle has hardly even begun.

Small enterprises need a judicious mixture of credit, training, management and technical advice, buildings and so on, and the nature of this assistance, and the form which is most suitable for particular types of business at particular stages of development, have been widely investigated. What is lacking, however, is effective delivery mechanisms; how can appropriate forms of assistance actually reach the individuals and enterprises they are intended to help?

Most academic institutions have not even attempted actually to assist small enterprises. Any interest their staff may have in such activities has taken the form of sociological or economic research, of little direct relevance to small enterprises themselves or even to attempts to assist them. The Birla Institute of Technology has, however, shown that it is possible for a university of high academic standing not only to play a part in small enterprise, but actually to promote large numbers of technically advanced and viable independent small businesses, which would never have been started without the intervention of the Institute.

It will be clear to the reader of this book that the major single element in this remarkable success story has been the enthusiasm, commitment, and ability of a small number of individuals. People of this sort are perhaps the scarcest resource anywhere, and it is tempting to conclude that without such people nothing can be done. There are, however, a number of lessons which can be learned from this experience, which could substantially improve the operations of existing small enterprise promotion programmes or form the basis for new ones elsewhere. The Birla Institute's staff have throughout attempted to work with and make use of Government sponsored programmes, in spite of difficulties, rather than trying to develop their own credit systems or industrial estates. They have clearly understood the operational problems and objectives of Government employees, and have elicited their co-operation and assistance by providing a means whereby they can achieve their objectives more easily. This collaborative attitude is further expressed in the relationship between the entrepreneurs and the Institute, and among the enterprises themselves. They depend on one another for their independence; the owners of the businesses support one another in their efforts, and some also play a role in the wider rural development activities of the Institute. Although they may owe their success in establishing a business to the Institute, they are carefully selected as being people of ability and initiative, who are unwilling to become permanently dependent on any form of assistance, and are aware of their wider responsibilities to the country as a whole.

The pages which follow include a number of case studies of enterprises which have been established through the work of the programme; this enables the reader to see the programme through the eyes of the individual entrepreneurs who have benefited from it, and this is a far more cogent demonstration of its value than any description of the programme itself. It should never be suggested that this, or any other programme, provides a blueprint which can be copied by other institutions elsewhere; it is rather a source of ideas and inspiration, which should be of value to anyone who is involved in the promotion of small enterprise, or to anyone responsible for a technical training institution who recognises that it must, if only in the interest of its own survival, start to make some positive impact on the small business sector.

Malcolm Harper
Cranfield School of Management

1 INTRODUCTION

The characteristics of small enterprises dovetail well with the socio-economic objectives of many of the developing countries. Generally, they are labour intensive, employment generating, capital saving, and capable of operation on a decentralised basis in rural areas. In countries which are concerned with the generation of thousands of new workplaces – especially in the rural areas – and with raising the incomes and quality of life of the poorer sections of the population, small-scale industrialization offers a far more appropriate alternative to industrialization strategies that emphasise large-scale, centralised industries, which until recently were favoured by development planners and practitioners. The issues of whether or not the technologies appropriate to small-scale industrialization exist and whether they are as economically and technically efficient as the large-scale alternatives have already been well researched. Evidence suggests that a wide range of technologies do exist and that, in a majority of cases, the smaller-scale technology is just as efficient as the large-scale[1].

A more recent issue is that of how to go about enabling the widespread adoption and use of these technologies. To a certain extent, this is one and the same issue as finding appropriate ways of developing and promoting the small-scale industries which are the social carriers of these technologies. On this issue, very little empirical data are available. Many suggestions have been made as to what may or may not work in respect of supporting small-scale industries. In practice, there are very few examples available of well thought-out models which have been effectively implemented. This report, by describing the nature and impact of the interesting and successful model developed at the Birla Institute of Technology (BIT) in Ranchi, India, aims to add to the very small body of literature available which can show what is involved and what can be achieved in the development and promotion of small industries. It is hoped, this will be of assistance to those wishing to start small industry programmes elsewhere.

BIT's involvement started in the early 1960's when its founder, Mr B.M. Birla, formed a Department of Industrial Research, to develop an awareness of the needs of industry among technical students through work on projects of practical use to neighbouring industries.

Later, with an industrial recession, growing unemployment among engineering graduates and a change in government emphasis towards the development and support of small industries, the Chairman of BIT (Mr G.P. Birla) decided that the Institute's resources should be extended to the development of entrepreneurship among BIT graduates and the promotion of small industries to be run by them. This meant setting up a working group within BIT to man an organization which could provide all the necessary inputs for the development of small-scale engineering units. The inputs were to cover the entire spectrum from laboratory-scale research to the production of commercial prototypes and continuing technical assistance for industrial production. The organization was also to provide assistance for financing arrangements and marketing.

Such an organization (SIRDO[2]) was established in 1972 and started work in a small way with funding from the Birla Institute of Scientific Research (BISR[3]) and staff inputs from BIT. There followed two major inputs which, when integrated with the ideas and technical expertise of the BIT staff and the facilities made available through BIT and BISR, helped the scheme expand and thrive. First, the United Commercial Bank agreed to finance the small units sponsored through the scheme without the usual constraints regarding collateral and financial contribution from the entrepreneur. Second, the Government of Bihar, recognising the relevance of the scheme to its own industrial development

[1] See: Carr, M. *Economically Appropriate Technologies for: An Annotated Bibliography*, Developing Countries (see Biblography) and Jenkins, G. *Non-Agricultural Choice of Techniques.*

[2] SIRDO: Small Industry Research and Development Organization.

[3] BISR is the unit within the Birla group which is responsible for industrial research and commercial research and development work. A few administrative staff are based in Calcutta but most permanent BISR staff are located in the four small-scale industry schemes in Ranchi, Allahabad, Bhimtal and Jaipur, the Economic Research Division in New Delhi and the Paper & Pulp Division at Amlai.

objectives, agreed to provide sheds and infrastructure for an industrial estate from which the entrepreneurs could operate until they had confidence and resources enough to move off on their own.

The combined effect was the establishment of several flourishing small-scale industrial units. So impressed was the Government of Bihar with the SIRDQ scheme that, in 1977/78, when it was looking for ways in which to allocate the funds provided by Central Government under the 'Half a Million Job' Programme, it decided to give increased financial support and also to direct that all technical institutes within the State should start similar programmes. It was thus that an idea conceived in the early 1960's eventually became translated in 1978 into a State Government-sponsored programme known as the Small Industries Research Training and Development Organization (SIRTDO).

A particularly interesting aspect of the scheme is that it has its roots in a technical institute and it shows how a small group of teachers within such an institute can develop and implement a workable model for small industry promotion. Apart from this, there are three features of the scheme which are particularly worthy of attention. These relate to replicability, integration and entrepreneurial development.

First, the model forms the basis for starting similar schemes elsewhere and can provide guidelines to governments when planning small-scale industrialization programmes. Apart from the involvement of the Bihar Government in strengthening the Ranchi scheme and in funding the setting up of five similar centres in the State, the Government in the neighbouring state of Uttar Pradesh has also recognised the effectiveness of the programme and, following a visit to the Ranchi centre, is planning to give financial support to the BISR centre located in Allahabad. Additionally, the United Commercial Bank has found the model works so well that it is now encouraging technical institutes in other states to copy this and is offering to give financial support to small entrepreneurs sponsored through such schemes.

A second point is that the model has been built up largely by planning for the more efficient use of existing resources. Facilities for the development of laboratory and commercial prototypes, testing facilities, favourable banking arrangements, assistance with raw material procurement and marketing, entrepreneurial training, and provision of central facility workshops are things which are widely available throughout India. The uniqueness of the Ranchi model is that it brings together all these essential ingredients of a successful programme under the direction of a single working group. By successfully combining the efforts and resources of a technical institution, a scientific research institution, a financing institution and the Industries Department of the Government it has become a classic example of how to approach the problem in a truly integrated way. By doing so, it also illuminates the extent to which services and facilities lack integration elsewhere.

Third, the scheme is concerned as much with the development of entrepreneurship as it is with that of small industries. Set in the heart of Bihar's tribal belt, the Institute is working in an environment where there is no tradition of entrepreneurship and very negligible growth of light and small-scale industries. In addition, it is dealing with technical graduates who, besides having no commercial background, are conventionally more inclined to seek out the status and security of employment in established organizations. By showing how entrepreneurs can be identified, motivated and trained in the face of these difficulties, the scheme makes a very real contribution to the field of small industry development, given that lack of entrepreneurship is so often cited as being a major impediment.

As far as possible, the report concentrates on these key themes of replicability, integration, and entrepreneurial development. Since it is important to look at the scheme within the context of its geographical, economic and social environment, Section 2 gives a brief account of the Bihar economy and of the numerous programmes and facilities which exist to assist small enterprises. Section 3 looks at the history, growth, objectives and methodology of the scheme, while the way in which it works is further expanded in Section 4 by means of seven case studies. Section 5 attempts to assess what can be learned from the scheme and compares it with the performance of related centres elsewhere in India. Section 6 looks at SIRTDO's work on rural industrialisation and rural development. Finally, Section 7 presents some major conclusions and recommendations.

2 THE ENVIRONMENT FOR SMALL-SCALE INDUSTRIALIZATION IN BIHAR STATE

Background

The State of Bihar lies in the eastern part of the country and covers an area of 175,000 km² which makes it the ninth largest State in India. In terms of population it ranks second (next to Uttar Pradesh) among all the States, with 56,353,000 people in 1971, and has a high density of population with 324 people per km² as compared with only 182 people per km² for the country as a whole. 90% of the total population is rural as opposed to 80% for India. The scheduled castes and tribes form 14% and 9% respectively of the total population of the State, and in some districts, such as Ranchi, the scheduled tribes account for as much as 60% of the population[1]. The level of literacy is low, being only 19.9% of the population in 1971 as opposed to 29.5% for India as a whole.

The State comprises two distinct and almost equally sized topographical units, namely the plains and the plateau regions. In the north, the flat plains are divided by the river Ganga into the North Bihar Plain and the South Bihar Plain. The soils are rich and alluvial and the area is agriculturally prosperous. However, the very high population density (489 per km² in North Bihar Plain and 392 km² in South Bihar Plain) means that agricultural holdings are very small and per capita incomes are very low[2].

The plateau region of Bihar, known as the Chotanagpur plateau, covers almost the entire southern half of the State. Here the soil is less fertile, but the population is less dense (178 per km²) and agricultural holdings are larger. Drought is common, irrigation is sparse, and given the shortage of non-agricultural employment opportunities in the region, seasonal migration in search of work is a regular feature. This situation exists in spite of the fact that the plateau is India's primary source of high quality mica and has rich deposits of iron ore, coal, copper, chromite, manganese, bauxite, steatite, asbestos and kyanite. Although Bihar accounts for 44% of the total mineral production in the country, the development of these resources has not been beneficial in terms of providing employment and increased incomes for the majority of the local population.

About 50% of the total land area of the State is under food crops while a further 17% is covered by forests. Principal food crops grown are rice, wheat, maize, ragi and pulses, while cash crops grown consist of sugar cane, oil seeds, tobacco and jute. The main forest products are timber *kendu* leaves, gum, *sal* seeds, resin and *lac*. About 59% of the State's Gross Domestic Product and 80% of the workforce are accounted for by the agricultural and forestry sectors.

The enormous mineral wealth of the State has led to the setting up of many large and medium industries based on these resources. These include: Bokaro Steel Ltd, Coal India Ltd, Uranium Corporation of India Ltd, Tata Iron and Steel Company, Tata Electric and Locomotives Company, Bihar Alloys and Indo-Asahi glass factory. There are also two fertilizer factories, an oil refinery and several cement factories, distilleries, mica industries, ceramic industries and rice and jute mills.

There are several thousand small-scale industries in the State, which are involved in a wide range of goods but concerned mainly with metal products, wood products, mineral products, machine tools and repairing and servicing. There are also a number of long-standing traditional craft industries of which perhaps the best known is that based on *tasar*, a variety of wild silk. The mining and manufacturing sector accounts for about 23% of the Gross Domestic Product of the State. However, due to the predominance of large-scale industries, it accounts for only about 8% of the workforce.

The State lies on the arterial rail and road routes connecting all major production and consumption centres of the country, although the plateau region is better served in this respect than the northern agricultural districts. Most areas of the State are provided with electricity although only 20% of villages had actually received electricity by 1975 as compared with

[1] The tribes are the aboriginal people of India, often living in isolated areas and frequently neglected or disadvantaged by the development process.

[2] The average per capita income would be even lower without the impact of a few wealthy families who own a large proportion of the land.

29% of villages for India as a whole. Postal and telephone services are fairly widespread although they appear to be somewhat erratic. There is a network of commercial bank branches in all towns and a fairly good network in the rural areas.

In order to set the problem of small industry development in context, there are a number of key features about the economic environment which need to be stressed.

First, industrial development in Bihar started with extractive industries, followed by heavy metallurgical industries. It was not preceded by the development of light capital goods or consumer goods industries, as generally happens in the process of industrialization. While the development of the mineral industry has been beneficial for the entire country, it has not created significant employment opportunities in Bihar, nor has it led to diffusion of entrepreneurial activities which would have accompanied the development of diversified light consumer goods industries. As a consequence, the economy is characterized by a shortage of non-agricultural employment opportunities, the lack of a sizable small-scale industry sector and a virtual absence of an entrepreneurial class.

Second, although the rate of growth of large- and medium-scale industries has been increasing in recent years, this has not resulted in a significant increase in the number of job opportunities[1]. At the same time, there has been a very limited increase in the rate of growth of the more labour-intensive small-scale industry sector[2].

Third, the health of the industrial sector as a whole has been adversely affected in the last few years by severe problems relating to power shortages, and the scarcity and inflationary prices of certain raw materials. Inevitably, small industries have been hit hardest. According to a recent article:

> 'Power shortages have hampered growth and also forced many entrepreneurs to either close down their units, slash production, or retrench employees. Small units are the worst casualties of the power famine. According to reports, production worth Rs 1500 lakhs has been lost in these small units, due to power shortages in 1979 - 1980[3].'

Similarly, small units have greater trouble than large industries in securing adequate supplies of raw materials at government-controlled prices. They are also less likely to be able to stockpile raw materials as a guard against inflation. This is a disadvantage, given that the prices of basic metals – upon which many of the State's small industries rely – have more than quadrupled in the last six years.

Policies for the promotion of small-scale industries

Like all other States, Bihar has its own policy framework for industrial development and its own package of policy measures for supporting small-scale industries. While these generally follow the broad guidelines set out by Central Government, the implementation of assistance programmes is the responsibility of the State Government.

As will be seen in the following pages, there exists a multitude of institutions, facilities and incentives which theoretically should meet almost every need and problem which a small entrepreneur could face. Indeed, the small entrepreneur in Bihar and elsewhere in India appears to be positively pampered in comparison to those in other developing countries. In practice, however, despite constant evaluations and revisions in small industry programmes, many small entrepreneurs (especially those in industrially backward areas such as many districts in Bihar) seem to have great trouble in realizing the potential benefits involved. This difference between theory and practice is an important one to bear in mind.

State corporations

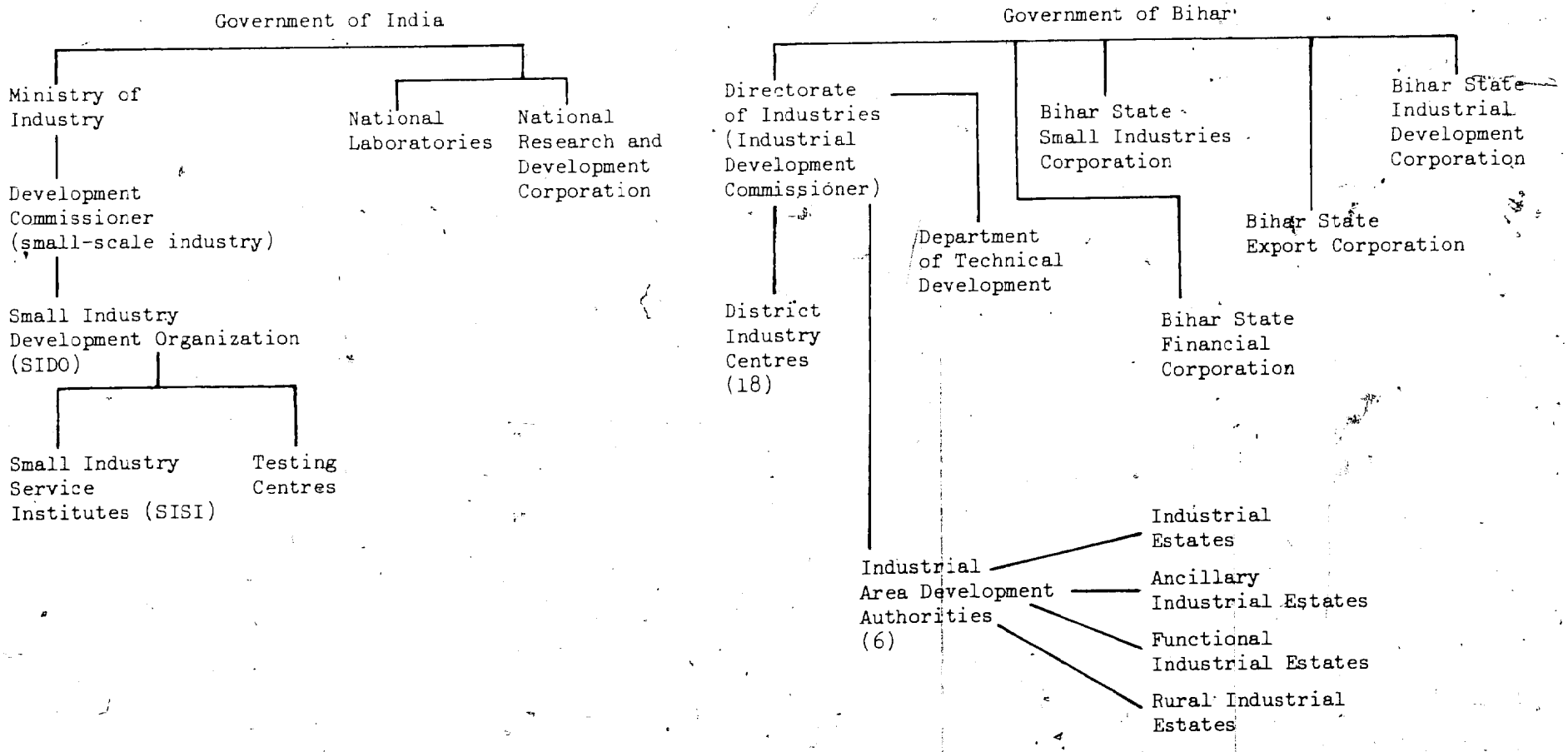
The Government of Bihar carries out the development and implementation of small industry programmes through the Directorate of Industries at Patna (headed by the Industrial Development Commissioner). Under the Directorate of Industries are thirty-two State Corporations and Agencies to which have been delegated many of the executive functions relating to industrial development. These are autonomous bodies with Boards made up of relevant public and private sector representatives who manage the

[1] While the number of industries registered increased from 2,600 in 1951 to 23,000 in 1973, the number of daily workers employed in these factories less than doubled.

[2] The rate of growth of small industrialization in Bihar is one of the lowest in the country.

[3] *Commerce* December 20, 1980 p. 1166 (see Bibliography)

Diagram I: Structure of Central and State Level Assistance to Small-Scale Industries in Bihar



Corporations within the guidelines set down by the State Government. The Industrial Development Commissioner is Chairman of many of these Corporations.

Of particular relevance to the small-scale industry sector are the Bihar Small-Scale Industries Corporation (BSSIC), which offers assistance with raw materials and marketing; the Bihar State Financial Corporation (BSFC), which offers medium- and long-term loans at favourable interest rates to small entrepreneurs; the Bihar State Export Corporation (BSEC), which competes in the international market and obtains orders to be supplied by small firms; and the Directorate of Technical Development (DTD), which offers funding for individual research and development (R & D) projects and prepares project profiles aimed at assisting entrepreneurs to start small businesses.

Industrial area development authorities

In addition, there are six Industrial Area Development Authorities (IADA) located in Ranchi, Patna, Muzaffarpur, Darbhanga, Jamshedpur and Bokaro[1]. These have responsibility for the development of industrial areas and construction of industrial estates including ancillary, functional and rural industrial estates. Their territory is limited to specific areas around towns which are deemed by the State Government to be industrially important. Within their area, they have authority not only to develop infrastructure, but also to provide a package of services to prospective entrepreneurs for setting up a unit. These services include registration, interest, capital and power subsidies, and various licences and incentives.

Until May 1978, entrepreneurs wishing to locate a small-scale industry outside of an IADA's territory did not have such easy access to government assistance. There were two reasons for this. First, while necessary inputs could be provided on the spot within an IADA, power to grant subsidies and incentives to entrepreneurs located elsewhere remained with the Directorate of Industries in Patna, thus involving an elaborate process of referral to the District and then the State level. Second, while all assistance measures within an IADA were available from one place (the IADA manager's office), entrepreneurs located elsewhere had to run around to several agencies, many of them away from the District, in order to get the same assistance. In an attempt to improve on this, the District Industries Centre (DIC) scheme was introduced in May 1978 whereby all assistance measures would be available to all entrepreneurs (outside IADAs) from one agency (DIC), to which had been delegated suitable powers of implementation. Every district in India was to have a DIC and two hundred were set up in 1978/79, of which eighteen are in Bihar State.

District industry centres

The District Industry Centre (DIC) Scheme is worth looking at in more detail both because it is an interesting initiative in its own right and because it ties in quite closely with the daily functioning of the small-scale industries sponsored by SIRTDO.

Basically, the DIC is an institution at the district level which aims to provide in one place all the services and facilities which are needed by entrepreneurs for setting up small-scale and village industries. Assistance includes identification of a suitable scheme, preparation of a feasibility report, arrangements for supply of machinery and equipment, provision of raw materials, credit facilities and inputs for marketing and extension services.

When a potential entrepreneur first approaches the DIC, he is seen by the Economic Investigation Manager who discusses with him proposed items for production. Following this initial enquiry and investigation process, the potential entrepreneur can provisionally register with the DIC and start looking for land on which to locate a factory.

The next step is to draw up a project proposal for appraisal by the Credit Manager of the DIC who forwards viable projects to the State Financial Corporation (SFC) or a commercial bank for funding. Although the DIC appraisal mechanism is supposed to be sufficient, the banks often turn down projects forwarded through this channel or insist on substantial changes before funding is given.

Once funding is obtained, advice is given on where to purchase machinery and equipment and, when the small business is running, the entrepreneur can then use the services of the managers dealing with raw material procure-

[1] The Ranchi Industrial Area Development Authority (RIADA) has particular relevance to the SIRTDO scheme. The manager of RIADA is a member of SIRTDO's managing committee and several of the SIRTDO entrepreneurs are located on Tupudana Industrial Estate which is managed by RIADA.

ment, marketing and technical information, as required.

Registration with the DIC is entirely voluntary but unless this is done no government assistance can be claimed. Incentives available to small entrepreneurs through the DIC include an interest subsidy, a capital subsidy and power subsidies. Any small industry which runs into severe difficulties can apply to the DIC to be registered as a 'sick unit' so as to gain access to additional benefits and incentives. Finally the DIC administers the scheme of the Industrial Development Bank of India (IDBI) which gives 'seed' money to assist new units which satisfy national priorities and whose promoters have insufficient funds to meet the normal level of contribution required by the commercial bank[1].

Small industry service institutes

In addition to State schemes to assist small-scale entrepreneurs, there are also some Central Government schemes, the most notable of which is the Small Industry Service Institutes (SISI) Programme. In Bihar there are SISI centres located at Patna and Ranchi and branch offices located at Muzaffarpur and Dhanbad[2]. The main function of these Institutes is to provide technical, economic and managerial consultancy to the prospective entrepreneurs for starting, expanding and modernising their units.

SISI is in general supposed to work as an information centre in all technical matters relating to small industries. Sometimes, necessary advice and assistance can be given by the SISI technical staff, but normally requests for specific technological assistance are referred to the relevant National Laboratory or another appropriate technical institute.

The SISI also organises training courses for small entrepreneurs and their workers. Three month entrepreneurial development courses are run for unemployed youth. Preliminary and advanced courses for entrepreneurship development are also arranged for students, women, scheduled castes/tribes and other weaker sections of the community. Additionally, technical training can be given to industrial workers sponsored by small industries.

With respect to marketing, the SISI can offer advice on choice of products and diversification of production. It has also set up sub-contract exchanges to help small-scale industries market their products to large-scale firms on a contract basis.

Central government R & D and testing facilities

The Central Government's National Laboratories, the National Research and Development Corporation, and the various Testing Facility Centres are also important. The National Laboratories, of which there are twenty-two throughout the country, provide technical facilities and staff for developing laboratory and commercial prototypes and processes relating to all types and sizes of industry. They are also supposed to deal with specific technological problems referred to them by individual entrepreneurs through the DIC, SISI, or other promotional agencies. Each branch concentrates on a specific field such metallurgy, ceramics, pharmaceuticals or textiles.

Any commercial prototype developed by the laboratories is handed over to the National Research and Development Corporation in New Delhi which is the agency responsible for licencing the process. If a small-scale entrepreneur wishes to purchase the licence or a process, 50% of the cost involved is refunded by the government.

Once an entrepreneur has purchased a licence and set up a business on the basis of a NRDC process, he is supposed to be able to refer any 'teething troubles' to the National Laboratory at which the R & D work took place. In practice, however, entrepreneurs seem to have difficulty in making use of this facility because of distant location and lack of personal contact.

Finally, testing centres for the engineering, metallurgical, chemical and electrical trades are available in Calcutta, Bombay, Delhi and Madras. These centres were established in an attempt to provide testing facilities which would enable small industries to produce goods conforming to the Indian Standards Institution (ISI) specifications and to provide testing facilities in accordance with the requirements of the purchasing agencies of the State and Central Governments. These work fairly well except for the fact that many of the country's small entrepreneurs are located at some distance from the centres. This is particularly inconvenient for

[1] As will be seen in the following chapters, the SIRTDO entrepreneurs (other than those located on Tupudana Estate) register with the Ranchi DIC so that they can claim government assistance. They also utilize the services of the raw material and marketing managers.

[2] In all, there are sixteen Institutes and nineteen Branch Institutes in India.

entrepreneurs who have a product which needs a quality control certificate for every batch or every item.

Central Service Facilities

There are a few central service facilities which are located on or near an industrial estate and are managed either by SISI, an IADA, or more recently a DIC. These central facilities aim at helping small entrepreneurs to compete on equal terms with larger firms by providing them with access to the sort of large, expensive machines which are needed on an occasional basis, but which an individual small firm could not afford to buy.

Theoretically, this is an important type of institutional support for small firms. Again, however, entrepreneurs seem to have difficulty in making efficient use of these facilities. Problems cited by entrepreneurs include inadequately stocked workshops, uninterested and insufficiently skilled staff, time-consuming bureaucratic procedures involved in use of the facilities, and an inability to be able to make use of them at the time needed.

SUMMARY

This institutional framework is both elaborate and costly. However, the impact in terms of small industry development and promotion is not all that could have been hoped for. For instance, only people living in areas where entrepreneurship has always flourished have been best able to make use of the incentives being offered to small industries. In other areas, similar or even greater incentives have been of less use because of the absence of effective programmes aimed at identifying, motivating and training entrepreneurs. In addition, an unknown but undoubtedly high proportion of small enterprises fall sick or never really get started, despite the institutional framework developed to ensure that they survive and flourish.

With respect to entrepreneurial development, the problem seems to be that when programmes do exist, they concentrate heavily on training and often completely ignore the need for identifying and motivating potentially suitable entrepreneurs. When training is given, it tends to be theoretical in nature and is of limited use either in terms of assisting determined trainees to develop entrepreneurial skills or in terms of convincing the less-determined trainees of the wisdom of starting a business. The proportion of people who set up a successful business after attending government funded Entrepreneurial Development Programme courses is thought to be very small indeed.

With regard to the high incidence of sickness among small units, it is commonly believed that one of the major difficulties is the lack of good advice given to entrepreneurs on the choice of product, the choice of technology, and the ways of changing technology to deal with changing conditions. Part of the problem, of course, is that the promotional agencies such as SISI and DIC have little or no R & D capacity. Thus, while the staff are involved in helping entrepreneurs to choose products and technologies, they are not actually involved in technology development themselves and the information they pass on to the entrepreneur is second-hand, non-specific and possibly out of date.

Similarly, if a small industry needs technological help to diversify production, upgrade quality, or reduce costs in order to remain competitive, the promotional agency can normally only assist by passing on the problem to a National Laboratory or other technical institute. This is a non-personal, non-immediate and often non-efficient method of diagnosis which rarely leads to the prescribing of the optimum solution for each individual client.

A contributing factor to the problem of maintaining a competitive position is thought to be the difficulty experienced by many small entrepreneurs in making efficient use of government testing centres and central facility services.

Finally, the difficulty experienced by many potential entrepreneurs in actually getting started in business is also thought to be due to a lack of good advice given in respect of identifying and developing good projects. As was mentioned earlier, the State Finance Corporation and the commercial banks often refuse to provide credit to a small entrepreneur whose project has been approved and forwarded by the promotional agency. More often than not, this is because the Bank's own technical assessment committee (despite the favourable assessment of the promotional agency) feels that the project would not be viable. Again, this points to a lack of integration between the various arms of the support mechanism.

Within this context the model developed at the Birla Institute of Technology seeks to do two things. First, it aims to show how entrepreneurship can be developed in an area and among people where it is traditionally lacking. Second,

it aims to show how the development and promotion of small industries can be approached in a more integrated way.

As will be seen in the following chapters, the group of five BIT teachers who are involved in the scheme are a rather special group of people. Of equal relevance, however, is the fact that they are heavily involved in every aspect. This includes identification, motivation and training of the entrepreneurs, advice on choice of product and technology, development of laboratory and commercial prototypes, transfer of proven technologies to the entrepreneurs for commercial production, technical assessment of proposed projects on behalf of the bank providing loans, and provision of on-going technical guidance and assistance.

The impact of this last function, which aims at helping the entrepreneurs to maintain a competitive position, is increased by the provision of conveniently located and efficiently operated testing and central service facilities.

3 DEVELOPMENT OF SMALL-SCALE INDUSTRIES: AN INTEGRATED APPROACH

History and growth

If you travel from Ranchi town along the road to Hazaribagh you will reach, after some 16 km, a hive of activity in the midst of an otherwise peaceful rural area. Five years ago there was nothing here except a narrow road turning off to the Birla Institute of Technology which lies 4 km away in the midst of the Sal forests. Today, just off this turning, there is a flourishing industrial estate and a cluster of small roadside cafes and shops which have grown up to service it.

Although it may look normal enough, this is in fact far from being an ordinary industrial estate. In particular, the eighteen factory sheds are all occupied by young engineering graduates from the Birla Institute of Technology and they are all running businesses sponsored by the Small Industries Research Training and Development Organisation.

The story behind the development and promotion of these small businesses is a fascinating one in its own right. Of more importance, however, is the fact that, at a time when governmental and non-governmental agencies throughout India and elsewhere are looking for approaches to small industry development which actually work, this scheme has the distinction of being one which is successful, worthy of detailed description and, it is hoped, eventual replication.

As was seen in the previous chapter, a common problem with small entrepreneurs in India is the lack of advice on choice of product and assistance with selection and adaptation of technology. As a consequence, production of sophisticated products is ruled out for most small firms because of lack of access to R & D facilities; and promotional measures relating to the acquisition of raw materials, subsidised inputs and preferential purchase, are of limited use to a small firm competing in a market which, because of ease of entry, is already flooded by other small firms. Further, flexibility of production so as to cope with shortages of raw materials, power cuts and changing market conditions is difficult because of an inability to get adequate assistance in adapting machinery or processes.

The BIT engineering graduates who have been assisted to start small industries have benefited from a unique scheme which integrates the R & D and promotional side of small industry development and by doing so increases the efficiency of both. The total effort can, in fact, be divided into three distinct yet overlapping parts, namely – technical education and research and development of laboratory prototypes; development of commercial prototypes and processes; and sponsoring and promotion of small commercial industries. Broadly speaking, these three parts are catered for by three institutions – the Birla Institute of Technology, the Birla Institute of Scientific Research, and the Small Industries Research, Training and Development Organisation. There are no fixed boundaries marking where the responsibilities of one institute ends and another begins: in fact, to try to define the role of each institute would be difficult since the same people tend to be involved in each. However, a word or two needs to be said about each institute separately before we can understand how they fit together within this integrated approach to small industry development.

Birla Institute of Technology

Founded by the industrialist Mr B.M. Birla, the Birla Institute of Technology (BIT) was established as an all India Institute of Engineering and Research by the Hindustan Charity Trust in July 1955. The Institute offers courses of study and provides research facilities in various disciplines of engineering, technology and science leading to undergraduate and post-graduate degrees up to doctorate level. Practice-oriented post-graduate diploma courses are also offered to cater for the needs of industry. For the purposes of the present study, two aspects of BIT are of particular importance. First, since 1972 the Institute has been autonomous, with powers to frame its own academic policy and conduct its own examinations. This has given it a great deal more flexibility than the rest of the technical colleges in the State which are all controlled by government. Second, the Institute's educational policy has always had a slant towards practical application of learning and has stressed maximum exposure to industrial processes.

With the aim of increasing its ability to guide students into using their talents in ways which

were most appropriate to local needs and circumstances, the Institute formed a Department of Industrial Research in 1964. Initially, the work of this Department, which drew upon the talents of various faculties in the Institute, took the form of conducting surveys in nearby heavy industries and government establishments. Before this, industry and academic institutions had not discussed how they might work together.

Gradually, the surveys revealed that much equipment in local heavy industry was idle for lack of critical components which took months to arrive from overseas. Therefore, it was decided to investigate the possibility of producing machines and components which up to that time had only been available from abroad. Once projects were identified, final year students were set to work on them. At this stage, the heavy industries in the area were merely interested observers and contributed no more to the experiment than indicating their current problems with idle machinery.

However, by the early 1970's heavy industry began expressing an interest in trying out and purchasing limited quantities of the items which BIT had shown were capable of local production. Larger industrial units were not interested in production for such a limited market and the technologies involved were, for the most part, outside the scope of existing small-scale undertakings. Thus arose the idea of encouraging some of the students who had worked on the projects to set up small industries for the commercial production of the items which they had helped to develop.

Birla Institute of Scientific Research

While BIT was capable of carrying out technical education and developing laboratory prototypes, it was beyond its capabilities and facilities to take the work any further. In particular, since larger industries seemed unwilling to place orders for products without first receiving a free full-scale sample for trial purposes, there was a need for facilities and funds to produce commercial prototypes.

At this stage, the Birla Institute of Scientific Research (BISR) - the unit of the Birla Group involved with industrial research and commercial R & D - became interested in the scheme and recognised the need to create some sort of organisational basis to help technical graduates establish their own small industries. This idea appealed because it was a way of turning job seekers into job creators, thus tackling the problem of unemployment among technical graduates and at the same time creating employment for their semi-skilled and unskilled workers.

BISR therefore decided to create a Small Industries Research and Development Organization which would conduct R & D of devices and processes for commercial exploitation and assist technical graduates to take up the manufacturing opportunities thus provided by becoming small-scale entrepreneurs. Special emphasis was to be placed on R & D, which would assist in establishing industrial units for the production of import substitutes or items for export.

BISR allocated funds to establish four centres to carry out this work: at Allahabad, Jaipur, Bhimtal and Ranchi[1]. In each case, the funds were for construction of a building, salaries for permanent technical and support staff, and purchase of necessary machines and equipment for prototype and process development. It was only at Ranchi Centre (which is adjacent to BIT) that the applied R & D work was completely integrated with the work of a technical institute. Thus, the work of BIT and BISR became part of the same scheme for assisting technical graduates to establish small industries.

Following the BISR initiative, laboratory prototypes of various products needed by the coal-mining industry were developed in the BIT workshops and commercial prototypes of these were produced in the central facility workshop of the new small industry centre. When these were found satisfactory after field testing, and Coal India Ltd (CIL) had agreed to place orders, the time came to hand over the products to entrepreneurs for commercial production. Three mechanical engineering graduates from BIT who had been involved in the developments were identified as potential entrepreneurs. However, at this stage, a number of obstacles were encountered.

First, the entrepreneurs were mainly recent graduates from middle or lower/middle class families and had neither experience nor significant funds behind them. Even given the fact that the government was at that time encouraging the

[1] The centres at Allahabad, Jaipur and Bhimtal are discussed in Chapter 5.

banks to give loans to techno-entrepreneurs[1], there was a normal requirement for the entrepreneur to contribute about 25% of the total capital investment required to start the business. This was something that most of these young graduates did not have. Remarkably, the BIT staff managed to deal with this problem by persuading the United Commercial Bank to experiment with a change in its normal lending practice and sanction loans amounting to almost 100% of the total capital investment involved in each business being sponsored. Some of the conditions under which the Bank agreed to this experiment were: that the staff of the scheme would monitor expenses incurred by the entrepreneurs and would assist the Bank in taking techno-economic decisions, that the scheme would provide operational guarantee and quality control, and that the scheme would provide sheds and central facilities for the use of the entrepreneurs.

The terms of the agreement with the Bank contributed to further problems. In particular, there was a problem with the clause stating that those entrepreneurs given sponsorship would also be provided with factory sheds and central facilities through the scheme. The need had arisen for a 'nursery' estate on which new entrepreneurs could locate their units until they were financially secure and considered by the Bank to be a 'good risk.' Unfortunately, neither BIT nor BISR could provide the funds for the construction of factory sheds since neither institution can involve itself directly in commercial production activities. Similarly, although BISR was able to provide machines and equipment relating to the production of commercial prototypes and other applied R & D work, it could not become involved in providing large expensive machines to which the entrepreneurs might need occasional access during production but which they could not purchase individually. Thus, to take full advantage of the banking agreement and to make the small industry scheme fully operational, funds were needed to provide factory sheds and infrastructure on a 'nursery' estate and to equip the central workshop with machines which could be rented by small entrepreneurs to assist with commercial production.

After several years of discussions, (during which time more projects followed) the BIT/BISR staff finally persuaded the Government of Bihar to contribute towards the small industry scheme so that these difficulties could be overcome. Financial assistance was given on an *ad hoc* basis during 1975 and 1976[2]. This was used to construct twenty factory sheds complete with infrastructure and to expand the central workshop facilities. The sheds were completed in September 1977 and were immediately occupied by BIT graduates being sponsored through the small industry scheme[3].

Discussions had continued throughout on how to get more permanent help from the State Government for the scheme. At the end of 1975, following the initiation of the 'Half a Million Jobs' programme by Central Government,[4] the Government of Bihar decided that one of the contributions it would make under this scheme would be the starting of small industry promotion activities in all technical institutions in the State.

Additional funding for five years from March 1976 was allocated to the existing BIT/BISR scheme, while the other technical institutes were directed to start their own centres. These institutes were to be responsible for providing the staff for such centres while the Government would provide funding for machinery, training and promotion work. Funds were provided for a five year period to the technical colleges in Jamshedpur, Patna, Sindri, Bhagalpur and Muzaffarpur and all were required to follow the Ranchi pattern and build a 'nursery' estate, central workshop facilities, quality control sections and an industrial library[5].

[1] Techno-entrepreneur is now a well-used term in India and indicates that the entrepreneur is an engineer or other technically qualified person. This distinguishes him from a commercial entrepreneur without technical qualifications.

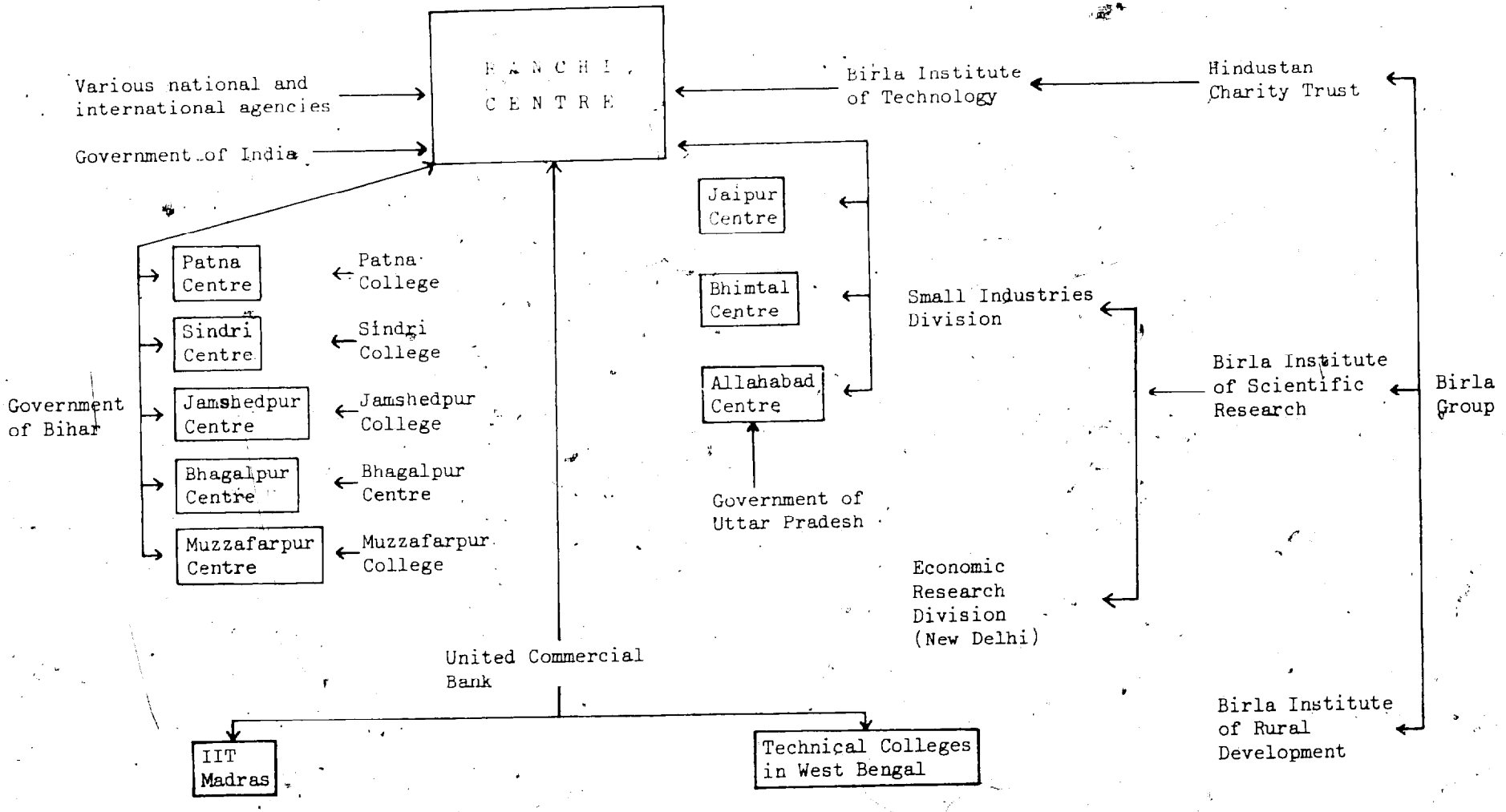
[2] This amounted to just under Rs 20 lakhs.

[3] It is interesting to note that in the meantime the first three units to be sponsored through the scheme had to be located in part of the Industrial Research Department workshop, while a fourth was located in the marketing centre on the BIT campus. Several other entrepreneurs were kept waiting while the 'nursery' estate was being completed, but only one was seriously inconvenienced.

[4] This programme was initiated in the mid-1970's to try to combat the period of severe industrial recession. The aim was to create half a million jobs within five years. Central Government provided funds to State Governments and set out guidelines within which they were to initiate programmes.

[5] These other centres are discussed in Chapter 5.

Diagram II: Agencies Involved in the Ranchi Scheme and in Related Small-Scale Industry Development and Promotion Centres



The 'nursery' estate

Small Industries Research, Training and Development Organisation

In 1978, following high-level discussions between BIT, BISR and the State Government, it was decided that, in order to facilitate funding, the small industries scheme at Ranchi should be registered as an independent society directed by a managing committee composed of representatives of the three institutes/agencies concerned. It was thus, in February 1978, that the autonomous body known as the Small Industries Research Training and Development Organization (SIRTDO) officially came into existence[1]. The small industry scheme, however, continued along much the same lines as before with each institute catering for different but often overlapping parts of the same programme. Of great importance was the fact that the staff executing the scheme remained the same.

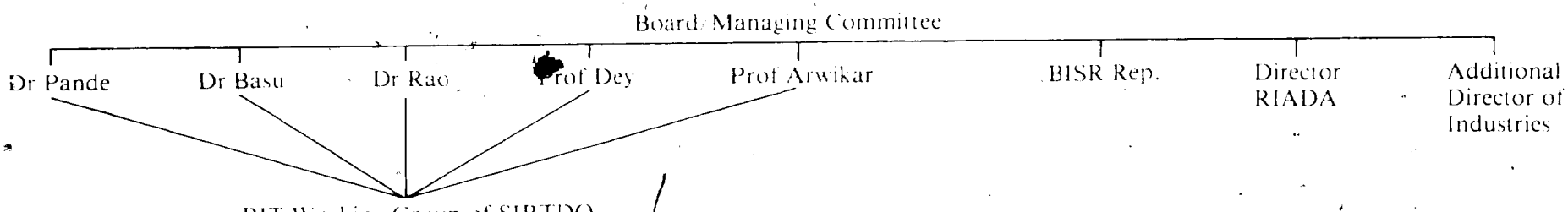
The managing committee of SIRTDO is composed of five members of BIT staff, one representative of BISR, and two officials of the State Government - the Additional Director of Industries and the General Manager of the Ranchi Industrial Area Development Authority (RIADA). The Director of BIT, Dr H.C. Pande, is Chairman of the committee. Dr Pande and the other four BIT staff members - Prof. J.S. Arwikar[2], Prof. I. Dey, Dr A.K. Basu and Dr B. Kanta Rao - have been involved with BIT/BISR activities from the very beginning and are still fully involved in both the R & D and promotional aspects of the small industry programme. Other members of BIT staff are used as short-term consultants from time to time, but only a few have developed a long-term relationship with the scheme.

In addition to this core group, who work for SIRTDO over and above their normal BIT workload, there are nine full-time technical staff and several support staff. The majority of these are permanent employees of BISR. The remain-

[1] The Centres at the five technical colleges in Bihar are also called SIRTDO.

[2] Professor Arwikar retired in January 1981.

Diagram III: SIRTDO Staff and Their Functions



BIT Working Group of SIRTDO

Functions

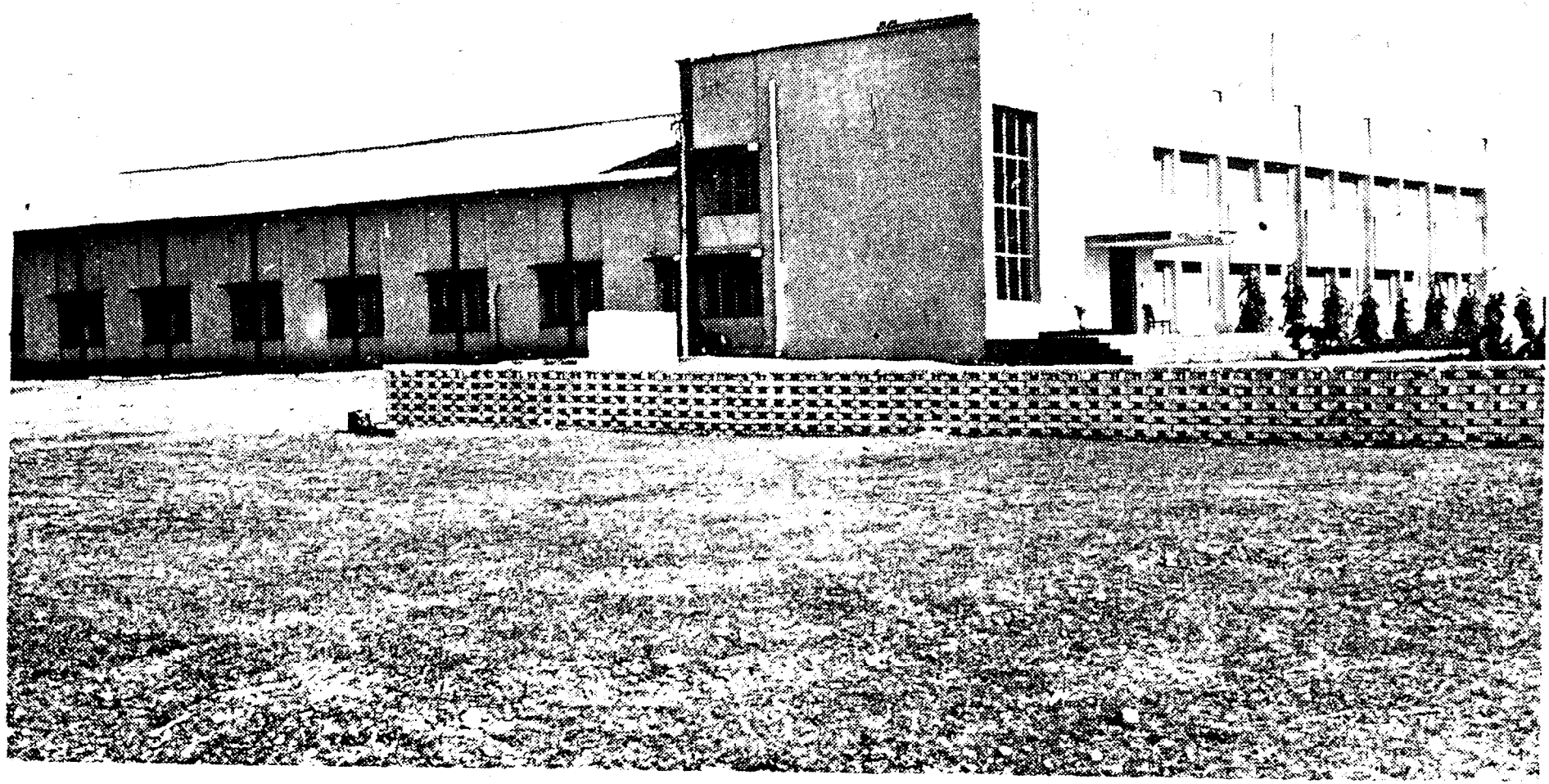
1. Countersigning of cheques
2. Technical assessment committee for bank
3. Identification and motivation of BIT students
4. R & D through Industrial Research Department
5. Day to day assistance with problems of small industries
6. Liaison with large industries and government departments
7. Planning for future direction of scheme

Senior Technical Staff
(10 permanent BISR employees)

Support staff
paid by BISR and SIRTDO

Functions

1. Commercial R & D
2. Assistance with production through use of workshop
3. Any other technical assistance to small entrepreneurs



The main administrative building and central workshop of the Ranchi Small Industry Scheme

ing staff are temporary and are paid for directly by SIRTDO from government money or from its own income. At present, government does not provide funding for permanent staff.

The main administrative/office building and workshops are the property of BISR. Within the workshops, the machinery and equipment used for fabrication and testing of commercial prototypes remain the property of BISR, while the machinery and equipment which is used for production purposes remains the property of the State Government. All SIRTDO-sponsored entrepreneurs have access to this production-related machinery at a nominal rent. Other industries in the area can also make use of this at a higher rate. The SIRTDO-sponsored entrepreneurs also have access to office facilities such as blueprinting, photoprinting, copying and typing at a nominal charge and have free access to the industrial library and conference/seminar room in the BISR building[1].

The eighteen factory sheds and related infrastructure on the 'nursery' estate opposite the main building are the property of the State Government. The SIRTDO administration looks after collection of rents and maintenance of the buildings on behalf of the Government. Although there are only 18 SIRTDO entrepreneurs actually located on the 'nursery' estate, SIRTDO has, in fact, sponsored a total of 32 units of which 29 are still under its direct guidance. (3 no longer need guidance and have moved off on their own.) Of the 11 units which are still under SIRTDO's wing but not actually on the 'nursery' estate, 1 occupies space in the main building, 2 have built their own sheds, 2 rent private buildings almost adjacent to the estate, and most of the others are located on the Tupudana Estate (about 40 km from the main SIRTDO building) which is a government industrial estate under the management of the Ranchi Industrial Area Development Authority (RIADA).

The entrepreneurs are all engineering graduates from BIT and most had no business experience and very little work experience before setting up their firms. The small-scale units they operate produce a great variety of products including mining equipment, transmission clamps, truck components, steel balls, nuts and bolts, electronic control panels, voltage stabilizers, dry-type transformers, fluids for intravenous injections and industrial adhesives. Generally speaking, they fall into the following categories: material handling and process equipment industries (6 units); metal processing industries (10 units); electrical and electronic control industries (4 units); electrical power industries (2 units); chemical and pharmaceutical industries (6 units); mica-based industries (2 units); and civil construction industry (1 unit)[2].

In total, the units have borrowed Rs 125 lakhs[3] in fixed and working capital from the United Commercial Bank. Their total cumulative turnover is about Rs 400 lakhs and there are orders for nearly another Rs 200 lakhs in hand. Between them, they have created full time employment for almost 411 people from surrounding villages, most of whom were previously unemployed. Most units are profitable, although, as will be seen, the success of the programme is measured by a great many things other than profitability. In fact, to think only in terms of the economics of the small-scale units would be to miss the whole point of the scheme, which aims at developing entrepreneurs who are far-sighted enough to see their efforts as a challenge to their technical abilities and a contribution to the development of the region as well as a way of making money.

Financial and technical contributions for these activities come from three different sources. These are BIT/BISR, the Government of Bihar and income earned by SIRTDO for doing work for various industries and agencies.

The BIT/BISR contribution consists mainly of the grant from BISR for the buildings, the secondment of permanent BISR staff to SIRTDO, and the use of BIT land, staff and facilities. It also includes a much lesser amount for the purchase of machinery and equipment. The size of the BIT contribution would be difficult to estimate: the BISR contribution up to 1980 was approximately Rs 20 lakhs.

To date the State Government contribution has been between Rs 30 lakhs and Rs 40 lakhs, of which about 70% has been for the building of factory sheds and development of infrastructure on the 'nursery' estate. The remaining amount has been spent on production-related machinery for the central facility workshop, wages of

[1] A list of machinery and equipment in SIRTDO is given in Annex 1.

[2] A list of all the technologies developed for firms is given in Annex 2.

[3] 1 lakh = 100,000
Rs 18 = £1

temporary SIRTDO workers and promotional services.

A new proposal for the five years starting March 1981 has been submitted to the State Government, and has received tentative approval. A major expansion of activities is planned for this period. Work has already commenced on building six large sheds to house additional electro-mechanical industries on the existing 'nursery' estate. Adjacent to this, work is also under way to construct sixteen smaller work areas which will form an electronics 'nursery' estate for existing and potential electronic units. Next to the SIRTDO main building, the foundation stone of a new pharmaceutical testing and certification facility has just been laid. Further plans include the building of a pharmaceutical 'nursery' estate with sixteen units and an agro-based 'nursery' estate also comprising sixteen units and the necessary central facilities. There are also plans for a residential block for staff and entrepreneurs.

Besides funding for the extra building, machinery and promotional costs involved in these expansion plans, SIRTDO has also requested that permanent posts should be created and paid for directly from the SIRTDO budget. Extra staff will certainly be needed to cope with the increased workload and, although BISR has supplied all the permanent staff to date, it would be difficult for either BISR or BIT to shoulder this additional burden. If the Bihar Government approves allocation of all the funds requested, SIRTDO should be able to sponsor and house almost eighty units on its own 'nursery' estates by 1986[1].

Finally, SIRTDO's own income comes from the rent of sheds on the industrial estate, receipts from the use of machinery and equipment in the central facility workshop[2], payment for projects undertaken specifically for large industries[3], consultancies and payments for conducting training courses.[4] In the future, payment may also be raised from royalties on patents and from additional work carried out by SIRTDO on a commercial basis[5].

Objectives and methodology

Objectives

Neither the objectives of the Ranchi scheme nor the ways in which the staff carry out these objectives are easily described on paper. An attempt is made here to describe these as clearly as possible. (Reference is made where appropriate to relevant case studies in Chapter 4 which explain individual aspects of the scheme in more detail.) SIRTDO's own information pamphlet states that the main aims of the scheme are:

- to provide leadership to the State effort for growth of small scale industries through the conduct of research, development and related activities
- to build a new class of creative and technically competent entrepreneurs from engineering to take up technologically challenging industrialization
- to utilize available technical manpower and expertise from engineering colleges
- to assist small-scale industries through central technical and information services, testing and quality controls.

These require some explanation and expansion.

As we have seen, the small-scale industry scheme originated with a need identified in the region for a type of firm which did not then exist – one which could achieve the quality of production of existing large-scale units but could also cope with small orders, offer competitive prices, and still make a profit. Showing that such firms could be established by careful selection of products, by the application of manpower and facilities already available in technical institutes, and with the occasional use of central facility equipment was, therefore, one of the main

[1] In the meantime, R & D work on new products which can form the basis for production by future entrepreneurs is proceeding in the BIT workshops. Items being investigated include bulb-holders, cheap binders, an infra-red proximity switch, cheap reading lights and a variety of chemical and pharmaceutical products.

[2] Between August 1977 and November 1979, 495 different jobs were carried out using central workshop facilities at a total charge of Rs 52,500.

[3] A list of projects undertaken specifically for large industries (including the cost involved) is given in Annex 3.

[4] This includes money from the Government of India for conducting the three Entrepreneurial Development Programme Courses for which there was a payment of Rs 1 lakh per course. It also includes payment from various voluntary agencies.

[5] Work is of course already done for industries in the area on a commercial basis, but SIRTDO now plans to encourage more of such work so as to increase its own income.

objectives of the scheme. This was seen both as a way of increasing the rate of industrialization in the Ranchi area and of providing guidance to the State effort relating to the growth of small industries.

A second objective was to give a lead to the State's efforts in respect of promotion of techno-entrepreneurs in a State where commerce is not a traditional occupation. The objective was not just to develop entrepreneurship or to create commercial entrepreneurs who think only in terms of turnover and profit, but to show that it is possible to have an entrepreneur who sees his own firm as part of the whole development effort and can make the correct techno-economic decisions on this basis. The rewards in this case come not just in terms of profit but from a sense of achievement in having solved a technologically difficult problem so as to produce something which was previously imported; having produced something through the use of technological skill which compares in quality to the produce of large-scale units using expensive automatic equipment; or having trained previously unemployed and unskilled workers to produce fairly complicated products so that they too acquire a sense of pride in their work.

A third objective was to develop a way of giving entrepreneurs the necessary amount of support and guidance while at the same time building up their confidence in their ability to make decisions and do things for themselves. This is an important issue - the achievements should be seen as those of the individual entrepreneurs rather than those of the organization itself.

It is important that these objectives are clearly understood, for otherwise the true point of the scheme will be missed. To a large extent, the human element has been the important one and it is possibly closer to the point, to speak in terms of the development and promotion of entrepreneurs, rather than the development and promotion of enterprises. Although the ultimate aim was to increase the rate of growth of small-scale industrialization, this was to be done in a way which benefited the region and nation as a whole rather than just providing profits for the owners of the small-scale industries. Anticipated benefits included provision of jobs through use of labour-intensive technologies; training of unskilled workers so as to raise rural income levels, and production of high quality goods.

Methodology

It is difficult to be precise about the way the scheme works, because part of the reason it works so well is its flexibility of approach. At the simplest level, however, there appear to be three major stages in the development and promotion process. These are: the development or pre-investment stage; the promotional or 'nursing' stage; and finally, the self-reliant entrepreneur stage.

Development or pre-investment stage

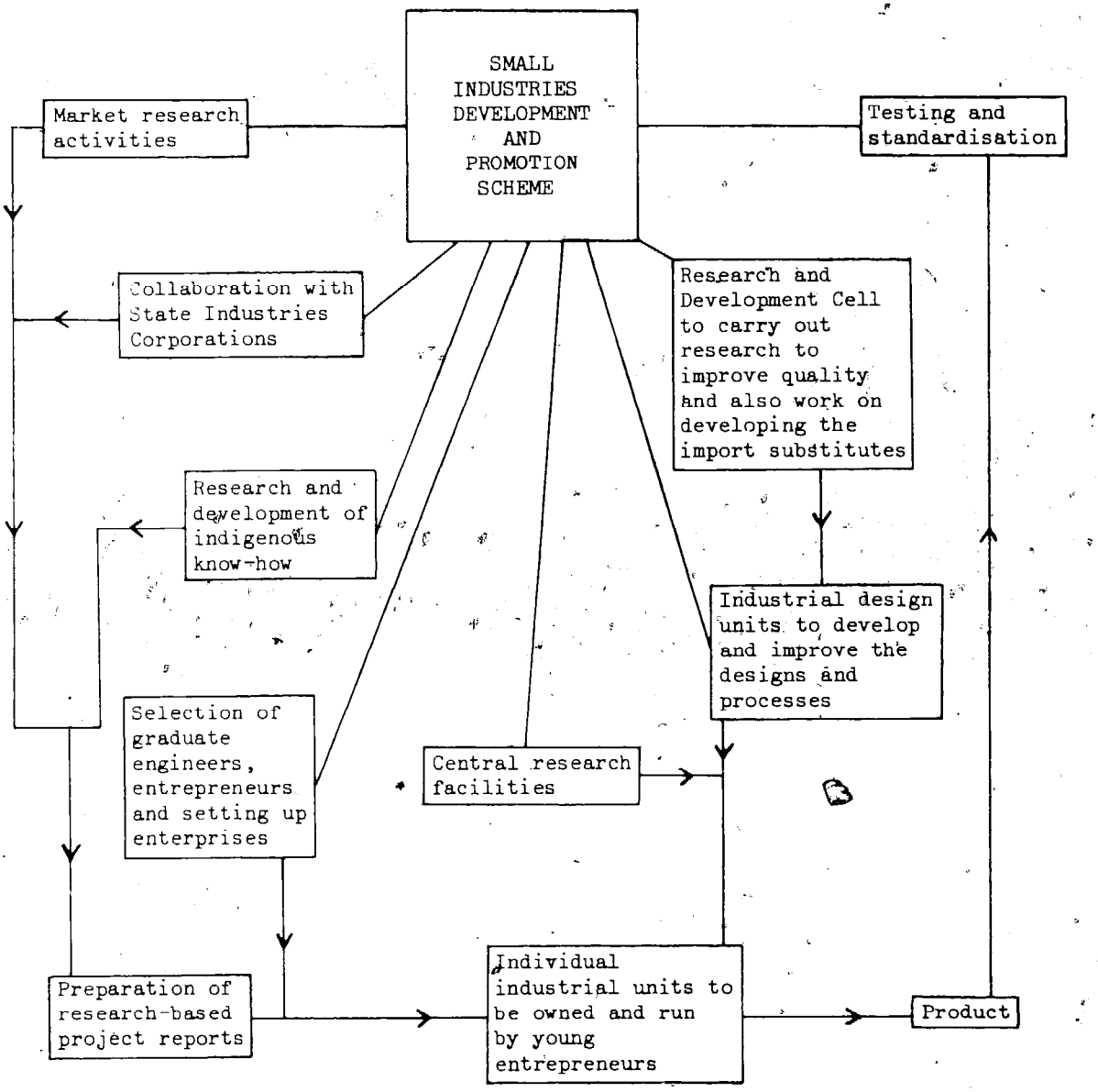
The first stage involves the identification of the entrepreneur and of the product and the necessary R & D work, training and other assistance needed to get both of these to the point where commercial production can begin. This stage involves BIT, BISR and SIRTDO and works more smoothly than would otherwise be possible because it is the same group of people (with different functions in each institution) who are involved throughout.

The first step is for the core staff, in their role as BIT teachers, to identify potential products and entrepreneurs. Choice of products can occur in a number of ways. In some cases, the staff have identified products through contact with heavy industries in the area[1]. In other cases, a neighbouring industry or a State government agency has approached BIT in respect of possible production of certain import substitution items or totally new products[2]. In yet more cases, the entrepreneur himself has identified a product and brought the idea to the staff for consideration[3]. In all cases, a great deal of thought is put into choosing which products will actually form the basis of SIRTDO-sponsored firms since this can be one of the major determinants of the way they will develop.

Choice of entrepreneur can also occur in different ways although the staff normally choose from final years students actually working on industrial projects or previous students who have had some work experience. An important factor is that a strict screening process is carried out by the staff to ensure that only the most determined applicants are given sponsorship[4]. In addition, an attempt is always made to match

[1] See Chapter 4, case studies of PIF and Transgietz.
[2] See case studies of Precision Foundry and Inbomi.
[3] See case studies of Mercurium and Ranchi Rolling Mill.
[4] It is the core staff in their role as members of the SIRTDO managing committee who grant official sponsorship to entrepreneurs.

Diagram IV: Activities Involved in the Ranchi Small Industry Scheme



the product to the interest and capabilities of the entrepreneur.

Having decided on a product and an entrepreneur, the next step is to proceed with development of a laboratory prototype. This work is normally done by the students/potential entrepreneurs themselves, in conjunction with the BIT staff. Following this, the development of commercial prototypes is normally carried out in the SIRTDO central facility workshop by the permanent staff with help from the potential entrepreneurs. Usually, it is only after these commercial prototypes have been successfully field tested, and orders for the product have been placed, that SIRTDO agrees to let the potential entrepreneurs start commercial production.

The core staff, in their role as members of the SIRTDO managing committee, are able to sanction the use of SIRTDO funds to assist with the process of technology development if this proves necessary. For example, SIRTDO can provide any funds needed to cover stipends and material costs incurred while completing R & D work in the BIT workshops[1]. In addition, in those cases where BIT/BISR facilities are inadequate, SIRTDO can pay for any necessary laboratory or commercial prototype or process development to be carried out by outside agencies[2]. SIRTDO can also pay for a potential entrepreneur to work for a period of time in a relevant large-or medium-scale factory so as to help him to work out the technical specifications of his product[3].

Similarly, SIRTDO funds can be used for entrepreneurial development. In particular, it funds Entrepreneurial Development Programme (EDP) courses which last for 3 months and which represent a good starting point for a young engineer who has no commercial experience[4]. The courses involve managers from large industries, business lawyers, bank managers, tax specialists, government officers, small entrepreneurs and other people who actually deal on a day-to-day basis with the problems of small-scale business. This practical approach is far more appropriate in terms of helping an engineering graduate to set up and run a business than the approach adopted by some of the other promotional agencies such as the Small Industry Service Institutes, which organise purely theoretical courses involving lectures by professional teachers.

It should be obvious from the above that the pre-investment stage in the SIRTDO scheme is totally different from that typical of other promotional schemes which involve and rely on a whole range of widely dispersed and largely uncoordinated agencies such as the District Industry Centre, the National Laboratories and the National Research and Development Corporation[5].

To explain this stage of the SIRTDO scheme more clearly, let us look at a hypothetical BIT student who is working on an industrial project during his final year. This work is being done under the supervision of his professor, who is also a member of the managing committee of SIRTDO. He finds the R & D work stimulating and knows from surveys carried out by BIT's Industrial Research Department that there would be a good market for the product from a nearby large industry.

He approaches his professor about the possibility of receiving SIRTDO sponsorship so that he can set up a small industry on the basis of this product. Having taught the student for over three years, his professor knows his abilities and

[1] If the R & D work is particularly complicated, it may take a long time and final year students may graduate before the work is finished. If they need financial support to continue with the work after graduation, SIRTDO can pay a small stipend. (See case studies on Transgietz and Paediatric Laboratories). SIRTDO may also pay for any excessive material costs involved (see case study on Paediatric Labs), although it prefers to get funds from other sources such as the large firm which will benefit from the new technology (see case study on Transgietz), or the Directorate of Technology Development (see page 6).

[2] For example, in the case of metal-processing industries, since BIT has no metallurgy department, the assistance of organisations such as the National Institute of Foundry Forge Technology at Ranchi and the National Metallurgical Laboratory at Jamshedpur has been utilized (see page 29 on metal processing industries). Similarly, since the facilities for developing pilot plants for the production of certain pharmaceuticals do not exist, this work has been carried out at the National Laboratory in Lucknow (see page 47 on Jayno Pharmo-Chemicals).

[3] For an example of this, see page 52 (Micage).

[4] The Government of India gives SIRTDO the money to run these courses (approximately Rs 1 lakh per course).

[5] See Chapter 2 for an explanation of the roles of these agencies.

character quite well and after careful thought and discussions with other members of SIRTDO's managing committee, sponsorship is granted.

The student continues working on the development of a laboratory prototype but before the work is completed, he finishes his course at BIT. At this stage, SIRTDO provides him with a stipend and he continues the work as a research assistant under his ex-professor's supervision. After a few months, the laboratory prototype is completed and the student is then sent to the SIRTDO workshop where a commercial prototype is developed with the help of the SIRTDO staff.

When the commercial prototype is complete, SIRTDO arranges for it to be field tested. In the meantime, the student participates in an Entrepreneurial Development Programme course funded by SIRTDO. Once field tests have been successfully completed, and orders for the product placed, the student is ready to proceed to the next stage and start commercial production on the SIRTDO 'nursery' estate.

Promotional or 'nursing' stage

The second stage in the scheme involves the 'nursing' of new units on the 'nursery' estate (and elsewhere): a process which is deemed to be complete once the entrepreneur can run his own business without relying on SIRTDO advice and support. During this stage, moral support and various types of financial, technical and commercial assistance are given. The entrepreneur is also helped to make efficient use of existing government schemes which offer assistance to all small industries in the State.

The first and most important step is to assist the entrepreneur to secure financing. Help is given in drawing up a comprehensive project proposal for submission to the Bank[1]. Of more importance, however, is the special agreement which was reached with the United Commercial Bank and which dispenses with the need for a SIRTDO entrepreneur to put up 25% of the total capital requirement or suitable collateral as a guarantee. Without this agreement, most of the entrepreneurs would have been financially incapable of ever securing a loan to start up their own business. The only strings attached to this deal as far as they are concerned are that they must stay on (or near) the 'nursery' estate until their term loan is repaid and that all cheques they sign must be countersigned by one of the members of the SIRTDO managing committee[2].

Having acquired a loan, the entrepreneur is then given assistance with setting up and starting to run a commercial production unit. In this respect, the SIRTDO staff will help the entrepreneur to choose appropriate commercial machinery or to design his own and to install this in a shed on the 'nursery' estate. They also help him to find his way through the maze of rules and regulations which relate to registering the firm with the DIC as a small-scale unit and applying for all the various government incentives to which such units are entitled. This is mainly a catalytic role to ensure that the entrepreneurs are able to make full use of existing government assistance measures. Established SIRTDO entrepreneurs who have already been through all the procedures provide invaluable guidance to the new entrepreneurs in this respect.

The new entrepreneur may also need help in acquiring markets. Many potential customers want to hold technical discussions about products and processes before placing orders and, in these cases, SIRTDO staff will accompany the entrepreneur when he goes to bid for a contract. This service is normally only required when first seeking a market for a new product. At a more indirect level, SIRTDO entrepreneurs are also

[1] The entrepreneur does not have to pay the SIRTDO staff for assistance given in this respect. By comparison, other entrepreneurs can apply for such assistance from a financial consultancy company through the DIC, but they must pay for this service first (2% of the total budget of the project) and can only reclaim 75% of this back, mostly after production has commenced.

[2] The terms of the banking agreement were described earlier (see page 13). In practical terms, this agreement means that once SIRTDO has given sponsorship to an entrepreneur, he is assured of getting a bank loan to start a unit. The Bank accepts the SIRTDO managing committee's assessment that the unit will be technically and economically viable and it also waives normal requirements for collateral for units under SIRTDO's technical and managerial guidance. By comparison, as was seen in Chapter 2, a project proposal which is forwarded to a bank through the DIC is often turned down by the Bank's technical assessment committee. Even if it is accepted, an entrepreneur going through this channel must still be able to put forward substantial collateral.

helped by the close relationship between BIT and heavy industry in the area. Because of its high technical standing, BIT is often approached directly by private and public enterprises which are looking for small-scale industries to make certain products[1].

Following this, full post-investment services are available to all SIRTDO entrepreneurs when they are needed. These can relate to new products, new designs, extension of credit, finding new markets and general issues relating to expansion or diversification. As has already been mentioned, the central workshop and other facilities in the main building are available at a nominal charge, as are the testing facilities and other equipment in the BIT laboratories. Technical advice is also available from within BIT, or if the required expertise is not available in-house, SIRTDO pays for an outside institute or consultant to provide the required help. Last, but not least, the time of the scheme's permanent staff is always at the disposal of the entrepreneurs and advice and support is freely and constantly given by the BIT members of the managing committee[2].

Again, the services available to a SIRTDO entrepreneur during this stage differ from those available to other small entrepreneurs. In particular, SIRTDO entrepreneurs receive more direct assistance with selection or design of machinery and with acquisition of markets; of perhaps more importance is the fact that they have immediate access to technical advice if technological adaptation or product diversification becomes necessary; immediate access to testing facilities to help with quality control; and constant access to a central facility workshop with a highly qualified staff. They also benefit from the fact that the SIRTDO staff are doing their utmost to support the small industries being sponsored through the scheme.

Self-reliant entrepreneur stage

In the third stage of the scheme, the entrepreneur is expected to move out on his own[3]. At this point, it is expected that he will be able to take the correct financial and technical decisions by himself; that he will have built up his own contacts with government and business so that he no longer needs to use the organization's name to get things done; and that he will be financially independent in the sense that he will be able to secure further loans by himself or have sufficient resources of his own to cope with any needed investment. Central facility services can, of course, still be used by the 'mature' unit, but rates are the same as those charged for any outside industry.

The one way in which the staff feel it is important to keep in touch is at the level of attitude formation and confidence building. This they feel is a far longer process than that involved in making an entrepreneur financially, commercially and technically self-sufficient. In particular, in a society which normally only measures successful entrepreneurship in terms of profits, they feel that there is a continuing need to let their ex-entrepreneurs know that someone also recognises technical excellence and good working relations as major achievements in themselves.

[1] See for example Case Study on Precision Foundry and Case Study on Inbomi. By comparison marketing assistance available to ordinary entrepreneurs registered with the DIC consists mainly of the DIC marketing manager helping to secure orders for them in government and public enterprise tenders. The SIRTDO entrepreneurs (since they are registered with the DIC) can also of course make use of this service.

[2] Quite literally - the members of the managing committee seem to be on 24 hour call. Office hours mean nothing. Entrepreneurs have constant problems and expect to be able to talk these over when they arise.

[3] As mentioned earlier, only three entrepreneurs have actually moved out on their own, but another eight or ten are expected to leave in 1981.

4 CASE STUDIES

Each of the following case studies is divided into three parts. The first part gives a background which relates the product(s) to the economic situation in India in general, and the Ranchi area in particular, and describes the role which BIT/SIRTDO played in developing the particular technology appropriate to the manufacture of these products on a small-scale basis. The second part looks at the various experiences and problems which individual entrepreneurs sponsored by SIRTDO have encountered in developing businesses based on these technologies and at the role that the organization has played in promoting them. The third part briefly analyses the case study and tries to bring out the major points of importance.

Although they are fascinating in their own right, it was not the purpose of this investigation to go into details about the technologies developed for the entrepreneurs, or the economics of the small scale firms. These are, of course, touched upon briefly throughout the case studies and more technical details are available in Annex 4, while some economic analysis is given in Chapter 5. For the main part, however, the case studies aim to give a general indication of the nature of the SIRTDO entrepreneurs and their units, and to clarify the way in which the SIRTDO model works. An evaluation of the model, based on the experiences described in these case studies, forms the basis of Chapter 5.

Material-handling and fabrication industries

Background

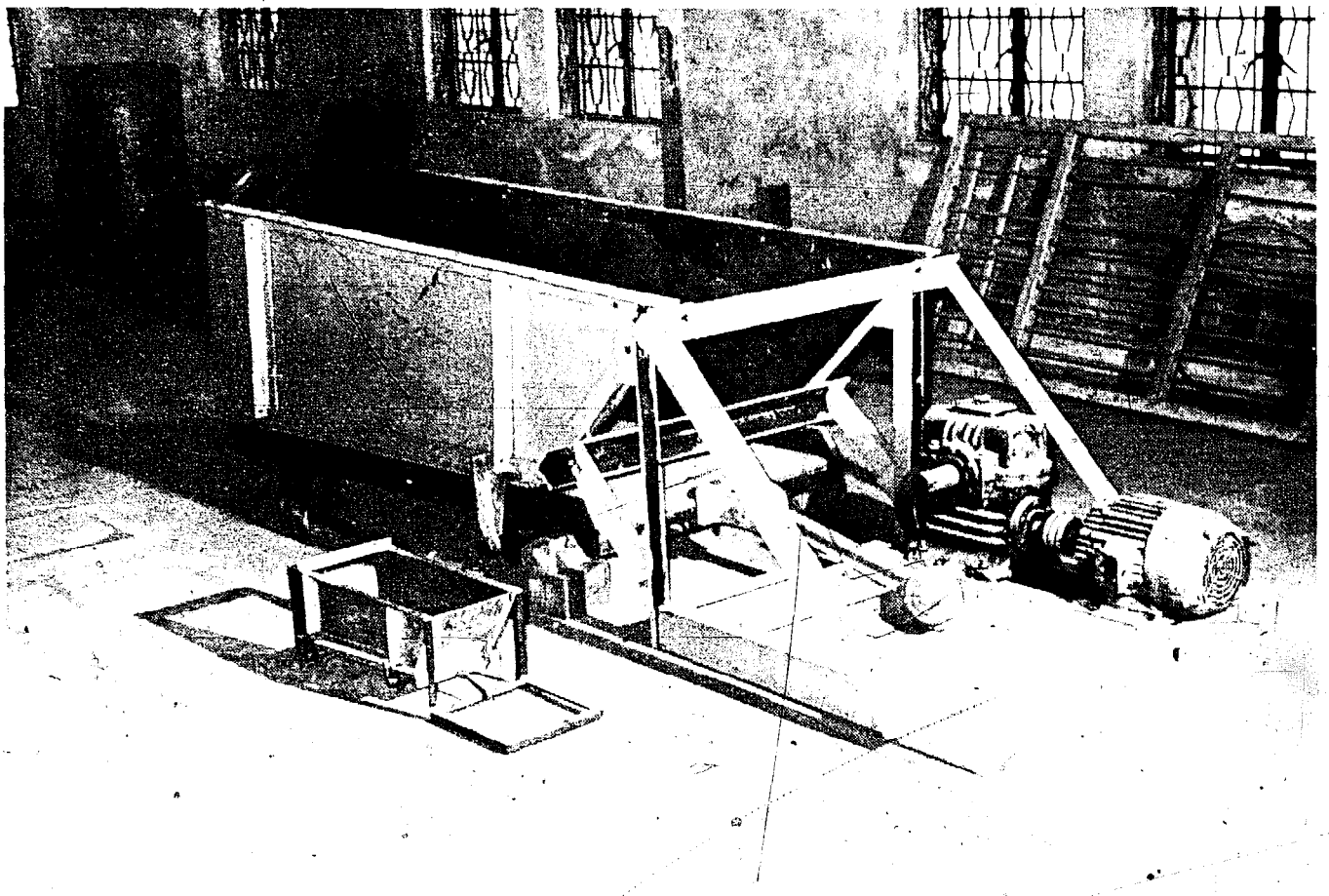
After nationalisation in 1969, Coal India Ltd (CIL) began to intensify the mechanisation of production. The first process to be mechanised was that of coal handling, with a complete system being introduced consisting of reciprocating coal feeders, conveyors, bunkers, throwers, screens and crushers. These systems were either imported from Russia or produced by transnational corporations located in India.

Given the large demand for reciprocating coal feeders, CIL came to BIT to ask if it would be possible to design and produce a model locally to substitute for the imported ones. On investigation, the BIT engineers were encouraged to find that not only the reciprocating coal feeders but also every other sub-system within the total system could be clearly identified and that each held good possibilities for production within the limitations of the small-scale industry sector. It was thus decided that coal handling would be a good area in which to concentrate technology development and the promotion of small business units.

The first step was to develop an acceptable reciprocal coal feeder. The BIT engineers adapted the existing technology and improved on the existing design so that a) it became feasible to produce it on a small scale, and b) the cost of each unit could be considerably reduced. A laboratory prototype was made, a production prototype successfully field tested by CIL, and the technology was given to one of the BIT students who had been involved with this project from its inception. In 1972, he started commercial production in premises made available within the Department of Industrial Research. Since the price quoted by this entrepreneur was only Rs 17,500 as opposed to Rs 39,000 and more for each imported reciprocal coal feeder, he was given an order for twelve units and this was later followed by much larger orders.

The second major breakthrough came when this first entrepreneur, encouraged by his initial success, investigated the possible market for other products in the coal-handling system and came to BIT with a project for manufacturing a picking conveyor on a small-scale basis. Two large firms had put in tenders to supply these to CIL, but the entrepreneur felt that if the BIT laboratory could again modify the existing design for small-scale manufacture and reduce the cost of production, then he would have a very good chance of competing. This second venture also proved successful and, after field trials of the commercial prototype, the entrepreneur won an initial order for several units at Rs 85,000 each. His large-scale competitors were quoting Rs 1.8 lakhs per unit.

The next project to be tackled by BIT was that of pneumatic control of mine-car axle brakes. CIL was currently using controls with electric motors but was dissatisfied with this system because of the danger of short-circuiting and electrical sparking in the presence of coal dust and methane gas. Foreign pneumatic centrally-controlled systems were available but these were very expensive and not totally suited to Indian conditions. Consequently, CIL asked BIT if it



Reciprocal coal feeder: laboratory and commercial prototypes

would undertake the development of a suitable pneumatic control system. This proved a challenging task and it was only after a year and a half that a satisfactory laboratory model was completed. A commercial model was then made and sent to CII for field testing. Results were satisfactory and another entrepreneur was identified to produce such units on a commercial basis. When CII put out a global tender, this entrepreneur was easily able to compete as he could supply a product which was both more suitable and much less expensive than that being produced elsewhere. This unit, which is looked at in depth in the following pages, was also initially located within the confines of the Industrial Research Department.

So successful was this interaction between CII and BIT in respect of coal-handling machinery that it was possible to sponsor yet another entrepreneur to produce this type of equipment. A project arose out of a request from CII to look into the possibility of making a pneumatic coal sampler. Again, the technology was adapted so that production could be carried out efficiently within the limitations of a small-scale unit and following successful field trials of a commercial prototype, this third entrepreneur was helped to set up production in yet another corner of the Department of Industrial Research.

It is worth mentioning that these small-scale material-handling industries are all fabrication units similar to the types which have been making roof trusses, grills and other simple mechanical structures in India for almost 100 years. What these traditional units lacked, and what the sponsored units possessed through BIT BISR involvement and help, was an ability to identify sub-systems within totally mechanical systems which are capable of efficient manufacture on a small-scale basis after appropriate modifications in design and technology.

All three entrepreneurs are still doing well and have increased their range of products. Two of the firms, Star Engineering and Technomek, have now left the BIT campus. The other, Perfect Innoculators and Fabricators, is still under SIRTDO control and is located on the 'nursery' estate.

Perfect innoculators and fabricators (PIF)

Mr Shahi, the owner of PIF, comes from a farming family in Uttar Pradesh. After graduation from BIT in production engineering in 1970, he stayed on as a lecturer until 1973. During this time, he was very much involved with the work of the Industrial Research Department and with the related small industry activities. At this early stage, work was still being done on identifying specific products which could be produced by small techno-entrepreneurs. Mr Shahi's involvement with the pneumatic controls for mine-car axle brakes has already been mentioned, but his firm did not in fact become registered until a little later when work on the prototype of a chain creeper was completed. Mr Shahi won the order for production of one of these for CIL by being able to offer an item of adequate quality at a price of Rs 2.99 lakhs as opposed to the Rs 13.00 lakhs being quoted by Voltas, his nearest contender.

This amazing difference in price needs some explanation. The most obvious point is that the price being quoted was kept deliberately low on BIT/BISR's advice so as to encourage the interest of other public enterprises and Government Departments. Even with this low price however, Mr Shahi still had a 10% profit margin. The low cost must be largely attributed to the design factor and also to the fact that no cost was included for the large amount of R &D work that went into this product. In particular, BIT/BISR staff and the entrepreneur had spent six months moving around the mines inspecting imported equipment, identifying the best points of each make and eventually combining the results of the research into a new design.

With the promise of a large order, Mr Shahi had no problem in securing a loan from the Bank. A term loan of Rs 43,000 at 11% interest was sanctioned which covered 100% of the cost of the machinery and equipment outlined in the project proposal. A cash credit limit of Rs 2 lakhs was also sanctioned. The loan was processed in a record time of 15 days. This was partly due to the CIL order, but also partly due to the fact that the Government was at this time encouraging the banks to give loans to small-scale entrepreneurs. Government 'seed' money was not received until 1976 and this amount of Rs 10,000 was used as working capital rather than to buy machinery. The term loan was repaid in 1976 and the 'seed' money was repaid in 1980.[1]

Equipment was purchased from the Punjab[2] and production of the chain creeper commenced. Unfortunately, due to a change in company policy, CIL decided that it would not in fact be using chain creepers and although this first one was purchased it was never used, and no more orders were placed for this product.

Payments for the chain creeper were coming in throughout 1974/75, but Mr Shahi obviously had to try to identify other items he could produce so that he could at least continue to pay his eight workers and cover his other overheads. He was reluctant to do any more product development work at this time, so the easiest product to make seemed to be coal tubs. Production of these started in 1975 and the firm's financial position started to improve with turnover increasing from 3.1 lakhs in 1975 to 6.9 lakhs in 1976. This good fortune, which resulted in Mr Shahi being able to pay off his term loan and buy his first car, was largely brought about by CIL pushing orders to this firm as a result of the good will created by the chain creeper episode[3].

Unfortunately, at the end of 1976 orders for coal tubs also stopped when CIL decided to try to increase the profitability of its repair workshops in certain coalfields by including coal tub manufacture as one of their areas of responsibility. With a complete halt in the demand for his one item of production, Mr Shahi resorted to structural fabrication work. It was at this time that the sheds on the SIRTDO estate were being built so fortunately he was able to secure some work making roof trusses. Although this and other odd jobs brought in sufficient income to pay his workers, turnover for 1977 dropped to Rs 1.46 lakhs and he was very anxious to find a permanent and profitable line of production.

[1] All banking terms and procedures referred to throughout the case studies are described in Annex V.

[2] Many of the entrepreneurs have bought their machines from the Punjab where a combination of low overheads, low labour costs, and high turnover combine to make prices very low indeed. Punjabi machines are often less reliable but simple technological modifications are often found to improve reliability. However, accuracy and stability (tolerance) are not much improved and most of the Punjab machines cannot be used for close tolerance jobs.

[3] In fact, CIL has taken a favourable attitude towards SIRTDO in general since this time.

At this time, Star Engineering (the first unit to be sponsored through the scheme) was turning away orders for reciprocating coal feeders because production facilities were already stretched to full capacity. This seemed like the obvious item for PIF to turn to since all the necessary equipment for production was already installed. Since there is an unwritten law that SIRTDO entrepreneurs do not compete with each other, discussions were held with the staff regarding the potential for the market to support an extra unit producing reciprocating coal feeders. It was decided that this would be feasible and in 1977, PIF made a commercial prototype for field testing. This proved to be satisfactory and an order for seven units was placed with the firm, but it was indicated that no further orders would be placed until these had been used for some time and proved to be satisfactory. This sort of experience, given the firm's past record of good quality and reliability with the same customer, is an indication of the time and effort it takes for a small unit to build up a good reputation. Payments for the seven feeders and for some structural fabrication work helped to raise turnover to Rs 4.8 lakhs in 1978.

In 1979, the firm was again in need of new products. No new orders for reciprocating coal feeders were coming in because comment on the seven units under trial was still awaited. In any case, Mr Shahi felt it was unwise to commit himself again to the production of only one item. Throughout 1979 therefore, development work was carried out on several new items including belt conveyors, tipplers and shute gates. Although the central workshop facilities were used in helping to develop these products, Mr Shahi did most of the design work himself with only occasional reference to BIT engineers.

For the year 1980-81, there are orders for all the products PIF manufactures - both old and new. These include forty reciprocating coal feeders (orders are pouring in following the release of a favourable test report); coal tubs for coalfields which are not producing their own; seven shute gates; a Rs 1 lakh order for a belt conveyor; and one high capacity feeder. Mr Shahi's confidence in his ability to produce good quality work for CIL has increased to such an extent that he has also just accepted from them a turnkey job consisting of reciprocating coal feeders and a control panel. This order (which will bring in two or three other SIRTDO units on a sub-contracting basis) is worth Rs 12.75 lakhs. He has also received a development order of four vibratory feeders - the first of which is to be made by April. This will be made in the SIRTDO workshop by the workshop staff, with Mr Shahi's assistance.

Mr Shahi's troubles seem to be over now that he has selected a well-balanced range of production items. He has a current labour force of sixteen[1] and he has already obtained financing to purchase extra machines. Through the District Industries Centre he has secured Rs 50,000 at 3% interest which is the maximum amount that a small-scale industry can borrow to purchase new machines. To this he is adding Rs 14,000 of his own money. The new machines, unlike the earlier ones, will be coming from a well-known manufacturer rather than from the Punjab. The earlier machines have caused a lot of trouble through breakdowns and although Mr Shahi believes he has reduced his problems in this respect as far as possible by substituting better trained and better paid workers for more sophisticated machinery, he now prefers to buy more expensive equipment since he can afford to make this choice.

Space itself is a problem for this firm and it is very obviously outgrowing its present 'nursery' shed. Mr Shahi has in fact recently bought his own land close by and will be moving into his own factory there once all the appropriate infrastructure is installed[2].

Mr Shahi, as one of the first entrepreneurs to be sponsored through the scheme, feels that the

[1] The labour force consists of the following: One foreman who has a diploma in engineering - Mr Shahi explains the drawings to him and he explains them to the rest of the workers. He is paid Rs 600 per month. Five skilled workers who receive between Rs 250-300 per month; and nine unskilled workers who receive between Rs 175-250 per month. One male clerical worker is being trained and is receiving Rs 150 per month. At the moment, however, Mr Shahi is still doing all his own typing and paperwork. He has recently added one engineer to work on design and quality control. This is the first engineer to be appointed by a SIRTDO entrepreneur. He will be paid Rs 1,000 per month.

[2] Three other SIRTDO entrepreneurs have bought land at the same place. Both the District Industries Centre and SIRTDO are doing what they can to hasten the installation of infrastructure so that all these entrepreneurs can move off the 'nursery' estate.

financial and commercial guidance given to the entrepreneurs who started at a later date was much better than he received. For instance, he feels that he should have applied for a larger term loan and chosen better equipment but there was no-one to give proper guidance in this matter. He points out, however, that without the organization's help he would not have secured a loan at all since he had no funds or collateral of his own.

He feels that the organization's help was also necessary in respect of helping to design his first products. Since then he has done most of his own design work although he still consults BIT staff once in a while if he has problems. He feels that the firms based on electronic industries are more advantaged in respect of the people they can consult than are the machinery-based firms.

The organization's name was invaluable in building up a market until his firm acquired a name of its own. The central workshop facilities are also very much needed. For example, all the machining on PIE's first conveyor belt was done there because the firm's own workforce was not qualified and delivery had to be made within two months. Again, Mr Shahi will need the workshop facilities to augment his own machine capacity to deliver the turnkey job for Coal India Ltd.

SUMMARY OF CASE

The technology is not very complicated in this type of industry and has played a relatively small part in the successful growth of the firm. Of greater importance have been the management and marketing skills of the entrepreneur. These have been essential in several respects. By substituting skilled labour for expensive machines and by using casual labour for hauling and lifting instead of maintaining an expensive lifting device, prices have been kept comparatively low. By fully exploiting the SIRTDO central workshop facility and using this (at highly subsidised rates) to supplement his own equipment and labour resources when a large order has to be completed in a short period of time, there has been no need to build up production capacity which would be idle for much of the year. Flexibility, to cope with changing marketing conditions, has been achieved through being able to train workers to do new tasks on existing machines, and considerable marketing expertise has been applied in acquiring customers for each new product added to the range. Finally, larger orders have been undertaken due to the entrepreneur's confidence in himself to get the work done with his own (and SIRTDO's) facilities and through skillfully managing the sub-contracting of parts of the work to other small-scale and tiny units.

Metal-processing industries

Background

As was seen in the previous case study, work in the mechanical engineering field started with products which could be made in small-scale fabrication units. At a later date, BIT staff identified a high demand for a large number of mechanical items relating to the metal-processing industry rather than the fabrication industry, but which could also be manufactured on a small-scale basis after modifications in existing technology.

First experience with the metal-processing industries was disappointing, for reasons which had nothing to do with the technology or the product. Following a request from a local electricity plant, a project had been initiated which aimed at developing a simple casting process for electrical motor housing. A laboratory prototype was made and a commercial prototype was successfully field-tested. One of the students who had worked as a project assistant on developing the process was identified as being a suitable entrepreneur to start commercial production, but the order never came!

After this initial setback, nothing further happened in this field until 1978, when the Bihar State Export Corporation came to BIT to ask if it would examine the possibilities of producing brackets for high voltage transmission towers. The entrepreneur who had been involved with the earlier project on casting processes was brought into the consultations regarding this request. He now took the initiative for drawing up the design for a die which (after receiving advice from BIT/BISR on the points which needed extra care if good quality was to be attained) he had made in Calcutta. The product proved to be satisfactory and production commenced. So great was the demand that two entrepreneurs were able to start units (Precision Foundry and Praveen Industries) based on this product.

Other small-scale enterprises based on casting, or on hot and cold forging, have since been sponsored by SIRTDO. The common link with all of them has been modification in operation

so as to allow the small-scale unit to get good quality of production and compete successfully with large-scale units using expensive automatic machines[1]. An additional advantage for the small units is that unlike the large firms, which rely on mass production and huge production runs to keep down their costs, they can undertake job work and cope with small orders.

It is to be remembered that BIT does not have a metallurgy department. However, organisations such as the National Institute of Foundry Forge Technology at Ranchi, the National Metallurgical Laboratory at Jamshedpur, and the Materials Science Centre at IIT Kharagpur, readily assisted the entrepreneurs. Thus, although the metal-processing industries often had to go without BIT's direct technical assistance, SIRTDO could assist by paying for outside technical expertise.

Since almost one third of SIRTDO's units fall in the metal-processing category, one should look at three of them in some depth in order to ensure adequate coverage of their nature and problems. Of the three units chosen, one is based on casting (Precision Foundry), one on cold forging (Mercurium), and one on hot forging (Perfect Forgings).

Precision Foundry

Mr Mandelia, the owner of Precision Foundry, graduated from BIT in 1972 with a degree in mechanical engineering. Since his father was the secretary at BIT, he had been living on the campus since 1960 and had a good background knowledge of the small industry scheme. He decided to become an entrepreneur, but at the time of his graduation there were no mechanical engineering projects coming up. While keeping in touch with the scheme, he took work in factories near Ranchi to gain some experience.

In 1973, the first casting project came into existence when a local electricity firm asked BIT if it could look into the possibilities of producing a simple casting process for electrical motor housing. Mr Mandelia was asked if he would be interested and, having registered Precision Foundry as a casting unit, he worked together with the organization's staff on producing a laboratory prototype and then a commercial prototype which was successfully field-tested. Unfortunately, the order for this product was never placed by the firm.

During the following two years, Mr Mandelia became involved in the sort of fabrication projects which had proved so successful for earlier entrepreneurs. A market was found to exist with Coal India Ltd for mini-coal-handling plants and after a laboratory model had been perfected at BIT, Mr Mandelia did extensive work in helping to develop a satisfactory commercial prototype. Unfortunately he lost the tender at the last moment to a large transnational corporation.

A project proposal had already been submitted to the bank on the basis of the mini-coal-handling project and a loan had already been sanctioned to finance the commercial production of this item by Precision Foundry. The Bank had sanctioned Rs 1.2 lakhs term loan, Rs 325,000 working capital and in addition Rs 16,000 was obtained at 5% interest for the purchase of machinery. The State Government agreed to give Rs 10,000 'seed' money. Some of this loan had already been spent on purchasing machinery when the order for the mini-coal-handling plant fell through. When production did start in 1976 therefore it involved the production of traditional items such as roof trusses which could be made using the available equipment. A small order for mini-coal-handling plants also came in during this year, but there was obviously a need to find a permanent and profitable line of production.

The firm's lucky break came in 1977. The Bihar State Export Corporation had quoted for a World Bank tender on rural electrification and one of the firms on whose behalf the Corporation had quoted had fallen down on the order. Having heard of the small industries scheme, some of the officials of the Corporation came to ask if there was an entrepreneur who could fill the order quickly. The items needed were brackets for high power transmission towers. They were to be cast in alloy aluminium instead of cast iron[2] and the order would only be given if

[1] The extent to which the entrepreneurs have succeeded in achieving a high quality of product is worthy of mention. One of the units producing industrial fasteners (Mercurium) is the first small-scale unit in India to gain the Indian Standards Institute (ISI) stamp of approval. Equally impressive is that another unit producing alloy steel balls (Perfect Forgings) was the first small-scale unit in the country to get a Lloyd's certificate of quality for its product.

[2] Although as strong as those made from cast iron, alloy aluminium brackets are much lighter and therefore place less strain on the transmission towers and reduce maintenance expenditure.

a suitable sample could be made available within three months from an entrepreneur who could prove his ability to produce by having his own dies.

Mr Mandelia was consulted about his possible interest and although this was a new product both for the organization and the entrepreneur, it was decided to accept the challenge. Having worked out with the staff the things which needed particular attention if a good quality product was to be obtained, Mr Mandelia went to Calcutta to have the dies made. This was a time-consuming process which took him and Mr Ranasaria of Praveen Industries (who worked closely with him and was interested in a 50/50 share of the potential market) the best part of three months to get the dies actually made. The samples made from these dies were satisfactory and the full order was placed by the Export Corporation.

Before starting production, Mr Mandelia had to convince the Bank that switching to this product was going to be a viable proposition so that he could get permission to use the remainder of the term loan to purchase equipment other than that which had been originally proposed. The Bank gave permission to use the term loan in this way after receiving a letter from BIT/BISR giving a favourable technical assessment of the new venture. The Bank also took into consideration the fact that all the testing equipment necessary to the success of the venture was available in the BIT laboratories. Mr Mandelia's obvious enthusiasm to make a going concern of the unit probably also helped.

Having made the initial contact with the Bihar State Export Corporation, the entrepreneur has had few or no difficulties in securing orders since the Corporation acts more or less as a marketing agent. When IBRD/IDA funds come in for rural electrification programmes, the country divides the funds between the twenty-three states and anyone can compete for orders. The Export Corporation bids on behalf of firms like Precision Foundry and takes a 'marketing' commission of 5% of the value of the order. For this commission, the firm is also certain of quick payment since the Export Corporation purchases directly from the firm within fifteen days. This is a great help since many small industries are kept waiting for months for payment from their customers. The firm can only market through the Export Corporation, but more than enough work seems to come in through this channel. Turnover in the first year of production (1978/79) was Rs 2.01 lakhs and this rose to Rs 8.05 lakhs in 1979/80. This put the firm on a sound financial footing and Rs 0.35 lakhs of the term loan could be paid back to the Bank.

The firm now employs up to twenty people[1] and has orders to keep it going at more or less full capacity until 1981. Mr Mandelia has purchased some land close by and will eventually build his own factory there. He feels he needs more time before moving because he will have to be in a strong enough financial position to absorb the costs of moving – both the direct costs and the indirect costs involved in two months closure. He wants to remain a SIRTDO entrepreneur because of the advantages involved.

Like many other new entrepreneurs, Mr Mandelia went through a difficult period during the first two or three years of his firm's existence, and he feels that if the relevant authorities could accept that new firms are likely to make losses in the initial stages, life would be made a little easier. For instance, the Bank cannot at the moment recognise a loss and insists that for accounting purposes any such losses should be shown as made up from the entrepreneur's own resources. The tax authorities are reluctant to accept that a new industry might be making a loss and it can cost thousands of rupees to have a tax assessment made before income tax relief can be claimed. Some of the government subsidies, such as the interest subsidy, which would be very useful in the early years of production, cannot be claimed unless timely payments of interest are already being made.

Having survived the first few years, Mr Mandelia feels there are three major problems remaining. These relate to raw materials, power and dies. The unit's greatest difficulty involves the steep rise in the prices of aluminium and steel – the main raw materials. Mr Mandelia finds it hard to obtain more than 20% of his requirements at the controlled price from government stores, and the rest has to be bought on the open market. Not only are prices higher on the open market, they are also liable to inflationary rises which makes it difficult to cope with big orders which take a long time to complete. For example, when dealing with IDA tenders, the prices initially quoted cannot be raised later when com-

[1] Some of the workers are casual and the number employed at any one time varies with the workload.

Precision Foundry. The oil-fired furnace for melting aluminum; the coal-fired furnace, used when power fails, is behind.

pleting the order even if the prices of raw materials have risen[1]. Trying to hedge against inflation and fluctuations in price by stock-piling is now very difficult because the cash credit limit was settled with the Bank at a time when prices were lower and the limit is now too low to allow sufficiently large quantities of raw materials to be bought.

Power cuts have lately been affecting the unit's ability to run at full capacity. Mr Mandelia has both an oil-fired furnace which requires electrical power for operation and a coal-fired furnace, which can be used when the power fails. However, he prefers the oil furnace since it is easier to control the temperature and it can work non-stop for 7 days without needing any attention. The coal furnace has to be stopped every 24 hours and takes 4 hours to clean. Also, because it is difficult to control the temperature, the rejection rate of brackets is greater. Although the coal furnace is much cheaper to run, it results in a much lower rate of production (about 250 units can be produced in the same time taken to produce 400 units with the oil-fired furnace) and since time is important the oil-fired furnace is preferred. The temperature control aspect of the coal-fired furnace could be improved by adding a blower, but this would again mean a reliance on electrical power.

The final problem is with dies. Mr Mandelia has been buying dies from Calcutta and has had to wait up to 6 - 12 months for delivery. Apart from the timing aspect, the quality of steel used has been such that the dies have had a limited life, and there are further problems in getting them refurbished. Typically, die life is only 50,000 parts, whereas orders are for more than twice this amount. The profitability of this unit would be greatly increased if the central facility workshop could be equipped with adequate die-making facilities. This would save time and improve the quality of production through ensuring better quality dies.

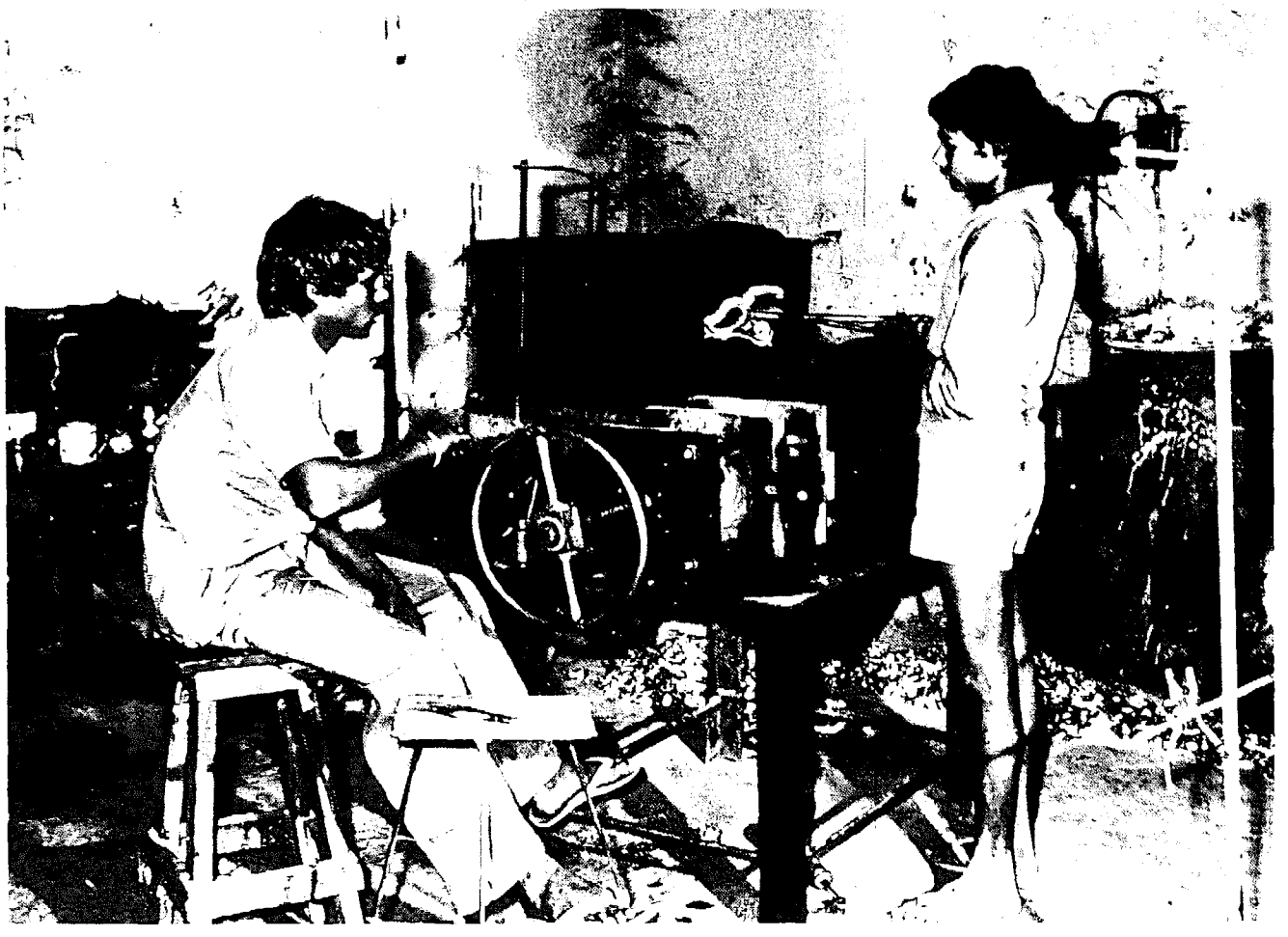
Mr Mandelia feels that the small industry scheme was important to the development of his firm in several ways. First, the ability to utilise the BIT testing facilities at a nominal charge was an enormous help since he has to have every production lot tested for quality. If he could not have used these facilities, he would have had to send each lot to Calcutta for testing. Second, the technical backup and expensive equipment available to him through the central facility workshop, plus the training he received at BIT, meant that he could take up a fairly sophisticated product for which there is less general competition in the small-scale sector. Third, the scheme was important in securing for him the first order with the Bihar State Export Corporation: it was the scheme's name which initially attracted the Corporation's attention and not the name of his particular firm. Fourth, the personal interest of the staff and the moral and technical support and advice given during the first three difficult years of production helped to keep him going.

Mercurium

Mr Beri, the owner of Mercurium, graduated from BIT in production engineering in 1970. Although he wanted to start his own business then, he felt he owed it to his parents to look for well-paid, secure employment after they had invested so much in his education. He joined the Government Irrigation Department, first as a research assistant and then as a sub-regional officer in charge of maintenance and repair of heavy earth-moving equipment. After four years of this work, he was more anxious than ever to start his own business and, having heard about the development of the small industry scheme, he visited BIT to look into the possibilities of receiving sponsorship to start a small business.

Having done a survey of possible items which would be in heavy demand in the area, Mr Beri came up with four projects which all seemed fairly promising, but he finally decided that production of bolts would be most profitable. While working on the project proposal, he decided that the machines for his unit could and should be made in India and did not have to be imported. He estimated that while equipping his unit with imported machines would cost about Rs 20 lakhs, he could design adequate machines himself (with the help of BIT staff) and have them made to his design in the Punjab at one tenth of the cost. The staff gave their blessing to this plan and the project proposal was submitted to the Bank on the basis of estimates for locally-made machinery. A term loan of Rs 2.5 lakhs, a

[1] Allowances can of course be made for inflation when quoting, but it is difficult to allow for rises such as that with open market steel - the price of which leapt up by 35% in one year. Details of rises in price of some of the basic metals between 1972 and 1980 are given in Annex VI.



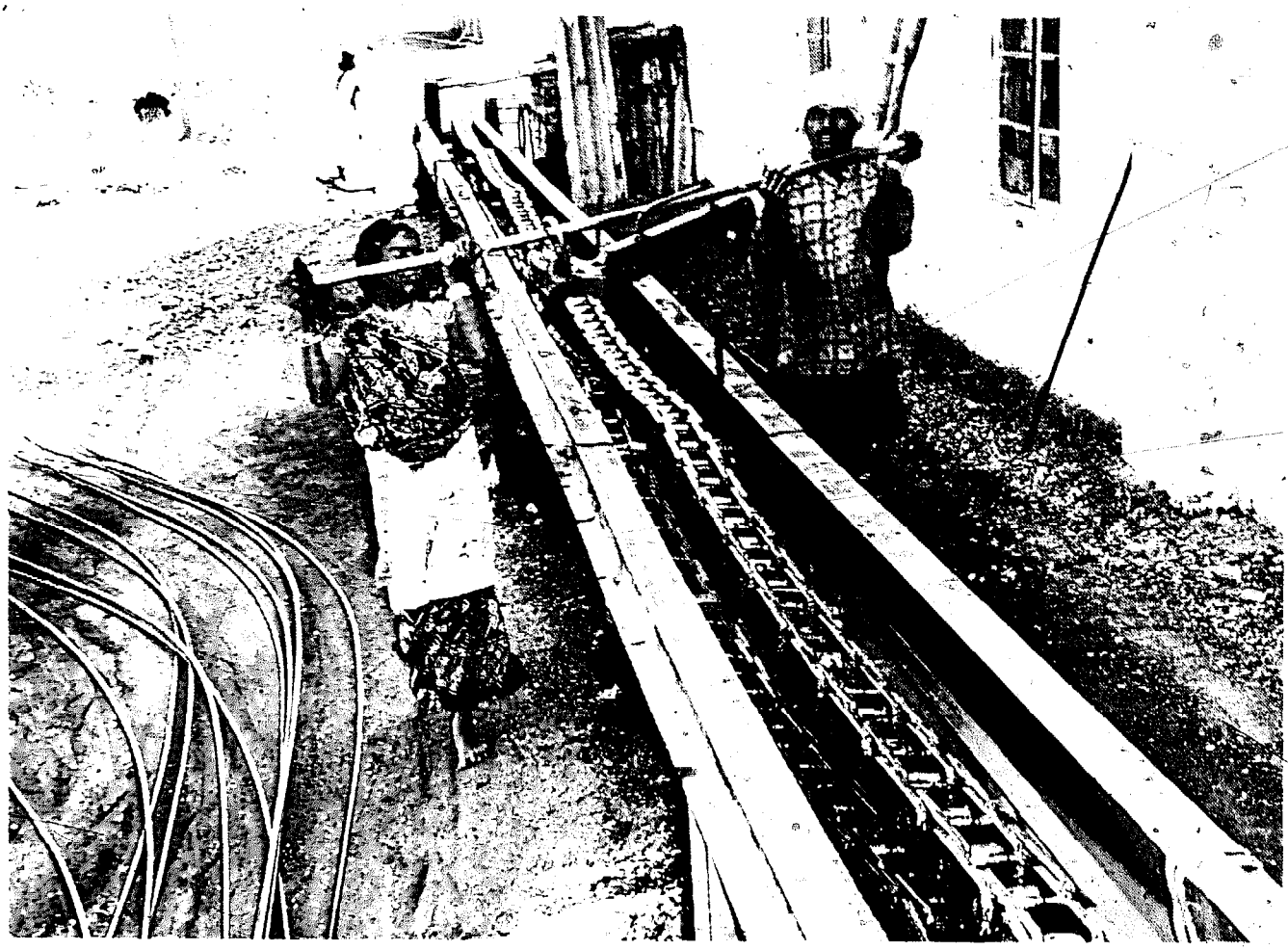
Gravity die-casting of transmission clamps

cash credit limit of Rs 1.32 lakhs and a bill purchase limit of Rs 0.6 lakhs were sanctioned. Also received was Rs 10,000 of 'seed' money from Government.

Having secured the loan early in 1975, Mr Beri went to the Punjab to supervise the making of his machinery. This took approximately one year. By March 1976, his machines and shed were ready and he started production in May. The ingenuity involved in equipping the unit cannot be described in detail here, but it should be mentioned that this equipment is unique and that Mercurium is the only bolt manufacturing unit of this size in India which uses cold forgeing technology.

In spite of being able to produce a high quality product, Mr Beri suffered a loss of more than Rs 1 lakh during the first year of production. There were several factors contributing to this. First, it was initially a period of sluggish demand for bolts. Second, the Bank was reluctant to release more than the 1.32 lakhs cash credit limit without proof of orders in hand. This was unfortunate since, unlike many of the products made by SIRTDO entrepreneurs, bolts are a common product which could have been produced, stocked and sold in greater quantities without any specific orders being placed if only the finance had been made available. Third, funds were only released in sufficient quantity to buy 2 tonnes of steel at a time. However, only trucks with a capacity of 10 tonnes could be hired, so transport costs per tonne were unnecessarily high. Finally, it took about six months to get registered as a small-scale unit and until this time the firm could not secure orders from Government departments or public corporations. Private traders try to take advantage of new firms in this position, and refuse to buy at good prices. Mr Beri simply refused to sell at the prices being offered, so this avenue of sales was ruled out.

1977-78 was a better year. Having acquired registration as a small-scale unit, orders from HEC, the Electricity Board and other public enterprises started coming in. Additionally, after realizing that Mr Beri could not be persuaded to sell at a low price, several orders



Mercurium's improved draw-bench for correcting diameter of the bar

started coming in from private traders at the asking price. Turnover went up to Rs 4.85 lakhs which compared very favourably with a turnover of only 0.80 lakhs in the previous year.

Although Mr Beri was able to supply bolts of almost the same quality as his large-scale competitors at prices about 25% lower than theirs, he still felt the need for something to give Mercurium's name an extra marketing boost. It was for this reason that he approached the Indian Standards Institute and asked if they would test his product to see if it was of high enough quality to receive the ISI stamp. It took about one year for all the tests to be done, but the quality standard was finally approved. Following this, the sales situation improved dramatically with turnover rising to Rs 6.3 lakhs in 1978/79 and again to Rs 10.8 lakhs in 1979/80. The expected turnover for 1980/81 is in excess of Rs 20 lakhs. This recent upturn in business has allowed Mr Beri to pay back Rs 1 lakh of the term loan and he hopes to be able to pay back the remaining Rs 1.5 lakhs by the end of 1981.

The unit currently employs nine full-time workers, two of whom are supervisory and seven who are skilled or semi-skilled and were trained on the job. Additionally, up to fifteen casual workers are employed when needed. Mr Beri also employs a sales manager and has two marketing agents to deal with the various government departments and public enterprises with which business is conducted.

The main problems still being faced by the unit are those of raw materials and power. One of the problems with raw materials is that only about 10% of the firm's needs for steel is available through the government channels at the controlled price. This is because the quota for government steel is estimated on the basis of the highest amount allocated to the firm from the government depot over the past three years, rather than on the basis of actual demand. Open market steel is more expensive and of a poorer quality, which affects the standard of the product. Additionally, difficulty is often faced in finding enough finance to pay for raw materials. Working capital is often tied up because of late

payments of bills, and the cash credit limit restricts the size of orders which can be undertaken. Mr Beri feels that these constraints are causing him to work at a much lower capacity than would otherwise be possible. If no difficulties were experienced in obtaining raw materials, he could probably double his existing output with his existing machinery by working extra shifts.

Recent power cuts have also been a problem and have resulted in lower output levels than would otherwise have been possible. Mr Beri feels that it would be too expensive to purchase a generator for his needs. He requires 60 kW and the interest he would have to pay on the Rs 3 lakhs needed to buy a generator capable of supplying this amount of power would make his product uncompetitive. He is thinking, however, of buying a diesel engine which could supply the needed power and which would cost less than Rs 1 lakh[1].

Mr Beri feels that SIRTDO's main role has been in providing people he can discuss important business decisions with. In particular, he feels it was important to have someone who could reassure him that he was doing the right thing. Apart from this moral support, Mr Beri feels that it has been important to have someone reminding him constantly about keeping up the quality of production.

Perfect Forgings

Perfect Forgings is a partnership owned by Mr K.B. Singh and Mr A.K. Singh, who both decided to go in for their own business because they felt this would be more profitable and more satisfying than paid employment. They were students together at BIT – one in production engineering and the other in mechanical engineering – and they both participated in the first entrepreneurial development programme run by BIT between March and May 1976. The course was held during the evenings, and during the days they spent their time trying to look for a suitable product which could form the basis of their business. They visited SISI and RIADA and also several industrial undertakings in the area, including a nearby thermal power station.

It was at the thermal power station that they identified a potential market for alloy steel balls to be used for pulverising coal being fed into the combustion furnace[2]. At this time, one large state unit (Bharat Heavy Electricals Ltd) and several small-scale units were producing this product, but the entrepreneurs felt that if they could develop a process for producing balls of a high quality, at a reasonable price and on a small-scale basis, they would capture a good part of the market. At this time Heavy Electricals Ltd had a huge profit margin – it was selling the finished product at Rs 7,000 per tonne whereas the raw material cost only Rs 1,800 per tonne. This firm normally bought all the produce of the small-scale units in the district and re-sold to the electrical companies at a profit.

The entrepreneurs took their idea to the SIRTDO staff, who helped them to draw up a project proposal for submission to the Bank. Since so many of the recent graduates from the EDP course were coming up with project proposals for finance at this time, the staff asked a team to come from the Bank to look at all of these together. Perfect Forgings was one of eight units which had their proposals approved with minor modifications[3].

The Bank sanctioned a loan consisting of the following: term loan Rs 3.4 lakhs; cash credit limit Rs 1.9 lakhs; and bill purchase limit Rs 1.2 lakhs. The term loan was re-financed by the Indian Development Bank and so was available at 11% instead of the normal 14%[4]. The Government of Bihar gave Rs 20,000 'seed' money. To date, the firm has managed to keep up with interest instalments but as yet has not repaid any of the capital on the term loan.

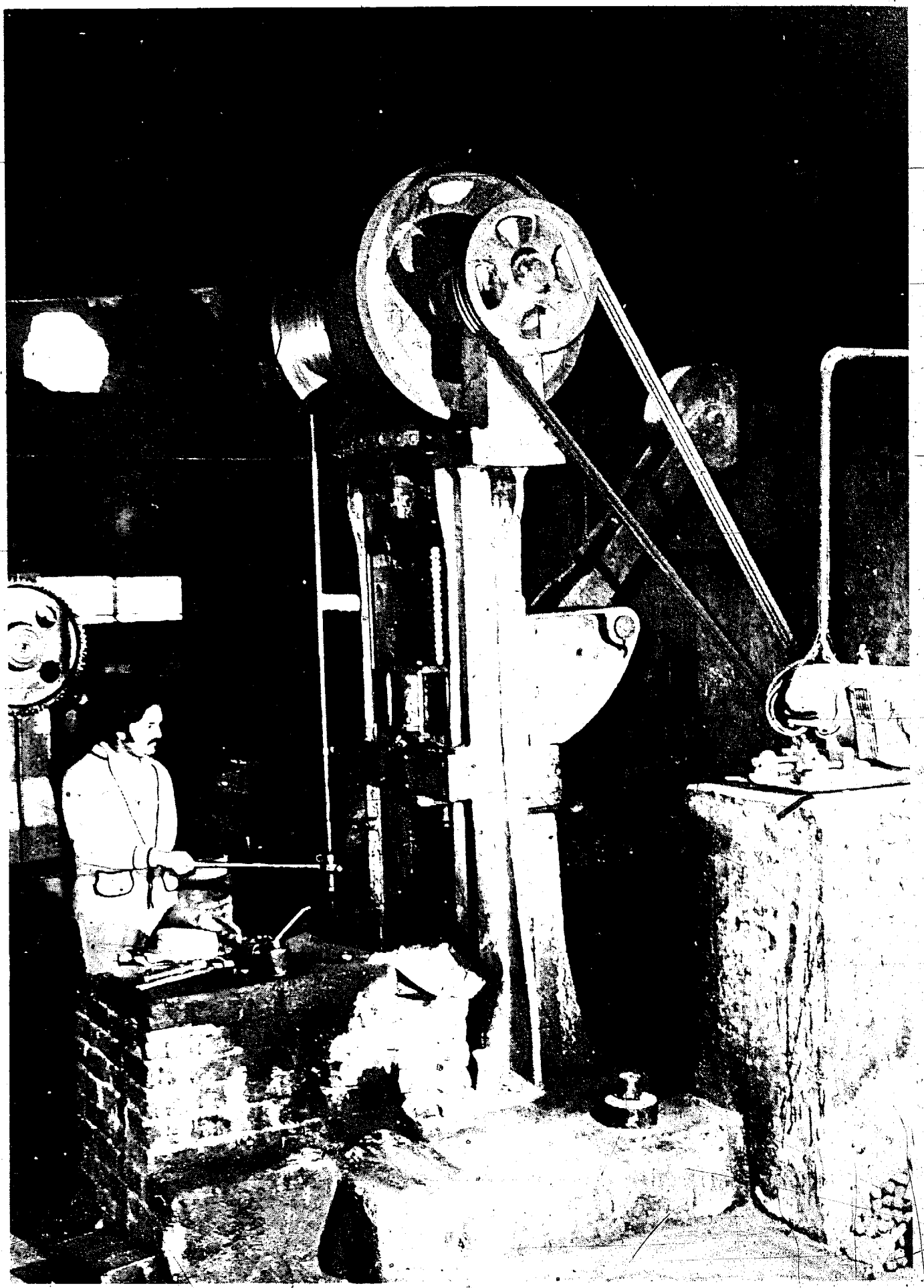
Having had the loan sanctioned by the Bank, the two entrepreneurs used money from the pre-operative limit (part of the term loan) to go to the Punjab to select, order and supervise the

[1] For units which require less power, the comparative economics of the generator and the diesel engine will change in favour of the generator. Cold forging units require more power than any other units sponsored by SIRTDO.

[2] Thirty five tonnes of steel balls are put into a drum into which coal is continuously fed for pulverising. It is then blown through with air to the combustion furnace. Good quality steel balls are essential, otherwise they splinter and pieces of steel get mixed with the coal and choke the system.

[3] Another three units had to make major changes in their proposals, but all of these also had their loans sanctioned upon re-submission three months later.

[4] The United Commercial Bank sent the Indian Development Bank eight projects of which five, including Perfect Forgings, were re-financed.



Power press for steel balls at Perfect Forgings

making of their equipment. As was mentioned earlier, machinery in the Punjab is amazingly cheap but it is necessary to actually go there to order it and to wait while it is being made. If the person for whom it is being made is not there when it is finished, someone immediately comes along and buys it for cash. An additional disadvantage with the Punjab equipment is that running costs are higher because of frequent breakdowns and high repair costs. The low capital cost was felt to be worth the attendant disadvantages.

The sheds on the 'nursery' estate were completed in September 1976 and, having installed the equipment, production commenced in early 1977. With the help of technical advice from BIT, good quality of product and low cost of production were ensured through modifications in the hot forging process. Good quality, plus the use of the organization's name, were useful tools when looking for markets. The entrepreneurs found that potential customers they approached had come to associate the organization's name with good quality and reliability and knew that there was a good technical back-up available through BIT/BISR which allowed access to expensive testing equipment and highly qualified technical advice.

The first large tender for which Perfect Forgings put in a quote came from the nearby thermal power station in August 1977. At this time, the price for alloy steel was Rs 2,300 per tonne, but by the time the contract was actually signed, the buying price had risen to Rs 2,900 per tonne. The power station refused to consider altering the price for the finished product which had been agreed the previous year and informed Perfect Forgings that if they insisted on raising the price of their goods, they would receive no further orders. The deal was concluded, therefore, at the agreed price of Rs 3,350 per tonne for the finished product. Given that 5% of the raw material is lost in processing, that fuel costs are Rs 250 per tonne and adding to this labour and overhead charges, there was no profit at all made on this order of Rs 1.18 lakhs.

At about this time, the Manager of the Divisional Headquarters of the Bank in Patna was visiting some of the units at Ranchi to ask what problems they had. Perfect Forgings explained the problem with the increasing and fluctuating price of alloy steel – the main raw material. (Unlike ordinary steel, this is not produced by government and is not subject to controls.) Beside the problem caused by customers refusing to raise their buying price to compensate for the rise in the price of raw materials[1], the unit was also facing severe problems because of the fact that the cash credit limit had been fixed at a time when alloy steel was only about half the current price. This meant that the unit was constantly having to stop and start work because only small amounts of raw materials could be purchased at any one time. It also meant that the unit was unable to stockpile to guard against fluctuations in the market price of alloy steel while orders were being completed. To try to help out with this situation, the Manager decided to give the unit an *ad hoc* loan of Rs 1 lakh at 14% interest for a period of one year. At the end of the year, since the situation had not improved, (in fact the price of alloy steel had by then risen to Rs 4,300 per tonne) the loan was extended for a longer period of time.

An additional problem of late has been that of power cuts. This was particularly bad in August and September 1980 when production was only 15 tonnes instead of 35 tonnes per month. The entrepreneurs have considered buying their own generator but decided that it would be completely uneconomic to do so. A 40 kW generator would be required. This would cost Rs 2 lakhs and would raise power costs to Rs 1.65 per unit as opposed to Rs 0.55 per unit currently being charged by the State Electricity Board. They feel that if SIRTDO purchases a 100 kW generator for the workshop facility and estate, this would help to solve their power problem.

A further problem is that of very tough competition from the other seven small-scale industries producing the same product in Bihar State. Whereas the large Heavy Electrical Company used to sell to buyers at Rs 7,000 per tonne at a time when raw materials were Rs 1,800 per tonne, competition between the eight small firms has reduced the final selling price to Rs 6,000 per tonne at a time when the raw material costs Rs 4,300 per tonne. This means that profit margins are very low. Attempts to form an agreement on minimum price between all the

[1] Customers are mainly government agencies which will only recognise that there has been a price rise in the raw material if the producer of this is also a government agency which provides documented proof of this. Alloy steel is only produced in the private sector, so no acceptable documentation can be supplied.

small firms have failed – there is always undercutting when quoting so as to try and secure a market.

Perfect Forgings has a slight advantage over its competitors since it was the first small-scale unit in India to obtain a Lloyd's certificate of quality for its product. This test was first carried out when the Bihar State Electricity Board said that it would give the unit an order if the Lloyd's certificate was obtained. Since then, all consignments for the State Electricity Board have been tested for the Lloyd's certificate at the Board's expense. (The cost is Rs 230 per tonne tested). Another attempt by the firm to maintain its competitive position has been to replace the oil-fired furnace with a coal-fired furnace, which has saved an estimated 25% of total fuel costs[1]. Apart from this, the entrepreneurs feel there is little they can do to reduce their costs per unit further.

The firm now employs thirty-two people and is working three shifts. Turnover has gone up considerably since production started (from Rs 4.9 lakhs in 1977/78 to Rs 11.2 lakhs in 1979/80), but the entrepreneurs consider they still have a long way to go before they can call themselves successful. By and large, they feel that their major problems would be over if their cash credit limit was enhanced to allow for the fact that the price of alloy steel has risen so much. It would also be of help if there was some way of producing acceptable documentation to government purchasers to prove that the raw material price has risen, so that a higher purchase price could be given for the finished product.

SUMMARY OF CASE

The technology involved in this type of industry is an important factor in its success, for without adapted machinery or processes and good quality dies it would be impossible to achieve high quality and low prices within the small-scale sector. With tough competition for products of this type, such small units would have stood much less chance of surviving if they had not developed an advantage in terms of price and/or quality. This is an example of an industry in which following the staff's advice to be quality-conscious really does pay off.

Both Mercurium and Perfect Forgings have documented proof of the high quality of their products which – together with low costs due to adaptations in technology – has assisted in securing markets. In the case of Precision Foundry, although technological skill was initially required to achieve the right quality and low enough cost to get the Export Corporation contract, the incentive to go on improving quality and reducing costs has been much less than in the other two firms. As might be expected, too secure a market takes away the constant necessity to go on innovating.

All of these industries are suffering from problems with raw materials – in terms of quantity and/or cost. This is as might be expected since such a high proportion of total cost relates to steel and other metals which are often difficult to acquire and subject to very high price rises in the open market. The most troublesome feature of this is that the cash credit limits, which were based on the value of three months' working capital two or three years ago, are now only equal to the value of one months' working capital or less. This makes it very difficult for the firms to buy sufficient raw materials to ensure continuous production runs; and capacity utilisation is lower than it could be.

Electronic control industries

Background

Most of the heavy industry in the Ranchi area was built up during the 1950's and 1960's and was based on imported technology developed during the 1950's. The Industrial Research Department of BIT had been carrying out surveys which revealed that many of the machines in these heavy industries were being brought to a complete stop by the failure of one small electronic component. For example, a high frequency furnace imported by the Heavy Engineering Corporation (HEC) from Czechoslovakia at a cost of Rs 12 lakhs was found to be lying idle because a capacitator costing only Rs 20 had failed. An even more serious example was that of the breakdown of a jig-boring machine imported by HEC in 1962 at a cost of Rs 27 lakhs (Rs 80 lakhs at present day prices); this was caused by the failure of the valve based, electronic system which accounted for no more than 2% of the total cost of the machine.

Since delays were usually experienced in

[1] To process one tonne of steel balls used to take 1.75 litres of furnace oil which cost Rs 250 per litre at the time of scrapping the furnace. The same amount of work takes 1 tonne of coal which costs Rs 220 per tonne.

obtaining spare parts, large and expensive machines were often lying idle for a considerable time. This was obviously a matter of some concern to HEC and other affected industries, but the BIT staff warned that the situation could become a great deal more serious since it was only a matter of time before the electronics technology being used became completely obsolete. BIT suggested that it would be worthwhile considering the possibility of replacing the existing circuits with solid state technology. Despite the warnings and suggestions, it took a specific incident to prove this prediction before anything happened.

In 1971, a valve failed in the electronics circuit in one of the HEC's machines, and replacements were no longer available. At this point, HEC asked BIT to investigate the possibility of developing a solid state circuit as a replacement for the old system. This was done and, having made the initial breakthrough, it was realised that many small-scale industries could be developed utilising the skills of recently qualified engineers who could study existing circuits and replace them with new types of circuit before they became obsolete. This, then, was the basis for identifying suitable students who could be assisted to start small-scale businesses in the field of industrial electronics.

Of all the fields covered, this is the one which requires the greatest R & D input by BIT staff in developing laboratory prototypes. It is estimated that almost ten times as much time is spent on R & D in electronics as all the other fields put together. There is a simple reason for this. Every product or application demands a different detailing of the electronics circuit and in many cases only a few circuits of a particular type will be needed. Thus, not only is a great deal of time put into developing each new circuit (because there is a great deal of trial and error involved), there is also a constant need to design more new circuits in order to stay in business. Although some of the entrepreneurs in this field are becoming less dependent on the R & D facilities available in BIT, it is unlikely that they could ever have succeeded in keeping their enterprises afloat without continued access to these facilities.

The other important factor in helping the entrepreneurs to remain competitive has been the constant availability of high quality printed circuit boards designed to meet their needs as their products vary. This needs some explanation. Basically, there are only three factors which determine the quality and thus the reliability of an electronic circuit. The first of these is the quality of the components, such as transistors and resistors. These are all mass-produced by large firms and so a quality-assured supply of these is available to all assembly firms whether they be large-scale or small-scale. The second is the diligence required in assembly of these components on the printed circuit board. A badly-assembled board will present constant problems. The third item is the printed circuit board itself. These boards are made by both large-scale and small-scale units, but while the former have been able to achieve a high standard of quality through the use of photo-etching equipment, the latter, unable to afford this high-cost technology, have only been able to produce a much inferior printed circuit board based on hand-drawn designs. This sort of card is (just) acceptable in entertainment electronics but not for use in industrial electronics.

By having access to the photo-etching equipment in the SIRTDO central workshop (something which they could not otherwise have had), the entrepreneurs being sponsored by SIRTDO could fill an important gap in the market, namely, responding to small orders with high quality products. This, plus the R & D back-up in the BIT laboratories, has been vitally important in allowing this group of entrepreneurs to survive by allowing them an enormous degree of flexibility.

Of the four entrepreneurs involved, one concentrates on control panels for mining equipment (Transcon); another started with supplying TATA industries with substitutes for imported process instruments such as temperature monitors and has since moved on to making control panels for minor irrigation schemes (India Instruments); a third started off by looking at medical electronics but went on to study and produce a whole range of products based on the same technology (Meditron); and the fourth entrepreneur (PCB House) produces printed circuit boards which are used by the other three SIRTDO units and by outside firms.

All but the last entrepreneur are doing extremely good business. His trouble is that the work generated by the three neighbouring units is nowhere near sufficient for him to operate at full capacity and he has trouble getting orders from companies in Calcutta and elsewhere since they would rather purchase from a nearer supplier. As a consequence, his yearly turnover is barely sufficient to cover the interest on his

bank loan[1]. The position should be improved in the near future since ample demand for printed circuit boards should be generated by the additional small-scale electronics units SIRTDO is planning to sponsor in the near future.[2]

Meditron

The firm of Meditron takes its name from the first product it was involved with - medical electronics. Some work is still done on this, but the main products are now control panels, voltage stabilizers, electronic teaching aids and electronic toys. The owner of the firm, Mr Agarwal, graduated from BIT in electronic engineering in 1970 and feeling that there was no productive role for him in his family's electronics business in Uttar Pradesh, he looked for other employment opportunities. These included selling scrap iron, working in an electronics factory in Delhi, and working as managing director of an electronics firm in Uttar Pradesh. This latter concern was a joint venture with the State Government and was set up through the Bhimtal branch of the BISR Small Industry Programme. Having succeeded in making this venture into a going concern, he sold out his share and left. He picked up on old connections at BIT and towards the end of 1976, a few months after leaving UP, he moved to Ranchi and started to build up Meditron.

Meditron started by doing maintenance and repair of electronic hospital equipment, mainly in medical colleges, but also in one or two larger hospitals. This was an area of personal interest to Mr. Agarwal, but he was also encouraged by the fact that surveys of the medical colleges carried out through the small industries scheme had found that about 50% of electronics equipment was out of order, of which about 70% could be salvaged. In addition, the Government of Bihar had expressed an interest in BIT tackling this problem.

Despite this apparently good market, Mr Agarwal quickly found that this sort of work was not particularly profitable. No-one would take the decision to have repairs done without an estimate of how much it would cost, but no-one would pay for having an estimate made - a task which was very time-consuming. Even when orders were made, there was rarely any design/technical information available to assist with working out the problem. Repair and maintenance work without written instructions from the makers is more difficult and takes longer than when some instructions are available. After about one year, Mr Agarwal decided to let this sort of work taper off and he now does very little in this line except to oblige a few old customers.

In the meantime, Mr Agarwal had been investigating other lines of production. His next venture came about as a result of having been in the right place at the right time. Some HEC officials came to BIT to ask about producing analogue controls to replace the damaged ones in some of their Czechoslovakian machines, as spare parts were no longer available. Mr Agarwal was the only person in the BIT laboratory when the HEC staff arrived, so he discussed the matter with them and it was agreed that he should supply a prototype for testing. This proved satisfactory and since then he has received several orders for this product.

At the same time, Mr Agarwal started doing repair work on HEC machines that were otherwise being sent to America for repair or which had been repaired only when an electronics engineer from the overseas manufacturer was brought to India at HEC expense. Not surprisingly, HEC began to get a rather favourable impression of Mr Agarwal.

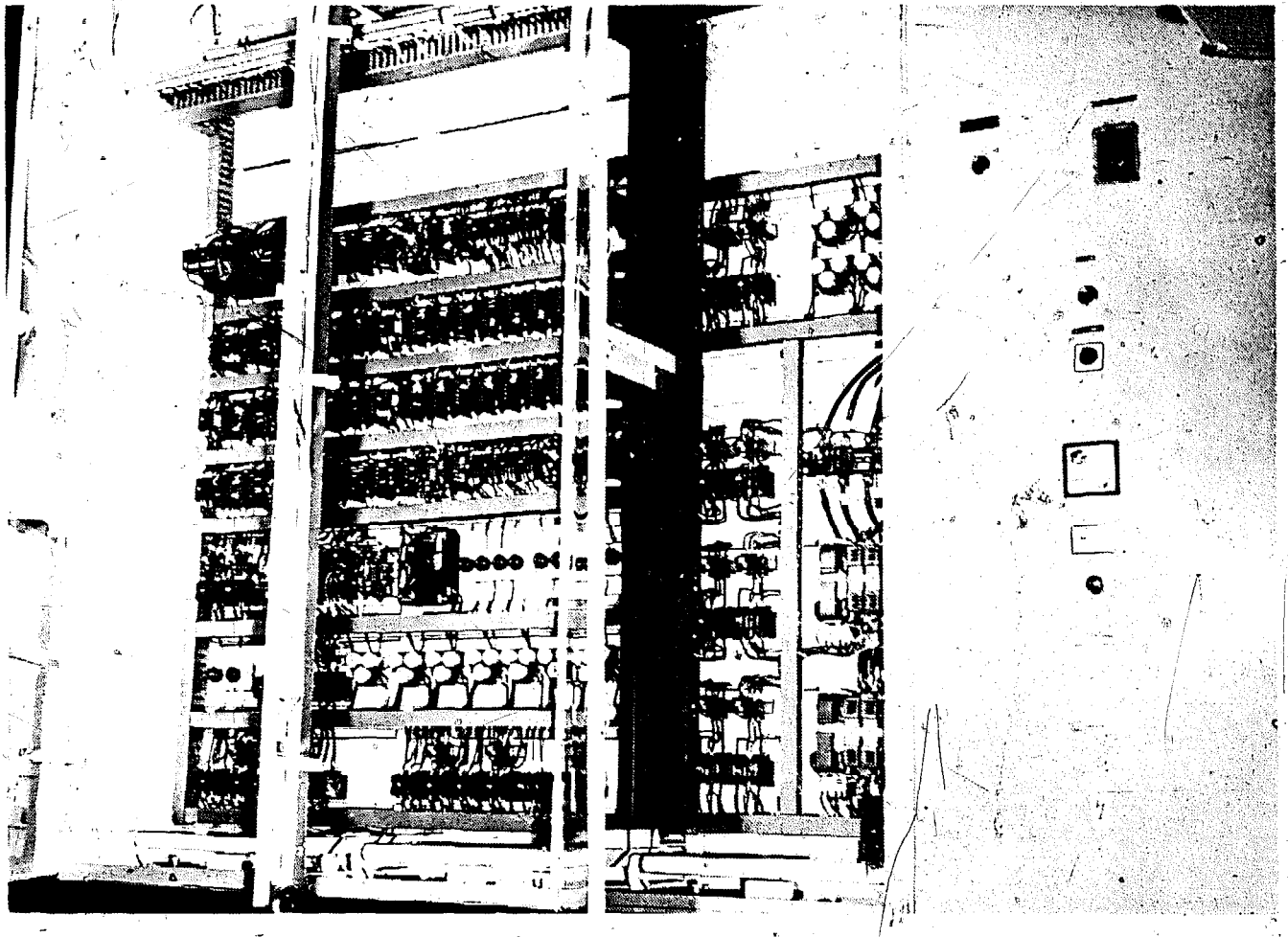
It was not in fact until after this initial contact with HEC had been made that Mr Agarwal's application for a bank loan came up for consideration. Since he was already known to the Bank (he had dealt with United Commercial before), since he had the small industry scheme's name behind him, and since he already had about Rs 1 lakh's worth of orders on his books, the Bank approved his loan without a single change (everyone else had their budgets changed even if only slightly). The loan which was agreed upon in June 1977 consisted of Rs 95,000 working capital; Rs 100,000 term loan at 14% interest; and Rs 50,000 bill purchase limit. The Government of Bihar provided Rs 12,500 'seed' money. To date, Rs 55,000 has been spent on machinery - which includes the Rs 12,500 'seed' money. The rest of the term loan has not been touched and it is unlikely that it will now be used since Meditron has become self-sufficient and can expand through reinvestment of its own profits. Rs 18,000 of the Rs 42,500 borrowed from the Bank has already been paid back.

[1] The entrepreneur could of course have saved himself these difficulties if he had held back part of his loan and expanded gradually as demand increased.

[2] See page 18.

After securing the loan, business began to expand. Through acquaintances, Mr Agarwal heard that Coal India Ltd (CIL) was having trouble with the controls for vibratory feeders which were imported from Germany. He went to investigate and was given a system to experiment with. It took nine months to develop the alternative thyristor technology and to persuade CIL to accept this. The R & D costs and the time involved in development were not paid for by CIL, but Mr Agarwal felt that he could do the job and that the consequent sales would cover his costs.

Mr Agarwal now assembles very complicated and very expensive control panels and is able to compete favourably in terms of price with larger competitors such as Voltas, Larson Toubre and Siemens. For example, towards the end of 1980, he contested a tender put out by HEC for a control panel and other electrical parts for a plano-miller. The price quoted by Meditron was Rs 30,490. The next lowest price quoted was Rs 36,950 which came from a large producer based in Gujarat. Because of his lower price Mr Agarwal was given the order. This was not always the case, however. In earlier days, HEC tended to give orders to firms which were quoting higher prices than Meditron, because they were well established and a known quantity, whereas Meditron was felt to be an unknown quantity – at least when it came to control panels. Mr Agarwal protested to HEC that they always came to him to do the small jobs that the big firms would not touch and even though they found his work completely satisfactory they would not give him a chance when it came to a big job. After five months, he persuaded HEC to give him an experimental panel so that he could prove that his work was of good quality. After this, he always got the order if his price was lower, and sometimes he has received an order which needs to be filled quickly even if his price is higher because he can supply more quickly than bigger firms. Mr Agarwal attributes his competitive price to the fact that he has lower labour costs than firms based in big cities; he has lower infra-



Meditron's electronic control panel for plano-miller

structural and overheads costs; and he does his own design and engineering work.

The firm now employs five men at an average wage of Rs 250 per month and (women) who do less skilled jobs at Rs 120 per month. He also employs one person who had previously received some technical training and is paid Rs 300 per month. All other employees were unemployed before they joined Meditron and have been trained on the job. Mr Agarwal tries to maintain a personal touch with his employees. He takes an interest in their families, looks after their medical expenses and has a flexible approach to salary increases. Business has been expanding so much that he will employ another six women workers as soon as he moves into his new factory in the next month or so.

The unit started with a turnover of Rs 0.85 lakhs in 1977/78, and just three years later is expecting to reach a turnover of Rs 20 lakhs. How much of this success can be attributed to the role of the small industry scheme? Mr Agarwal feels that it has helped particularly in two respects. First, because of the organisation's name, he has been able to put a lot less labour into acquiring sales than he would otherwise have needed. He remembers when he was running the firm in Bhimtal that he had to spend months running around looking for markets. He points out however that although having technical backing is useful in respect of getting orders, being a SIRTDO entrepreneur sometimes works as a disadvantage if one of the other entrepreneurs has done a bad job for a customer. Second, Mr Agarwal feels that if it had not been for the scheme he would never have taken up some of the more complicated of his projects/products because he would not have had access to the expensive testing equipment needed or immediate access to a highly qualified consultant whenever he had problems.

Even a unit as successful as this one has its difficulties. Meditron's problems seem to consist mainly of those relating to labour. The problems are of two types. First, it is very difficult to get good technically qualified staff to work in a small-scale unit because there is no job security; this means that Meditron is without sufficient technical supervisory staff who can relieve Mr Agarwal of some of the work burden. The effects of this could be clearly seen in 1979/80 when turnover figures dropped dramatically (from Rs. 1.5 lakhs in 1978/79 to only Rs 0.9 lakhs) because Mr Agarwal was involved in product development and did not have as much time as usual to supervise on-going work. He feels that the demand from big industries for small order import substitution work is so great that he could take on ten times as much work if he had more technically qualified supervisory staff.

The second labour problem is that it is very difficult to get good clerical staff to commute from Ranchi to SIRTDO. Bus journeys to and from SIRTDO would cost about Rs 80 per month, which is a lot of money given that a clerical worker would only earn about Rs 250 per month. Mr Agarwal really feels he needs someone who has a B. Comm. degree who can look after the paperwork and release his time for R & D work. These problems will be solved in the only sensible way – by offering competitive wages to attract the type of skills required.

SUMMARY OF CASE

The secret of success in this case study is the ability to meet small orders with high quality products at a reasonable cost, thereby being able to capture a market which is difficult for either large-scale producers or normal small-scale units. There is a great deal of R & D work involved in this type of industry and, although the entrepreneur does much of this himself, the backing of the BIT electronics staff has enabled him to take up much more complicated products than he would otherwise have contemplated.

A factor of particular interest is the way in which uneducated and unskilled men and women from neighbouring villages have been trained to perform relatively complicated tasks such as assembling printed circuit boards.

It should also be noticed that this type of firm has few problems with raw materials or power supply. Bottlenecks in this case revolve around supply of 'brainpower' and technical supervisory staff.

Electrical power industries

Background

Electricity has now been supplied in India for almost a century and nearly all the machinery associated with electricity supply is made in the country. BIT's investigations revealed than an item not being produced locally was a mining transformer for use below ground in the local mines. The transformers being used were imported from Poland, Czechoslovakia and Romania and they were found to be highly

susceptible to breakdowns under Indian conditions. Coal India Ltd (CIL) asked BIT to look into the possibility of producing a transformer better suited to conditions in the Indian mines.

Although no underground transformers were being manufactured in India, it was found that most of the transformers being used above ground were made locally. These locally-made transformers were oil-cooled and afforded some protection against high voltage. Inside the mines, however, the use of oil was not permitted and until then the more complicated technology of making flame-proof dry transformers was not available in India. The challenge for BIT therefore was to design the technology for making dry transformers available in India.

BIT was given one of the problematic imported transformers and after two years produced a commercial prototype of an improved dry transformer. After several months' trial in a particularly bad area of one of the mines, the transformer was declared a success and orders were placed for more. At this stage, the technology was handed over to the two students who had been working on the project. They formed a partnership and started production. The history of their firm follows.

Transgietz enterprises

Mr Zutshi and Mr Das Gupta[1] became friends while studying mechanical and electrical engineering at BIT. Neither came from a business family, but both had decided by their third year that they would be interested in setting up a business together. As final year students they worked on the project on producing dry transformers for the mines. This was both interesting and looked like a promising business proposition. At the time of graduation, Mr Zutshi was undecided as to whether to go to the USA for further education or start his own business. Since there was a wait of eight months before he could go to the USA, he decided to do the Entrepreneurial Development Programme. Mr Das Gupta also undertook the course.

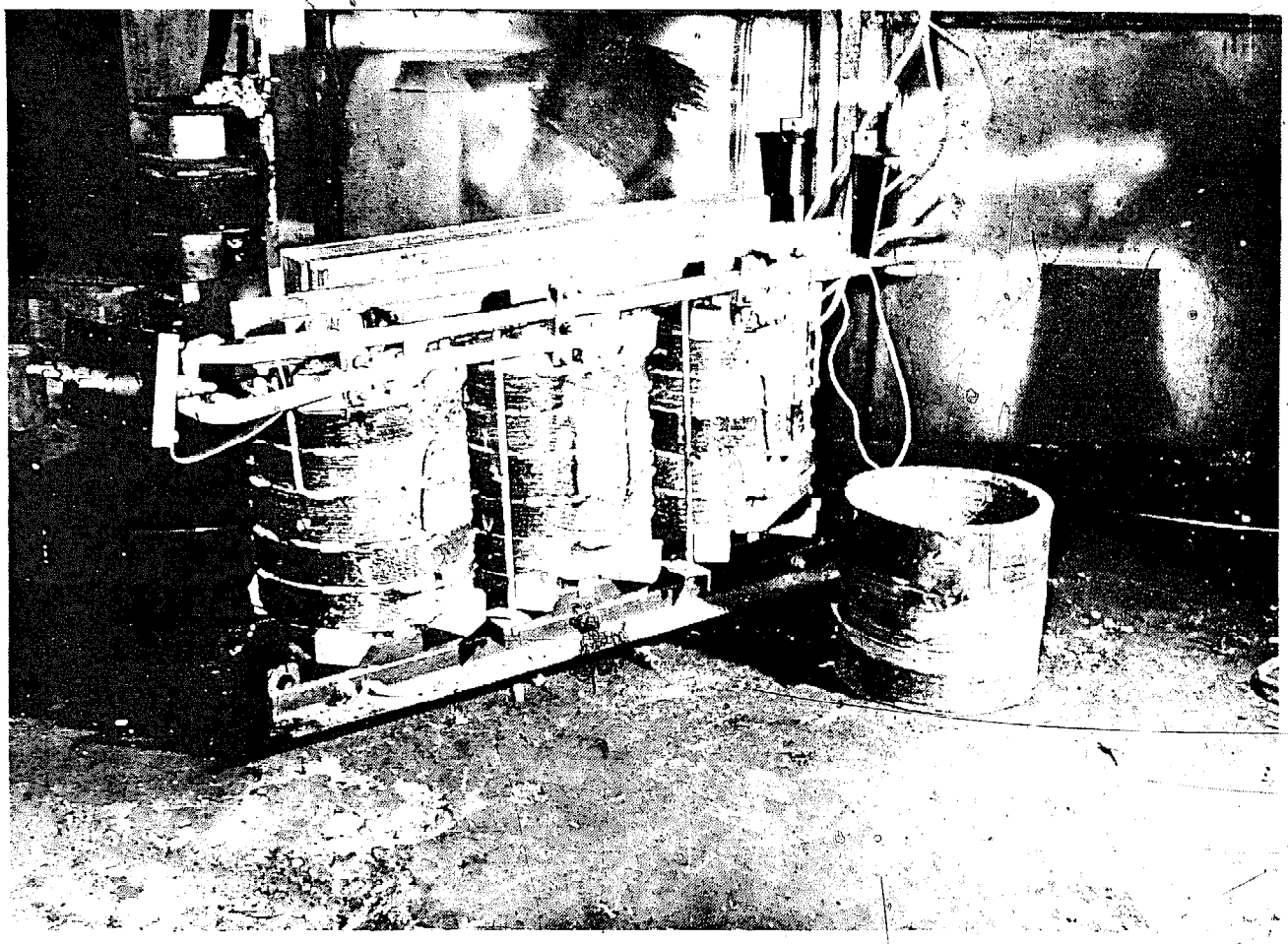
It was during the course that the project on transformers was prepared, and Mr Zutshi decided to stay in India and go into business. Having registered the firm with the Director of Industries, a request for finance was submitted to the Bank in August 1976 and was approved with minor changes in December 1976. A term loan of Rs 2.58 lakhs to be repaid in three years, a cash credit limit of Rs 2.30 lakhs, and a bill purchase limit of Rs 1.6 lakhs were sanctioned. The term loan represented 95% of the fixed capital requirement. The government 'seed' money made up the remaining 5%, although this was not in fact received until 1980.

Enquiries were made about machinery and quotations received. In the meantime, research and development work continued on the dry transformer. Testing was done in BIT laboratories and at an electrical equipment factory near Ranchi. When these tests proved satisfactory a commercial prototype was sent to Coal India Ltd (CIL) for field testing and after six months of satisfactory service, the first orders for transformers started coming in. Thus, although it was March 1977 when the first advances were paid for machinery, it was September 1978 before all the equipment was purchased and installed and production of transformers began.

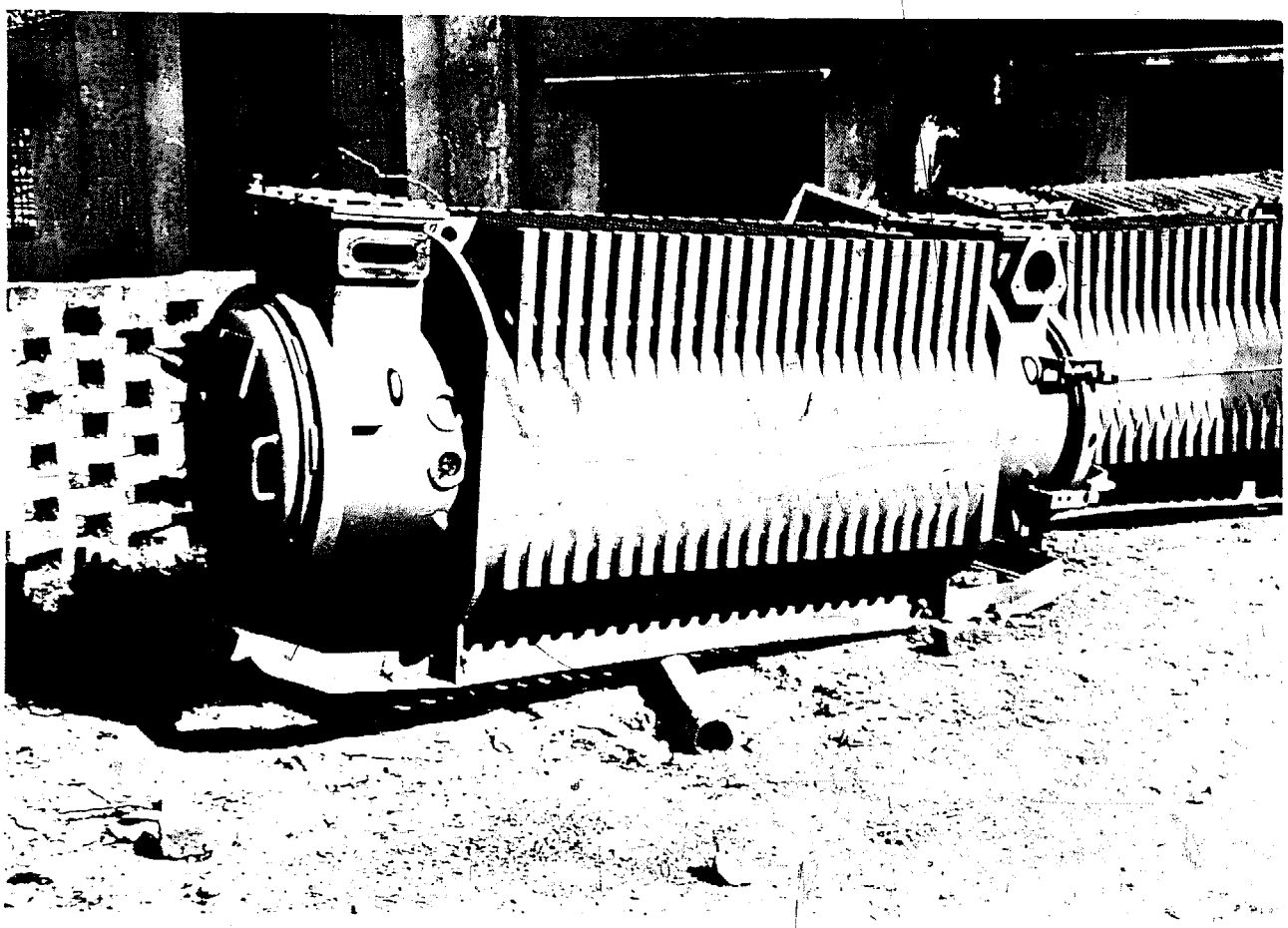
In the two years before the business started properly the two entrepreneurs kept themselves afloat by doing some consultancy work for neighbouring industries. They also had a stipend from SIRTDO until January 1977 while finishing R & D work on the dry transformers. The total turnover during these two years was only about Rs 0.80 lakhs. As soon as production of transformers commenced, however, turnover lept up to Rs 1.11 lakhs in 1978/79 and again to Rs 4.50 lakhs in 1979/80. The unit now employs eight unskilled workers, two clerks and four skilled workers at wages varying between Rs 200 and Rs 800 per month. All employees come from neighbouring villages and were trained on the job.

Since the entrepreneurs felt they should not rely on just one product (no matter how profitable it was proving to be), they decided to diversify. They chose electronic control panels as there is a big market for this product. Additionally, an old class-mate who is a specialist in control panels has just joined them after leaving his job with a large-scale electronics firm. While there are no competitors in the field of dry transformers, there are both large-scale and small-scale competitors in the field of electronic control panels. Transgietz manages to compete by maintaining a lower price than large-scale competitors (through lower overheads) and better quality than small-scale competitors. There is no

[1] Only Mr Zutshi could be interviewed as Mr Das Gupta was out of town trying to collect some of the overdue payments to the firm.



Transgietz's dry-type transformer, with a burnt-out transformer imported from Europe



Metal housing for transformers

competition with other units of the SIRTDO estate – all tenders are by agreement only contested by the unit which is most in need of work at the time.

Orders have now started coming in for ordinary above-ground transformers as well as dry transformers. An order of over Rs 15 lakhs has recently been secured through a World Bank Rural Electrification programme in Gujarat, Assam and Orissa. This was a global tender in which Transgietz quoted the lowest prices. Contracts of this type are secured for Transgietz with the help of its managing agents in various parts of the country. These are private agents who receive a commission on any orders they secure for their clients. Transgietz finds that this type of marketing technique works extremely well when looking for markets outside the immediate vicinity.

With the benefit of these new fields of activity, turnover in 1980/81 is expected to reach at least Rs 10 lakhs and a major part of the term loan will have been paid back by the end of that year. Not content with these successes, the firm is now carrying out R & D work into different types of transformers with a view to cornering even bigger markets. In particular, work is being done on pole-mounted, completely sealed transformers and self-protection devices for sealed transformers. The Rural Electrification Corporation has indicated that there would be a large market for completely sealed, low capacity transformers. Apart from other advantages, these are absolutely safe from pilfering, which is a major consideration when dealing with electrification programmes in remote areas. Neither the wound-cores nor the self-protection devices for these transformers are made in India, but through SIRTDO and the Intermediate Technology Development Group (of London), Transgietz is hoping to get hold of part of such a device from the U.K. so that it can be studied and adapted for production in India. In particular, the transformer and self-protection device will have to be adapted to Indian conditions of high ambient temperatures and an unreliable supply of electricity. The Rural Electrification Corporation has indicated that it would be willing to put up at least 50% of the material cost of developing a satisfactory transformer. The entrepreneurs could probably raise the remaining material costs themselves.

In 1981, a major expansion is planned with new units being set up in Kashmir and Uttar Pradesh to produce transformers. It is also planned that the firm will turn itself into a private limited company with four Directors. These will be the two existing partners, the recently joined electronic panel specialist, and a recently graduated BIT pharmaceutical student. One of the new products of the Company will be the medical preparation which has been developed by this fourth director. This move is seen both as good business sense through diversification of production, but also as a means of helping other people to get into their own business without having to go through all the initial difficulties that the first two entrepreneurs faced.

It is felt that the Bank will look favourably on requests for additional loans since Transgietz has been a good customer over the past few years. The company has repaid a good part of the term loan and has been paying back interest at approximately the rate of Rs 55,000 per annum. An indication of the Bank's faith in the business is that it helped the firm secure the World Bank order (it guaranteed to pay up to Rs 3.5 lakhs if the firm fell down on the contract). In addition, the Bank is showing favourable signs towards extending the firm's current cash credit limit so that it can cope more easily with rises in raw material prices. Like many of the other units, Transgietz has been experiencing difficulties in acquiring steel at the controlled price. It tends to be given either sheet steel, or angles, or channels, but it requires all three types, to maintain production and must therefore buy significant amounts on the open market at high and increasing prices.

The unit's major problem has been power cuts, affecting its ability to work at full capacity. Because of the cuts in recent months, only Rs 5 lakhs out of Rs 7 lakhs worth of orders could be executed. If trends continue, then out of a total order of Rs 12 lakhs so far received for the coming year, it will only be possible to execute Rs 10 lakhs worth. Unlike some of the other entrepreneurs, Mr Zutshi has not introduced 'flexi-time' as a way of coping with power cuts since he feels that it is unfair to ask his staff to be on twenty-four hour call. Instead, he continues to employ them for the normal eight hours every day and tries to occupy them as fully as possible by saving operations requiring only manual operation for when the power is off. Mr Zutshi is not considering buying his own generator since he would need 50 kW and he could not afford to pay the Rs 2 lakhs for this. The Department of Industry has recently introduced a measure to assist small industries by providing up to

Rs 20,000 'seed' money to buy a generator, but this would not be sufficient to be of help. The unit would, however, benefit if SIRTDO were to proceed with plans to buy a generator for the whole estate.

A further problem which has arisen in the last six months has been the delay in payment of bills by customers. At the moment, pending bills amount to Rs 2.5 lakhs. This, of course, causes a certain amount of hardship, but the firm has managed to keep up production by getting outside credit facilities and by using some of its own resources.

The unit has found the small industry scheme invaluable for several reasons. First, as new graduates, the entrepreneurs would never have received 95% of their capital requirements from the Bank if they had not had the scheme behind them. Second, they could never have persuaded CIL to put up the Rs 60,000 material costs needed to do the R & D work in the dry transformer which formed the basis of the business. Third, they could never have persuaded CIL to try out the product. Now the firm's name is known and its reputation is established and loans, material costs for R & D and offers of contracts are being acquired largely without any assistance.

SUMMARY OF CASE

Technology plays a pivotal role in this firm's case since the extensive R & D work involved has given it a monopoly in the production of dry-type transformers. It would have been impossible for the normal small-scale entrepreneur to start a firm based on such a product – he would have been unable to pay for the R & D costs himself and CIL would never have financed a small-scale industry to carry out such work. The small industry scheme was therefore absolutely vital to the establishment of this industry, but the entrepreneurs have displayed a remarkable ability to seize this opportunity and expand in many directions in a very short space of time.

Chemical and pharmaceutical industries

Background

In 1971/72, a new Pharmaceutical Department was created at BIT. The Professor was very much oriented towards practical R & D work and associated himself almost immediately with the small industries scheme. He considered the sort of pharmaceutical and chemical items for which there is a good market and which could be made by small-scale businesses. Two areas were identified as promising. First, it was found that most of the basic ingredients used in the pharmaceutical industries were imported or mass-produced locally by large firms using high-cost technology. It was felt that many of these ingredients could be produced from local resources by small-scale firms if the appropriate technology could be developed. Second, it was found that most drugs and industrial chemical preparations being used in the area were coming from Bombay, Calcutta, and other big cities, and that sales prices were very high because they included inter-state taxes, transport costs and all the promotional and distributional overheads of large, centralised producers. It was felt that if the technology appropriate to small-scale formulation of these products could be developed, there was no reason why small-scale businesses could not compete with existing large-scale producers.

Since plenty of land was available, BIT set aside ten acres for the cultivation of medicinal plants, from which small-scale units could produce extracts. The plants included peppermint, Japanese mint, citronella and lemon grass. Equipment for extracting oils was developed by the mechanical engineering department and laboratory tests were carried out by the pharmaceutical department. The cultivation of soya beans was also started and work done on the small-scale processing of soya oil and soya milk. This work has led to the formation of one unit near Ranchi producing menthol[1], and another unit on the BIT campus (Nutrients India) producing soya oil and soya milk. It has also played a vital role in the rural development programme described in Chapter 6. There is a huge potential for starting up small industries in this line. Advantages include the fact that most of the plants can be grown on waste land and do not require irrigation; the processes are mainly manual and can therefore be carried out in rural areas; they are labour-intensive and so create a maximum number of jobs; and costs are low so the small producer can compete with large firms, to the ultimate benefit of the consumer.

With respect to the second area of work – the small-scale formulation of pharmaceutical and chemical products – a production unit was started in this line as early as 1974. This was

[1] Menthol has a huge market with industries producing toilet preparations, nasal preparations and cigarettes.

Bihar Drugs, which is looked at in detail in the following pages. Because of the special nature of the main product of this industry, the promotional aspects presented somewhat of a challenge. When dealing with life-saving drugs (in this case fluids for intravenous injections) good quality is not just important, it is essential, and the organization did everything in its power to ensure that quality was maintained while at the same time trying to prevent too much direct interference. Having assured themselves that the firm's products were of adequate quality, the staff then turned their attention to the equally difficult task of convincing the medical practitioners that this was so. Together with the entrepreneur himself they have been so successful in breaking into this difficult market that the firm is now expanding its production facilities in Ranchi and is about to establish markets outside Bihar State.

With one formulation industry successfully off the ground, SIRTDO has decided that it should encourage more entrepreneurs in this line. Most are still in the early stages of development, but it is interesting to review them briefly before going on to look at the case history of Bihar Drugs.

A bank loan for Paediatric Laboratories has just been sanctioned and the entrepreneur is waiting to move into one of the new sheds on the SIRTDO estate to commence production. It has taken him two years of work in the BIT laboratories to develop the six products which he will be producing. During this time he was being paid a stipend by SIRTDO through its pre-investment assistance funds. SIRTDO also paid for all the R & D costs.

Chemit India has only recently started production of industrial adhesives in a factory on the Tupudana Industrial Estate. The entrepreneur brought this idea to SIRTDO along with two or three other proposed products. After careful consideration, SIRTDO advised him that the adhesive was probably the most feasible product and decided to sponsor him to start production. Before this, all industrial adhesives came from outside Bihar State. The firm is still building up its market and ironing out technological difficulties. With SIRTDO's help samples are being tried out by various state-owned firms which report back on any defects noticed in the product. Once initial difficulties have been overcome and good quality is achieved and acknowledged, this should prove to be a profitable enterprise.

Lastly, as soon as a shed is available, Jayno Pharmo Chemicals will be registered as a small-scale industry, apply for a loan and commence production of a drug intermediary. SIRTDO has supported this future entrepreneur for the last two-and-a-half years while he perfected this product. It also paid for the work he carried out at the National Laboratories in Lucknow to develop a pilot plant.

Bihar Drugs

Mr Dey, the owner of Bihar Drugs, is not a graduate, but was working in the pharmaceutical laboratories of BIT at the time that BIT/BISR was looking for potential entrepreneurs in this field. His father, who has had years of experience working in chemical factories, was also working at BIT at this time as a public health analyst. Both Mr Dey and his father became interested in the small industries scheme when they saw that the first few entrepreneurs were beginning to make progress and they were the first to approach the organization's staff about setting up a small-scale pharmaceutical unit.

A project proposal was drawn up on the basis of production of a few simple items such as injection fluids and also on an entirely new product - malt extract from wheat bran - which was developed in the pharmaceutical laboratory and for which there was believed to be a huge market. The Bank approved a term loan of Rs 40,000 at 14% interest; a cash credit limit of Rs 70,000; and a bill purchase limit of Rs 20,000. The term loan has since been paid back in full.

The enterprise started off in space allocated by BIT in the campus marketing centre. This was a considerable help financially in the early stages. In addition, BIT/BISR loaned, on a rent-free basis, certain electrical equipment such as an air conditioner. An industrial licence was difficult to obtain because of all the formalities to be gone through according to the Drugs Act. This was eventually obtained and production began in a small way in 1974.

In the beginning, the BIT laboratories were useful in providing facilities for the rigid testing procedures through which each batch of drugs had to go. After a while, the unit acquired its own small testing unit, but at BIT/BISR's suggestion, a portion of each batch was also sent to a major testing laboratory in Calcutta. BIT/BISR was very anxious that every possible check should be made, since the major product

was a life-saving drug. It even offered to pay for this additional testing if the entrepreneur felt that he would be unable to cope with the added expense.

Having established that the drugs produced by the unit were of a high quality, both BIT/BISR and the entrepreneur went about building up a market for the produce. This was a particular problem in the case of drugs, where trade-names are of such great importance. BIT/BISR helped by asking the Department of Industry to point out to the Department of Health that good quality drugs were available from this small-scale unit and that it should be given preferential treatment in governmental purchase of drugs. The entrepreneur went about promoting his product by taking free samples to doctors in various hospitals in the area. He concentrated on those which had a good reputation, even if this meant initially settling at a loss, because this was important in building up a name for the firm.

The unit acquired orders over time, but expanded more slowly than growth in demand would have allowed so as to be able to maintain quality and reliability. A major upheaval was experienced in 1976 when the unit had to leave the BIT marketing centre because the State Government was objecting to the use of the property for industrial purposes. At this time, the unit moved to its present location, a privately-owned building almost equidistant between the SIRTDO building and the main BIT buildings. This move was inconvenient and the cost of remodelling the building was a financial burden, but the setback was quickly overcome and business continued to improve. Initially, the firm was having to take its product to the customers, but after a while many of the customers started coming to the laboratory to purchase supplies directly. At the moment, drugs are sold directly from the laboratory and through a marketing stall in Ranchi town. A ricksaw is used to transport drugs into town to keep this outlet stocked.

The firm now supplies many of the hospitals/clinics run by the large industrial undertakings in the area and nearly all the missionary hospitals buy their supplies from here. The latter are possibly encouraged by the fact that the firm gives a 10% discount on all drugs which will be used to help poor people.

At the moment, nine people work for the firm. Four are unskilled and five are skilled. The latter have been with the firm from the very beginning and were trained on the job. Unskilled labour is paid Rs 5 per day and skilled labour Rs 9 - Rs 10 per day. The entrepreneur's two brothers also work for the firm.

Expansion is now being planned. Land has been purchased in Ranchi town and a loan has been approved by the Bihar State Financial Corporation to construct a new laboratory. This has to be repaid within two years. The five skilled employees who have worked with the firm for the past six years will be given the option of continuing to work for it after the move. If they wish to do so, then accommodation will be built for them in the compound of the new laboratory. In addition, it is hoped to start selling in West Bengal. A sales representative will be employed to build up the market in this state.

Although the progress of the firm has been fairly smooth, there have nevertheless been certain difficulties, many of which still affect the firm's competitive status. A major problem is the securing of raw materials. The State Trading Corporation and the Government-controlled company, Indian Drugs and Pharmaceuticals Ltd, are both authorised to supply the required raw materials, but they will only sell in bulk. This means, for instance, having to purchase a minimum of 25 kg of Vitamin B at a time at a cost of Rs 30,000. Since the firm cannot afford to do this, it must purchase its raw materials in smaller quantities from the Bombay market at prices approximately 10% higher per kg than those charged by the authorised government suppliers.

Another problem is that there is no laboratory in Bihar which can test products which contain vitamins, so these have to be sent to Calcutta for testing. The necessary equipment is very expensive and would be far beyond the means of the firm to purchase. However, such equipment will be provided in a new pharmaceutical laboratory being planned by SIRTDO.

Power cuts have been a problem for the unit in so much as their water distillation plant is electrically operated and all their major products use distilled water. Production gets held up therefore when the distillation unit is not working. To combat this problem, the firm has recently ordered a coal-fired unit for Calcutta which apparently is capable of giving the same output. The only difference will be the need to have someone constantly cleaning up the coal dust. The firm is also thinking of purchasing a small generator for lighting purposes and then it will be almost totally independent of central power supplies.

The economics of the major product – Blood Transfusion Fluid – is as follows:

Empty bottle	Rs 1.75
Liquid (including distilled water and power)	Rs 1.25
Rubber plug, aluminium cap and hanger	Rs 1.00
Labour, breakages	Rs 0.50
TOTAL	Rs 4.50

The minimum selling price is Rs 5.50 per bottle[1], so the minimum profit per bottle is Rs 1.00. Sales are stable at approximately 6,000 bottles per month, so annual profits from just this one product come to Rs 72,000.

The firm's future looks sound. The missionary hospitals are regular customers and more orders are now coming in from HEC, Central Coalfields Ltd, and other large industries in the area for their clinics and hospitals. The firm has just signed a two-year contract to supply medicines (transfusion products and patent drugs) to Metallurgical and Engineering Consultants Ltd. There are many other potential markets with which it cannot cope at the moment because of restricted capacity but this situation will change after plans to expand have been implemented.

The entrepreneur's youngest brother is in his final year of a pharmaceutical degree at BIT and also plans to join the firm, probably after further training abroad. Of the fifteen students in his class, no more than two or three are interested in setting up their own businesses through the SIRTDO scheme. He feels that this is because the risk is still too great in the pharmaceutical field, given that trade-names are still so important. Although there is a huge market for drugs in Bihar (20% of all drugs taken in India every year are consumed in this State), there is still a tendency to think that any drug produced in Bihar cannot be of good quality. Bihar Drugs has been working hard at disproving this notion, and it is hoped that once it has a well-established name more BIT students will be encouraged to start up businesses in this line.

Mr Dey feels that the organization's help was much needed in getting the initial loan to start the business. Also, since he owns no property in the State to offer as security, he again needed the organization, as a guarantor, to secure the loan from the State Finance Corporation for his expansion plans. It also played a useful role in helping to build up a market for his products. Now the firm is fairly independent, although Mr Dey still sometimes consults the BIT staff about new products. Once the new SIRTDO pharmaceutical central facility is built, he will of course make use of this – especially the vitamin-testing facilities.

[1] This compares with Rs 7.50 to Rs 8.00 per bottle from Calcutta-based firms.

SUMMARY OF CASE

The most interesting point in this case study relates to the marketing of the product. The technology involved in formulation industries is not very complicated, but breaking into a market which is so concerned about brand names is not easily done. Success in this case must be attributed mainly to the entrepreneur's marketing skills and his ability to constantly provide good quality products. It must also be partly attributed to the faith which the market places in any product having the technical backing of BIT/BISR.

A sick unit

Background

Most of the SIRTDO units have had their ups and downs and many have been on the verge of total disaster before struggling through to better days. One unit which has really not been able to cope with the problems it has had to face is the Ranchi Rolling Mill. In the current terminology this is in fact classified as a 'sick' unit in as much as it has been closed for the past year. The history of this unit is reviewed since it is important to look at less successful ventures as well as more successful ones. It is also included in the hope that it can shed some light on the sick unit issue at a time when a high proportion of small-scale units in Bihar State can be thus classified. To be fair to SIRTDO, it needs to be stressed at the outset that one sick unit out of thirty-two is a remarkably good record by any standard. It also needs to be stressed that the staff are far from giving up hope of ever effecting a cure.

In the early 1970's there was a boom in the construction business in the Ranchi area caused by extensive building by the Ministry of Defence. After an approach by a former BIT student, the staff decided it would be feasible to sponsor a unit involved in the re-rolling of steel rods to meet demand in the construction

industry. Although such a unit would require heavy machinery, a great deal of electrical power and heavy raw material financing, the technology involved was relatively simple and it was thought that this would be a good basis for starting up production and acquiring and training a labour force. It was envisaged that the unit would eventually go on to produce special roll section.

Having decided to sponsor the unit, the difficulty arose of finding a suitable location for it. Three entrepreneurs had already been sponsored, but they were working either out of the BIT workshops or the main building. Because of the amount of space needed for a rolling mill, an alternative solution needed to be found for this unit. At this time, the organization had no money for building sheds, so the State Government was approached and asked to provide the finance. As we shall see, it was the delay in getting funding for the shed which started off a whole series of delays and complications which were to lead to the current closure of the unit.

Ranchi rolling mill

After graduating from BIT in civil engineering, Mr Jain, the owner of Ranchi Rolling Mill, travelled to the USA to pursue his interest in modern techniques of structural fabrication. His plans did not work out and after twelve months he returned to India and became a partner in his brother-in-law's steel and scrap-dealing business located 30 miles from Ranchi. It was while working there that he became aware of the plans which the Ministry of Defence had for starting new construction work in the area. He drew up a proposal for a small-scale unit which would produce the type of construction steel likely to be required, and a project application was submitted to the United Commercial Bank in February 1974.

In May 1974, the Bank approved a loan consisting of Rs 3 lakhs term loan; Rs 1.5 lakhs cash credit limit; and Rs 1.15 lakhs bill purchase limit. Three months later Mr Jain placed the order for the rolling mill.

As has already been mentioned, a major

Ranchi Rolling Mill: the main engine which drives the mill is on the left; the furnace is at the back

concern at this stage was finding a location for the unit and, having no funds of its own to build a shed, the organization approached the State Government for finance. Negotiations were still going on regarding this when Mr Jain's mill arrived in May 1975. By this time, over a year had elapsed since submission of the project proposal to the Bank and owing to inflationary rises in the prices of machines and raw materials since then, both Mr Jain and the scheme's staff felt the amount of the loan should be revised. In July 1975 an application was submitted to the Bank requesting an enhancement of limits to Rs 4.15 lakhs term loan; Rs 2.35 lakhs cash credit limit; and Rs 0.3 lakhs bill purchase limit.

By September 1975 the staff decided that the unit would really be in trouble if there was any further delay in securing a shed in which to install equipment and start production. They decided to hand over some resources so that construction of the shed and installation of equipment could begin. Production could still not commence, however, until the new limits had been sanctioned by the Bank so that extra funds were available to purchase all the necessary equipment.

The sanction was not received until July 1976 but almost immediately after this Mr Jain was informed that, on the basis of a telegram from the Bank's headquarters, the renewed limits were going to be kept in abeyance. At this point, BIT/BISR arranged for a meeting at the headquarters of the Bank in Patna. At this meeting it was decided that the entrepreneur should find from his own resources the extra Rs 1.15 lakhs needed for fixed capital so that he could start production. Once the unit had started production, the renewed limits would become operative.

BIT/BISR helped as far as possible by paying for extensions to the shed, part of the chimney for the furnace, and the security deposit for the H.T. connection. In April 1977, the electrical connections were made and in the following month a trial run was made. Production started in June 1977 (three years after the first sanctioning of the Bank loan) even though Mr Jain had been able to procure only Rs 0.8 lakhs out of the Rs 1.15 lakhs he needed to become fully equipped.

Problems with finance continued to plague the unit. Even though the Bank had agreed that the renewed limits would become operative once production commenced, it now became reluctant to commit the whole of the cash credit limit so as to enable quick rolling. This may have been because of an uncertainty as to the unit's ability to operate profitably at this time given the decision taken by both Central and State Government to halt construction work for a year and the consequent collapse in the price of construction steel.

Whatever the reason for the Bank's attitude, it caused the raw material dealers to lose trust in Mr Jain because of the difficulty he experienced in honouring payments. Despite these difficulties, Mr Jain managed to keep the mill running – largely through utilization of his own resources in the absence of any significant funding from the Bank.

In the following year, the market picked up when Government construction work recommenced. Unfortunately, the rolling mill was by this time in so many difficulties that responding to the increased demand was almost impossible. The Bank continued to release only small amounts of cash credit at a time and because of his worsening reputation with the raw material dealers, Mr Jain could not obtain credit for the necessary supplies to take on worthwhile orders. On top of these problems were those of heavy maintenance and power costs, the heavy burden of interest of both the term loan and the cash credit limit and a spate of breakdowns. Between July 1978 and March 1979, there were four major breakdowns in quick succession. Of particular concern was the fact that the burnt-out motor could not be totally rewound because of a lack of funds and this led to repeated failure. During this time, Mr Jain even withdrew the small amount of money in his child's savings account to keep the mill running.

In February 1979, the entrepreneur requested the bank to release the sanctioned cash credit limit so that he could pay an impending electricity bill of Rs 70,000. The Bank demanded an equitable mortgage in order to release the enhanced limits. This was readily provided in the form of a plot of land owned by Mr Jain's mother and valued at Rs 84,000. While this was being processed, the electricity lines were disconnected and it was almost three months before they were reconnected and production could again commence. By this time, the excellent market conditions had almost come to an end with the onset of the rainy season.

In August 1979, the electricity lines were again disconnected, but restored three weeks later as a special gesture on the part of the State Electricity Board after just a small payment on

account. By now very little finance was left, and in an attempt to get the unit going again Mr Jain borrowed Rs 50,000 from a financier on a short-term basis and deposited this in his credit account. Unfortunately this amount was of little use since the overdraft in his credit account had risen to Rs 37,000 due to interest accumulation and the Rs 50,000 was balanced against this.

There now seemed to be very little that could be done in the short term except run on a conversion basis (re-rolling scrap on a labour charge basis) so that at least salaries could be covered. Whenever such work could be found it was taken on, but unfortunately this caused increased suspicion on the part of the Bank because it became aware of the fact that the mill was working but that there were no transactions going through its books.

In February 1980, the electricity was again disconnected since by then a total bill of Rs 1.5 lakhs was owing. This of course meant that the mill was again forced to close down production just as the season of peak demand was beginning. The unit has remained closed since this time.

SIRTDO has spent a great deal more time on the steel construction unit than on others, and mainly on financial problems rather than on technical or marketing problems. The staff have done everything they could to help Mr Jain, including writing letters to the Bank's headquarters to state their belief in the viability of the unit; attending meetings with Mr Jain at the Bank's headquarters in Patna; helping him to work out estimates of profitability; persuading the electricity board to accept small payments on account; and looking for financiers who might back the unit during peak demand periods. Unlike other units, SIRTDO has also helped out financially on a loan basis to try to help Mr Jain to get started properly.

Assistance has of course continued since the last closure of the unit and, due to the staff's efforts, the Bank has at least been persuaded to 'freeze' the loan so that the interest stops mounting up while the matter is being further considered.

SUMMARY OF CASE

Here we have a classic example of a firm running into difficulties through under-financing. There have been few technological problems and the market for construction steel has been adequate and frequently excellent. Many orders have been turned down mainly because of the inability to purchase sufficient raw materials. Thus, the BIT/BISR staff feel that despite the inherent pitfalls in this type of industry – including high requirements for finance, raw materials, and power, and a large amount of competition – the firm could have been working successfully by now if adequate amounts of working capital had been released at the appropriate time.

A convalescent unit

Background

This last case study tells a story which is both remarkable and encouraging. Of all the case histories, it is the one which probably best captures the essence of the SIRTDO approach, for it shows how, with appropriate backing, an enterprising and determined entrepreneur can overcome difficult circumstances which would have completely eliminated any other small business.

The organization has sponsored two mica-based industries – one to produce organic micanite and the other to produce inorganic micanite. The case study is about the latter unit, which is now through the worst of its troubles, although by no means completely healthy as yet. Hence the reference to it being a 'convalescent' industry.

Interest in mica-based industries started in 1976 when Indian Railways mounted an exhibition in Ranchi with the aim of identifying local entrepreneurs who could help in solving various production problems. One of the problems which was brought to BIT's attention was that of local production of organic micanite to substitute for imports. The staff felt this would form the basis of a small-scale unit and gave the idea to a production engineer currently undergoing the Entrepreneurial Development Programme. Initially, he studied the technology at the theoretical level and decided it could be simplified and made more labour-intensive and that, provided good quality resins could be obtained, good quality micanite could be produced. SIRTDO then arranged for the entrepreneur to work in a large-scale unit producing micanite so that he could study the problem at a practical level. The two months he spent there was paid for by SIRTDO as part of the extension to the entrepreneurial training. It became clear during this time that if quality was to be achieved using manual techniques so that production could be carried out on a small-scale basis, the labour would have to be skillful and very well trained. Having identified two or three highly-

skilled workers, the firm of Micage was registered and production commenced in 1978.

There have been a few ups and downs for this firm in the past two years, but it is now doing fairly well. As we shall see, the problems faced by the other mica-based industry - Inbomi - were far from easy to overcome.

Inbomi

Mr Raza, the owner of Inbomi, graduated from BIT in mechanical engineering in 1976, registered for the entrepreneurial development programme and started looking for a suitable product on which to base a small business. His father, a specialist in glass technology, suggested he should look into the possibility of producing inorganic bonded micanite and allied products which could use the same facilities. This was discussed with BIT/BISR and he was encouraged to study the idea further.

At the railway exhibition mentioned earlier, he identified several mica-based and fibre-glass components which were listed as being needed and which he was interested in trying to produce. The next stage was to find the technology appropriate to producing these on a small scale. The National Research and Development Corporation in New Delhi was consulted; so were consultants in Calcutta. Two of the professors at BIT were also able to help. Eventually, a sample of a commutator separator (used in electric motors and generators) was developed in the BIT laboratories and sent to the Chittrangan Locomotive Works (CLW) in West Bengal for approval.

In the meantime a project proposal was drawn up and submitted to the Bank. A loan consisting of Rs 1.82 lakhs term loan, Rs 1 lakh cash credit limit; and Rs 0.20 lakh bill purchase limit was sanctioned and selection of machinery commenced. The government also gave Rs 15,000 'seed' money. After some delays, a shed was obtained on the Tupudana industrial estate at Hatia. After further delays, necessary infrastructure such as electricity, water and telephone lines were supplied and a start could be made on installing machinery. Eventually production was ready to begin in October 1978.

Difficulties now arose in getting orders. On the basis of the sample which had been sent by the firm, CLW gave a verbal assurance that large orders would be placed for the product if quality could be slightly improved. To achieve this, it seemed it would be necessary to import an expensive (Rs 6 lakhs) precision sanding and levelling machine from the U.K., but the Bank would not sanction a special loan and it was impossible to acquire an import licence until orders were given in writing. CLW and the other companies approached would not give written orders until samples of improved quality had been supplied. SIRTDO called in an outside consultant to advise on alternative solutions for imported machines for improving quality, but there seemed to be no immediate answer. The machine could be made locally, but such firms would not consider going to the trouble and expense of making a one-off machine.

The same difficulties were experienced with a glass epoxy laminate which was also being used as an alternative to imported electric motor and generator parts. The Inbomi product was found to be of unacceptable quality, but it was suggested that orders would be placed if a special resin made by Du Pont and other large international firms could be imported. The same difficulties arose in securing finance and an import licence without a confirmed order.

The firm was now in the difficult position of having fixed commitments with respect to payment of interest on the loans, payment of rent for a shed, payment of electricity bills, wages, etc. There was however no turnover to cover these costs. Fortunately the situation, although difficult, was not as problematic as it might have been. The Bank agreed to allow postponement of interest payments until production could commence. Mr Raza was even allowed to draw up to Rs 500 per month from his cash credit limit during this time to pay for two employees to guard the factory and machinery. Similarly, the Department of Industry agreed to wait for payment of rent on the shed until production started. Finally, although Mr Raza had signed a two years minimum guarantee for electricity supply (amounting to about Rs 1,000 per month for 30 kW), the State Electricity Board took no action other than cutting off supplies when payments could not be made.

Although Mr Raza continued to participate in tenders and did everything possible to find work, he could secure no definite orders for his micanite and fibre-glass products.

In mid-1979, some engineers from the TATA Electric and Locomotives Company (TELCO) visited SIRTDO to see whether there were any entrepreneurs who could undertake production of truck components for the company on an ancillary basis. The staff explained that Inbomi had a heavy press which could possibly be used

to produce such components. Having inspected both the Inbomi factory and the SIRTDO workshop facility, the TELCO engineers said that they could offer work in sheet metal items if Inbomi was able to produce items of satisfactory quality. The proposed order was for 2,500 coupling mounts and 2,500 air cylinder brackets. The main problems were acquiring good quality dies and adapting the existing heavy press to cope with this work.

If Mr Raza had gone to Calcutta to have the dies made, it would have cost him almost Rs 30,000, to be paid there and then. This represented a large financial burden at this time, but as he thought at first that it would be the only way to revive his unit, Mr Raza persuaded the Bank to sanction a special loan of Rs 25,000 for the making of the dies in Calcutta. The approval of this loan was helped by the promised order from TELCO and a written assessment from SIRTDO saying that this was in its opinion a technically and economically feasible venture. As it happened, the dies were eventually made on the milling machine in the central facility workshop. This took the entrepreneur six months, during which time his factory was closed, but the cost was only Rs 10,000, which SIRTDO agreed he could pay later when his business picked up. This meant that the Rs 25,000 sanctioned by the Bank could be used for other essential work, such as adapting the heavy press for metal sheet work. During this time, he received a great deal of help and advice from SIRTDO staff and also from the TELCO engineers.

Work on the dies was completed, samples of the automotive components were found to be satisfactory, and production began in March 1980. Production of these and other components for TELCO has now started bringing in a regular turnover of Rs 15,000 per month. TELCO is so satisfied with the firm's work that it has offered to give an interest-free loan so that new machines can be bought and the range and quantity of items produced can be increased. Raw materials are not a problem since TELCO supplies the required amount of steel needed for each order. It also has supplied dies made in its own workshops for many of the items ordered from the firm.

At this stage, it is worth mentioning the special involvement of TELCO. The headquarters of TELCO are at Jamshedpur and until 1971 its ancillary development scheme was concentrated in West Bengal. After industrial disruptions in the area, TELCO decided to diversify and look for ancillary firms in other parts of the country. It now has 2,600 ancillary units and a minimum of three firms producing each component so that production is ensured. The company is very keen on encouraging techno-entrepreneurs such as Mr Raza because it feels that they are likely to be more quality-conscious than the normal commercial entrepreneur who is more interested in turnover. This is why they offer help in the form of the free services of their engineers to advise on die making. Apart from provision of raw materials and offers of interest – free loans, they also take a lenient attitude towards maintaining production schedules when the cause of the delay is beyond the entrepreneur's control. This was helpful in Mr Raza's case when there were very bad power cuts in July and August which caused him to fall behind in his schedule. The main thing in which the company is interested is quality, and Mr Raza ensures this by using good dies and maintaining the standard of workmanship.

Thanks to this regular work, Mr Raza has now almost paid off his electricity dues. He is starting to pay arrears on the rent of his shed, and he will shortly be in a position to start paying off the interest on his loan. He is now employing nine people: one die-maker at Rs 400 per month; one supervisor at Rs 250 per month; six semi-skilled workers at Rs 150 per month (he hopes to raise this in the near future); and one representative at Jamshedpur to liaise with TELCO. This representative receives Rs 250 per month from Mr Raza but also works for one other person. The supervisor lives behind the factory in accommodation provided by Mr Raza. The die-maker is a valuable asset while he remains (such skilled people are normally paid three or four times as much). Two new dies are currently being made in the SIRTDO workshop and will be used in four or five months time.

Mr Raza now wants his own die tool room so that he can make and correct dies on the spot. At the moment, if anything is wrong with one of the dies, he has to carry it all the way to SIRTDO – 40 km – and all the way back again. He is starting to equip his tool room by selling the scrap metal he accumulates after cold forging the truck components from the sheet metal supplied by TELCO. If Mr Raza's factory had been located on the 'nursery' estate rather than at Tupudana, he may have felt less urgency about developing his own capacity in this respect. The

location of his factory has other implications. An advantage is that the sheds at Tupudana are permanent, whereas those on the 'nursery' estate can only be rented on a temporary basis. A disadvantage is that it is difficult to get accommodation nearby.

Mr Raza ultimately intends to return to production of his original line. He still has the equipment he needs and he has space to expand. Having earned enough money from sheet-metal working, he hopes to be able to buy the expensive machine which held up his micanite production two years ago. He is already getting orders in the fibre-glass line. He recently got an order worth Rs 70,000 for fibre-glass rods from HEC. Also, when TELCO switches from sheet-metal to fibre-glass components, which he believes is only a matter of time, he is on their priority list of suppliers. At the moment, most of the operations in fibre-glass production are done manually; but if production picks up Mr Raza hopes to be able to buy automatic equipment (e.g. vacuum impregnation plant) to improve quality.

SIRTDO's help has been invaluable to Mr Raza in several ways. First, he needed the organization's backing to get his loan and the additional special loan for modifying his machinery to produce truck components. Second, it was through the scheme that he was able to make the contact with TELCO, which was what gave him his second lease of life; also TELCO only offered an order after inspecting and being satisfied with the central facility workshop. Third, had it not been for the help of the organization's engineers and the subsidised use of the workshop for six months (plus allowing delayed payment), the changeover from mica-bonded products to truck components would have been far more difficult. Fourth, Mr Raza and the other entrepreneurs on the Tupudana Estate needed SIRTDO's weight behind them to get the minimum infrastructure installed for their factories. Finally, Mr Raza needed the constant support and encouragement he was given during a very difficult period.

SUMMARY OF CASE

Of interest in this case is the fact that a monopoly product was identified which could form the basis of a highly successful firm, but that companies would not place written orders until quality was improved and the machine needed to improve quality could not be obtained until orders were placed in writing. This sort of situation must arise in the case of a large number of small industries, causing the demise of more than a few.

Had it not been for the determination of the entrepreneur to pull through and the interest of the BIT/BISR staff in seeing that he did so, the firm would have folded up under such adverse circumstances. The way in which the entrepreneur converted his equipment to produce truck components instead of micanite products took both skill and courage. It is doubtful whether such a scheme could ever be contemplated or achieved by an entrepreneur who had less technical and financial backing and less moral support.

The case study is also interesting from the point of view of illustrating the working relationship between a large company and one of its ancillary small-scale units. Other companies may differ from TELCO, but in this case the arrangement appears to be highly beneficial to both parties and suggests that ancillary arrangements should be encouraged where possible. The ancillary unit (unlike most small-scale industries) has no worries about raw materials, gets interest-free loans to expand production facilities and is assured of a regular income. In return, the parent company is assured a supply of high quality components at a lower cost than would be possible if they were made by the company itself.

5 EVALUATION OF THE SMALL-SCALE INDUSTRY SCHEME

General overview

There can be no denying that the approach adopted in the Ranchi scheme seems to be working well. Engineering graduates who normally tend to prefer the status and security of a permanent job in government or big industry have been persuaded instead to take to the risky business of starting their own small industries. In addition, the industries they have started (with only one or two exceptions) have managed to thrive at a time when many small units in the area are going through severe difficulties in the face of adverse economic conditions. Also, the model has already been accepted by the Bihar Government, the Uttar Pradesh Government and the United Commercial Bank as one which is worth trying to replicate elsewhere. Thus, the three important areas - entrepreneurial development, development and promotion of profitable small firms through an integrated approach, and development of a model which can be and is being replicated elsewhere - have all been successfully tackled. Each of these areas is looked at in turn.

Entrepreneurial development

Motivating technical students and graduates to set up their own businesses has not been easy. As was seen, for the first two or three years, only four entrepreneurs were involved in the scheme. However, once it was seen by others that they were doing reasonably well, the process of motivation became less difficult. More students than can be presently handled through the scheme are now requesting sponsorship and many ex-students, who have been in paid employment for several years, are now interested in returning to Ranchi to start a small industry or to join one of their ex-classmates who has already established a unit.[1]

The scheme's success in respect of entrepreneurial development cannot be measured only in terms of the number of students and graduates expressing an interest in starting a business. Experience in Bihar and elsewhere has shown that many of the people who show interest - even to the extent of applying for and attending conventional entrepreneurial development courses - are not really serious. In India as a whole, it is believed that no more than about 2 - 3% of people attending such courses actually go on to start a successful business. By comparison, of the 75 people who have participated in the three entrepreneurial development courses run by SIRTDO, 47 have gone on to start small business and all but one or two are doing well. In addition, SIRTDO has successfully identified and promoted several entrepreneurs who did not attend the formal courses.

The staff attribute their success in this respect to four factors. First, since the entire four-year teaching course at BIT has an industrially-related slant, final year students are already well-steeped in the virtues of the practical application of their research. Spending their final year on an actual industrial project further increases their interest.

Some of the most successful businesses, including Transgietz, have been based on a project which the entrepreneurs were working on while they were students.

Second, although all potential entrepreneurs are BIT graduates and are thus well known to the SIRTDO staff, a very strict screening process is still applied to applicants for training and eventual sponsorship through the scheme. Third, as was seen earlier, the entrepreneurial training courses run by SIRTDO tend to be more practical and more relevant to small industry than those run elsewhere. This vocation-oriented approach intensifies the students' interest in small industry development.[2]

[1] Most of the entrepreneurs said that ex-classmates had been in touch with them regarding information on starting a business. Problems in paid employment included low wages, lack of responsibility and lack of job satisfaction. Some (eg. Transgietz) have already been joined by ex-classmates. Many of the current entrepreneurs, including those owning Mercurium, Meditron and Ranchi Rolling Mill, left previous paid employment to start their own businesses.

[2] Only three of the nine entrepreneurs covered by the case studies attended a formal entrepreneurial development course and there seems to be little difference between their performance and that of the others. It should be noted, however, that those who did not attend a course started their business in the

Finally, the entrepreneurial training period extends right through the 'nursing' period of the scheme, when the entrepreneurs build up their confidence to make decisions and take risks. In other words, they build up the essential qualities of entrepreneurship while they have the security of SIRTDO backing behind them. This is an important feature of a scheme which deals with people who do not come from an entrepreneurial background. Under this cover, firms such as PIF have risked taking on very large orders; firms such as Meditron have risked going into very complicated and sophisticated products; and firms such as Inbomi have risked investing money in adapting equipment to try to save the unit from closure.

As was seen earlier, the objective was not just to identify and train entrepreneurs, but to promote a new class of techno-entrepreneurs who are concerned with more than earning maximum profits. To what extent has this been achieved? The entrepreneurs are, of course, interested in profit and most units, after initial setbacks, are providing their owners with adequate returns. However, the SIRTDO entrepreneurs are undeniably different from normal commercial entrepreneurs!

Technology and engineering skill are talked about far more than turnover and profit. Most of the entrepreneurs speak with a sense of achievement and satisfaction about the way in which technological adaptation or development has helped to establish small-scale units which can compete with large firms in terms of quality and price. They are particularly proud of the high standard of goods they produce and place their reputation for this above the possibility of increasing short-term profits through reducing standards.

This attitude towards profits vis-a-vis other considerations is carried through to labour relations within the units. Most employees are paid more than the minimum wage; many are given thorough training so that they can work with semi-automatic or manual machines; consideration is extended in terms of working hours and working conditions. Most employees are well pleased with their jobs.

Further, most of the entrepreneurs are not concerned with producing just anything to earn money; they are genuinely interested in their product's value in terms of saving import payments (Transgietz, Precision Foundry); or reducing the price of basic goods to consumers (Bihar Drugs).

Finally, unlike many commercial entrepreneurs, the SIRTDO entrepreneurs believe in acquiring markets through quality and skill rather than by eliminating competitors.[1] The philosophy is one of supporting the small-scale sector. They never take markets away from each other and where possible they try to help each other and other units in the district through sub-contracting arrangements.

It is still too early to see whether the staff's objective of creating a class of self-reliant entrepreneurs has been fulfilled. To date, only three entrepreneurs have actually left the 'nursery' estate and moved off on their own. Of the remainder, most have been under SIRTDO's wing now for more than the three years estimated to be sufficient time to rear a self-reliant entrepreneur. On the whole, the entrepreneurs do seem to be reluctant to leave the 'nursery' estate, although most are now making important decisions without undue reliance on the SIRTDO staff. For example, PIF took on the large turnkey job for Coal India Ltd without consulting the SIRTDO staff. Similarly, Transgietz decided to start up new units in other States, take on additional partners and diversify into new areas, and Bihar Drugs decided to expand within Bihar and in West Bengal without seeking the SIRTDO's staff's advice and guidance.

It is interesting to note that most of the entrepreneurs never mention the role which SIRTDO has played in the development of their firm. When telling their story in their own words, they inevitably refer to the way in which they solved a technological problem or acquired a new market. Only on the second telling, when the entrepreneurs were specifically asked to think about the way in which SIRTDO had helped, did it become apparent that the staff had in fact helped out in almost every stage of the development of the units. This feeling among entre-

early years of the scheme when there were fewer units being sponsored and the staff had more time for each unit. As the size of the scheme grows, the formal course will become more important.

[1] As was seen in the case of Perfect Forgings, the normal practice of small commercial entrepreneurs is to acquire markets by undercutting competitors, thus harming everyone's chances and weakening the sector as a whole.

TABLE I
Selected Characteristics of SIRTDO-sponsored Industries

	Fixed Capital* [Rs lakhs]	% loan repaid	Working Capital [Rs lakhs]	Cost per Workplace [Rs lakhs]	Power Requirements	No. Employees
PIF	0.43	100%	2.200	2,867	15.00kw	15
Precision Foundry	1.46	30%	0.325	6,667	3.75kw	18
Mercurium	2.60	40%	1.320	14,445	60.00kw	18
Perfect Forgings	3.60	0%	2.900	11,560	40.00kw	32
Meditron	0.55	42%	0.950	5,000	2.25kw	11
Transgeitz	1.82	35%	2.300	13,000	30.00kw	14
Bihar Drugs Ranchi	0.40	100%	0.700	4,445	9.75kw	9
Rolling Mill	3.80	0%	1.500	11,850	60.00kw	35
Inbomi	2.22	0%	1.000	21,888	30.00kw	9
AVERAGE	1.65		1.440	10,484		15.66

* None of the entrepreneurs have yet needed a term loan to purchase a building and/or land. Fixed investment excludes these items.

preneurs, of accomplishment without undue assistance, is one which greatly pleases the staff.

Development and promotion of small firms

As can be seen from Table I, the amount invested in each SIRTDO-sponsored unit is well below the defined official limit of Rs 20 lakhs pertaining to small industries. Other characteristics of the units also qualify them to be included in the small-scale sector. The cost of creating a workplace varies between Rs 3,000 and Rs 22,000 – the approximate average being the Rs 10,000 which is normally given as typical of the small-scale sector in India as a whole. This compares with estimates of costs per workplace of Rs 50,000 in heavy electrical firms; Rs 100,000 per workplace in heavy machine building plants; and Rs 160,000 in the steel industry.[1] Requirements for power are also mainly well within the 75 kW limit up to which incentives/subsidies are available through the Government's small-scale industry incentive programme.

In most of the industries, investment costs, cost per workplace and power requirements are much less than would be expected for the type of product being manufactured. This is due to a variety of factors – although all of these basically relate to design or adaptation of the technology so as to save on capital and power costs.

For example, PIF does away with the need for expensive lifting devices by making use of large numbers of casual labourers who are easily available in the area. The owners of PIF, Mercurium and Perfect Forgings use more skilled labour and put in more time in terms of training, management and supervision, so that they can utilize lower cost machine from Punjab as opposed to high-cost machines from well-known local firms or from abroad. Savings are particularly large in Mercurium's case due to extensive design work which allowed the previously automatic process to be broken down into individual operations and substituted manpower for machinery where possible. Precision Foundry uses mainly manual techniques, and at times of severe power cuts, a coal furnace can be used – thus making the entire factory almost independent of a central power source.

In some cases, capital costs are also kept low by using production facilities in the central workshop – avoiding the need to purchase costly machines which would be unused for much of the time. This was seen to be particularly true of PIF. Similarly, the electronics firms, such as Meditron, can utilize the central photoprocessing facility when they need high quality printed circuit boards.

One of the major arguments put forward against small-scale firms is that their cost per

[1] Panditrao, Y.A., *Financing Cottage and Village Industries*, Commerce Pamphlet page 7 (see Bibliography).

unit and their sales price is often higher than in larger firms. This is based on the principle that mass production will result in economies of scale to the ultimate benefit of producer and consumer alike. Prices quoted by SIRTDO-sponsored firms, however, tend to be very competitive. For example, Star Engineering and PIF were able to retail a reciprocating coal feeder for only Rs 17,500 as opposed to a minimum of Rs 39,000 for the imported variety. Much of this, of course was due to differences relating to import tax, freight charges and labour costs.

However, PIF and several of the other entrepreneurs have also been able to quote prices which are considerably lower than those quoted by large-scale industries located in India. The most notable price differential is that between PIF's chain creeper at Rs 2.9 lakhs, and the Rs 13 lakhs quoted by Voltas, the nearest competitor. Other firms have lesser, but still significant, price advantages. For example, Mercurium sells bolts at 25% less than the nearest large competitor. Meditron has just produced a control panel for a planomiller for Rs 30,490, as opposed to Rs 36,950 quoted by the nearest large competitor. Perfect Forgings sells steel balls at Rs 6,000 per tonne, whereas the main producer in the State was selling at Rs 7,000 per tonne even three years ago when raw material prices were much lower. Bihar Drugs has prices down to 30% less than those of big firms located in the main cities.

What helps the SIRTDO entrepreneurs to offer such competitive prices? Part of the answer, of course, lies in their low fixed costs per unit. As has already been mentioned, equipment costs are kept low. Infrastructural and managerial costs are also low - the owner carries out many of the tasks which would be assigned to special managers in larger firms. In addition, although there is very little difference between real wage rates in the main cities and those in the Ranchi area, money wages are considerably lower in the latter. This gives the SIRTDO entrepreneurs an advantage over their large-scale competitors - many of whom are located in main cities.

The SIRTDO entrepreneurs do benefit from substantial subsidies in the form of assistance with R and D, free technical advice, use of BIT's testing facilities at a nominal charge and free or subsidised use of central workshop facilities. These are the sort of subsidies which are supposedly available to every small entrepreneur as part of the Government's programme to help them compete on equal terms with larger firms. The facilities provided by SIRTDO are easier to make use of than those available elsewhere in the State and so the SIRTDO-sponsored entrepreneurs are better able to translate these facilities into lower production costs.

Since all the SIRTDO entrepreneurs are registered with the Ranchi District Industry Centre, they are also entitled (along with all other registered entrepreneurs) to claim any incentives and subsidies available through this channel. The only subsidy which they have taken advantage of to any great extent is the electricity subsidy of 9 paise on 45 paise per unit. Other subsidy schemes are either not applicable in the Ranchi district or are bureaucratically difficult to obtain.

Even allowing for the role that technological developments and direct and indirect subsidies have played in keeping costs low, it may be supposed that costs have been cut at the expense of quality. This has almost universally not been the case. As was seen, products are of a high enough standard in some of the firms (eg. Mercurium and Perfect Forgings) to obtain certificates from ISI and Lloyds. This is practically unheard of in the small-scale sector. Consistently high quality has been the basis for firms such as Bihar Drugs gaining a foothold in difficult markets where brand names predominate, while high quality has enabled firms such as Inbomi to secure contracts with quality-conscious firms such as TELCO. Meditron and some of the other electronic firms are able to supply goods of a higher standard than normal small-scale industries in this field and thus capture any market in which large-scale producers are not interested.

In general, SIRTDO-sponsored entrepreneurs have a reputation in the State for producing high-quality goods. This is a result both of the staff encouraging the entrepreneurs to be quality-conscious, and helping them to be so through assistance with design of machines and dies and the provision of testing facilities. It is appropriate to mention that the entrepreneurs also encourage each other to maintain quality since if one entrepreneur does inferior work it reflects on all the others.

With low prices and high quality, are the SIRTDO firms profitable? This is something which it is less easy to be specific about. It is probably safest to say that most of the firms made very little profit (or even made a loss) in the first one or two years of operation - mainly due to difficulties in establishing the right

product and/or in acquiring markets. For example, changes in policy of Coal India Ltd caused initial difficulties for PIF; Mercurium had practically no turnover until Government contracts were secured; Precision Foundry struggled along with normal fabrication work until the contract with the Export Corporation was secured; Transgietz had to survive from consultancy fees until field trials on their dry transformer were satisfactorily carried out and orders were placed; Inbomi was in deep trouble while trying to develop micanite products and has only begun to recover after switching to truck components and acquiring regular orders from TELCO.

Having established a market, however, turnover and profits have generally increased very quickly. In most cases, profits could have been increased further in the short term by raising prices and/or lowering quality. To a large extent, however, markets have been built up through offering good quality products at competitive prices. To alter this so as to try to make short-term gains, would probably lead to loss of hard-won markets in the long term. As was seen, it took a lot of time and sometimes a lot of money (directly or indirectly) to overcome customers' caution about buying from a small firm. For example, Meditron had to spend a lot of time and money in convincing HEC that large control panels could be satisfactorily produced by the firm - even though HEC thought highly of the work done on smaller orders. Bihar Drugs had to invest a lot in giving free samples and selling to those hospitals which would help the products' reputation - even if this meant selling at a loss.

The firms could, however, be more profitable if solutions could be found to a variety of problems (mostly of an institutional nature peculiar to India, but not unknown elsewhere) which affect their ability to work at full capacity. A major factor affecting the rate of production is the number of power cuts. As was seen, this resulted at times in Perfect Forgings' output dropping from 35 tonnes to 15 tonnes per month; Transgietz was able only to produce Rs 5 lakhs out of the Rs 7 lakhs of orders secured in 1979 - 1980; Bihar Drugs cannot work at full capacity without power for its water distillation unit; and Precision Foundry can only operate at about 60% capacity when there is no power to run the fan for the oil-fired furnace.

Another important factor contributing to the under-utilization of capacity is the problem of acquiring adequate quantities of raw materials - either because stocks are not available at all, or because stocks are not available at the government-controlled price. The problem is often compounded by the fact that cash credit limits are no longer sufficient to allow for the purchase of enough raw materials for a good production run. This was seen to be a particular problem with the metal-processing and electro-mechanical industries.

Other problems which have contributed to under-utilization of capacity are: difficulty in finding technically-qualified supervisory staff (eg. Meditron), and a lack of working capital due to late payment by customers for completed orders (eg. Mercurium).

Despite these problems, most of the firms are now making an adequate profit. One way of assessing this is the extent to which loans are being paid off. The Manager of the branch of the bank concerned with the scheme estimates that only about 20% of SIRTDO entrepreneurs are falling behind on repayment schedules, as opposed to between 40% and 50% of small entrepreneurs in Bihar as a whole. As shown in Table I, PIF and Bihar Drugs, being the first units to start, have already paid off their term loan. Of the rest, most have paid back 30 - 50% of their term loans and are still well within the agreed repayment period.[1]

The staff of the small industries section at the Bank's headquarters in Calcutta are so satisfied with the performance of the SIRTDO units that they are now actively encouraging other technical institutes to adopt the same sort of scheme so that the Bank's job of lending to the small industry sector is made easier and more effective. Following a visit to BIT to study the model, the staff of IIT Madras are about to start a similar scheme for developing and promoting small-scale units with financial backing from the United Commercial Bank on the same terms as agreed with BIT. Several technical institutes in West Bengal are also in the process of setting up similar schemes based on the model worked out between BIT and the Bank. It will be interesting to see if these schemes meet with the same degree of success as the one in Ranchi.

Replicability

An obvious question to be asked about the

[1] Ranchi Rolling Mill and Inbomi have not yet paid anything off their loan for reasons which have bee discussed.

Ranchi scheme is whether it can be replicated elsewhere. To help in providing an answer and in identifying which circumstances are of particular importance, it is useful to examine other related centres in India.

Bihar government technical college small industry schemes

As was mentioned earlier, the Bihar Government has directed that the government-controlled technical colleges located at Patna, Sindri, Bhagalpur, Muzaffarpur and Jamshedpur should start small industry schemes similar to the one developed by BIT/BISR at Ranchi. Of the five colleges concerned, only Patna could be visited and this is used as the basis for comparison.[1]

Towards the end of 1977, the technical college at Patna received the first instalment of the Rs 50 lakhs which had been promised by the State Government for the purpose of starting a small industry development programme. This has been used to build a large workshop and administrative offices in the college grounds and work has started on four 'nursery' sheds. College teaching staff and technicians will be expected to work on the scheme over and above their normal college duties, but there is no provision for permanent staff to work with the entrepreneurs.

The only fully-fledged entrepreneur is an ex-student who left a well-paid job to start his own business producing tractor parts. At the moment, he produces away from the campus and the only input from the scheme in this case was technology development. The entrepreneur secured his own loan, found his own building and his own markets. Two potential entrepreneurs are occupying space in the college workshops and are involved mainly with electrical products.

[1] Patna is in any case one of the furthest advanced in developing small industry activities, although none are very far advanced. In Sindri two sheds have been built, but are not yet occupied. The two entrepreneurs for whom they are intended are working in the college laboratories. Sindri has one of the best high voltage test laboratories in the country and it is hoped that units which can make use of this facility will be promoted here. In Bhagalpur, there are two entrepreneurs working on small household electrical appliances but as yet there are no sheds and no workshop. Nothing has happened yet at Muzaffarpur or Jamshedpur, although in the latter case it is believed a workshop is now under construction.

The college staff involved in the scheme feel there are three major factors holding up progress. First is the problem of creating an interest among the students in the idea of starting their own business. To tackle this, the staff have decided to try two measures. One is to give industry-related projects to final year students; the other is to encourage those giving seminars on industrialization in Patna to hold them in the college so that the students can be exposed to these.

The second problem is that of lack of funds. Only a small proportion of the total funds promised by the State Government has actually been released, even though the planned five-year period is now almost over.

The third problem was said to be the lack of heavy industry in the immediate vicinity which can provide a good market for the products of small firms. This is regarded as an advantage which the Ranchi centre has over them. It is true that the small firms sponsored by the Ranchi centre do relate closely to neighbouring heavy industry, but this is because it seemed to be the most appropriate strategy in that particular area. It would be more fruitful to think in terms of developing a strategy for the Patna area, rather than trying to follow closely the Ranchi pattern, which was designed for different circumstances.

Despite these problems, at least a start has been made, and it is encouraging to note that the staff sound genuinely enthusiastic about the scheme. It is too early in the day to tell how successful they will be in identifying and sponsoring small-scale techno-entrepreneurs, but there are some obvious points which can be made which throw light on possible developments.

First, in the Patna case (and possibly the others) the idea of promoting techno-entrepreneurs came from the outside – the Government – and, however enthusiastic the staff sound about responding to the directive, it can probably never be the same as carrying out a programme which has evolved from within. In particular, it will be interesting to see if the college teaching staff are willing to divert as much of their 'research' time away from conventional research activities as is the case at BIT. Second, while Patna and the other colleges have the input of government promotional funds, they do not have the input of permanent staff to work full-time on the small industry scheme. In Ranchi's case, this is the input provided by BISR. It will be interesting to see how much can

be achieved without provision for permanent, technically qualified staff to work with the entrepreneurs. Third, whereas Patna and the other colleges are government-controlled and offer conventional academic courses, BIT is autonomous and better able to gear the entire teaching syllabus towards the practical application of engineering in industry and business. This difference is carried through in respect of the actual training of potential entrepreneurs. Patna and the other colleges rely on their students receiving training through SISI-run Entrepreneurial Development Programmes (EDP) which are almost totally theoretical in nature. As was seen earlier, BIT runs its own EDP courses (through SIRTDO), which are much more practical in nature (see page 21).

Not a great deal has been accomplished as yet in terms of development and promotion of small industries; but it should be remembered that, even at the Ranchi centre, it took quite a long time to build up the scheme. However, the differences which exist between Patna and Ranchi should be given careful consideration and appropriate action taken by the managing committee and/or the State Government if success is to be assured. Perhaps the most significant difference which could be acted upon is the absence of any permanent staff at Patna working full-time on small industry activities.

BISR small industry schemes

While the technical colleges in Bihar State have two of the elements of the Ranchi scheme: the technical college and the government promotional funds; the other BISR centres have only one element: the scientific research institute. How well can such an institute perform without the close integration with a technical college and the State Government? Of the three centres concerned, the one located in Jaipur, the State Capital of Rajasthan, offers the best basis for comparison.[1]

The Jaipur Centre was started by Dr N.G. Nair, the present director, who left the BIT teaching staff and joined BISR in 1972 for this purpose. Jaipur was chosen as a possible centre because of the interest expressed by the State Government in having BISR assistance to build up small-scale electronic industries. The State Government eventually decided to do this instead through its own efforts by setting up electronic development and test centres rather than by giving its full support to BISR. However, BISR proceeded with plans for its own centre.

While negotiations were going on with the government regarding basic necessities such as land and infrastructure, Dr Nair converted part of his own residence into a makeshift laboratory and set about identifying areas of research and potential entrepreneurs.[2] Eventually, a ten-acre plot in a somewhat remote area of land intended for future industrial development was allocated to BISR. No building or infrastructural development had begun on this land and, rather than delay any further, BISR decided to invest its own funds in sinking a tubewell so that work could commence. Even so, it was not until 1976 that the building had been completed and equipped and worthwhile work could begin.

In addition to Dr Nair, the Centre now has six scientists, four technicians, and several support staff. All are permanent employees of BISR. There are several laboratories, a workshop, a small library, a seminar room, and space for 'nursing' two or three entrepreneurs to the stage where commercial production becomes feasible. To date, twenty entrepreneurs have been sponsored - mainly in the electronic fields. Of these, one is still in the main building; five are in their own factories on land under lease to BISR; one is renting a government shed just over the road

[1] The other two centres are located in Uttar Pradesh. The one in Allahabad has developed several precision components to be used by Indian Telephone Industries, GEC, and others. A number of mechanical items developed by the centre are being used as exportable power-plant accessories. Research on hand-made paper technology has been started recently. It is of interest that the Government of Uttar Pradesh has extended its support for the establishment of a small-scale industrial estate under this centre, following a visit of UP Government officials to investigate the Ranchi Centre. The centre in Bhimtal is still in its development stages but has been established mainly to help the industrial development of the backward hilly areas of the state. Its research facilities and thus the industries which it will be helping to develop will be mainly in the areas of electronics, special paper and medicinal plants. The possibilities of small-scale power generation using the region's perennial rivulets will also be an area for exploration.

[2] The first entrepreneur to be identified actually started doing investigatory work in this makeshift laboratory.

from the main building; and three are working in their own or rented premises in Jaipur. The remainder have started factories elsewhere in Rajasthan or outside the State. As far as could be seen during a short visit, all but one or two of the units are working successfully.

The objectives of the Jaipur centre are more or less the same as the Ranchi centre since BISR established both with the idea of assisting young engineering graduates to start their own industries. However, the method of work is sufficiently different to warrant some description.

Since the Jaipur centre is not integrated with a technical institute, the potential entrepreneurs cannot be identified from 'in-house' as happens in Ranchi. Given the tradition of commerce in Rajasthan, this seems to present very few difficulties, and there are too many potential entrepreneurs seeking sponsorship rather than too few. However, as with the Ranchi scheme, a thorough screening process is used to ensure that only the seriously interested and most determined of enquirers are given sponsorship.

Some of the entrepreneurs bring their own ideas for products, but more often they become involved with one of the technologies which has been developed at the BISR centre. Unlike the Ranchi area, there are no significant heavy industries in Jaipur which could provide a market for the products of small units. Identification of potential products tends to be done therefore through constant research by the BISR staff into trade journals and similar sources of information regarding market conditions. R & D work is then carried out in the laboratories and workshop in respect of those products which seem to have a good potential market. Product selection on this basis is obviously rather more indirect and less certain than in Ranchi's case, where the BIT/BISR staff can discuss marketing possibilities directly with potential customers.

This makes the 'nursing' part of the scheme important in Jaipur's case because of the time normally needed to allow the entrepreneur to experiment until he has a commercially viable product. During the 'nursing' stage he experiments with various production runs from within the main building. He has no fixed overheads in respect of rent, electricity or machinery and he has free access to all BISR staff and facilities. This sees him through a difficult stage during which many new entrepreneurs fail due to inability to cover overhead costs. It is also during this time, while he has the backing of BISR, that he develops the confidence to take risks and make decisions.

Once satisfied that production is commercially viable, BISR asks the entrepreneur to move out on his own and set up his own factory. Help is given with drawing up a project proposal for financing; and advice is given if necessary on choice of commercial machines. Although there are five entrepreneurs located on BISR land, there is no concept of a 'nursery' estate in Jaipur's case. These five entrepreneurs and, of course, all the others sponsored through the Centre become totally independent of it once they are declared commercially viable. This is because BISR cannot get involved in commercial production, and unlike the Ranchi centre, there are no state government funds available to give any promotional support to entrepreneurs once their firms are registered and have gone into production. There is, therefore, no concept of giving technical and managerial supervision to new units in order to secure loans.[1] After the 'nursing' period, the BISR laboratory and workshop facilities continue to be freely available for R & D work on product diversification. Testing equipment in the workshop is always available at a nominal charge.[2] Except under special circumstances, machines such as lathes and presses needed for production purposes cannot be used by entrepreneurs who are no longer under BISR control.[3] BISR allows the entrepreneurs it has sponsored to continue to use its name when seeking new markets. In this case, BISR insists that high quality is maintained and refuses the right to have its name linked to a product if quality is found to be unsatisfactory.[4]

It is interesting to note that besides work directly related to small-scale industry development and promotion the Jaipur Centre also

[1] Given the more favourable banking environment in Rajasthan, this has not really proved too much of a problem.

[2] Interestingly, although the Government-funded Electronic Development and Testing Centre (which is adjacent to BISR) contains more and better equipment than the BISR workshop, it is not used a great deal by industries in the area. This is thought to be because there are too many formalities and too few sufficiently qualified personnel.

[3] An exception is the production of dies.

[4] The work of the Jaipur Centre is further described by means of some brief case histories in Annex VII.

carries out applied R & D work for industries and government departments in the area. For example, in collaboration with the Electronic Trade and Technology Development Corporation, an undertaking of the Department of Electronics of the Government of India, a 12"/14" solid state portable television set is being developed. Negotiations are also going on for colour TV work. Full commercial rates are charged for such work and it is hoped that there will eventually be a spin-off in terms of opportunities for small entrepreneurs.

Future plans for the Jaipur centre include expanding the workshop area and facilities and trying to get more land from the government for entrepreneurs' factories close by. With the recent opening of a chemical laboratory, there are also plans to start sponsoring entrepreneurs producing chemically-based products such as paints, paper and glues and resins for phenolic laminates. There seem to be no immediate plans on the part of the State Government to give any financial backing to the scheme.

Even without the integration with a technical college and the backing of government funds for a 'nursery' estate and promotional work, it will be obvious from the above that the Jaipur scheme has managed to achieve more or less the same results, on a lesser scale, as the Ranchi scheme. The environment for the small-scale firm is of course different in Rajasthan and this, together with the tradition of entrepreneurship in the State, may have helped to compensate for any disadvantages involved in not having all the components of the Ranchi centre. More potential entrepreneurs could of course be helped if government money was available to fund a 'nursery' estate and to provide expensive production-related machinery and more testing equipment in the workshop.

The important point which emerges is that an institute of scientific research has, on its own, been able to accomplish a great deal in respect of development and promotion of successful small industries by ensuring that its research work is strictly action-oriented and aimed at providing new opportunities for identified clients. The common element found both here and at the Ranchi centre is a permanent group of well-trained and interested staff under dedicated leadership whose major function is to assist entrepreneurs to develop technologies to the stage where they form the basis for viable small-scale industries and thereafter to provide technological assistance with product diversification and testing facilities to help ensure maintenance of quality.

This is not a service which can be effectively rendered by simply providing central facility workshops and expensive development and testing equipment. The special human factor found in the BISR centres is what is needed to make buildings and machines work properly. This human element seems to have at least four characteristics. First, the staff are very well qualified and capable of highly innovative R & D work. Second, they are genuinely interested in seeing that the fruits of their labour, in the form of the technologies they develop, are used by small entrepreneurs to create viable small industries. Third, there is a personal relationship between staff and entrepreneurs because the centres are small and cater for only a small number of entrepreneurs at any one time. Finally the staff are less likely to move around than are employees in government establishments; they put down roots and have a long-term interest in what they are doing.

Factors in success – and problems

There is no doubt that the pervasive philosophy of the staff is a very important element in the style and effectiveness of SIRTDO's work. Without the drive and enthusiasm of the small group of people who conceived, developed and implemented the model, it is doubtful whether very much could have been achieved. Even with the same facilities and assistance measures, it is certain that the outcome would have been very different if the staff had regarded their work as just another job.

Philosophy

The philosophy is important enough to deserve a special mention. It is basically built on what the staff call 'the three C's': competence, confidence and comprehension. They believe that enabling people to carry out their work competently is the best way to build up their confidence to undertake further tasks by themselves. They feel it will also eventually lead to an understanding or comprehension about the way things can be done to the benefit of society rather than just for personal gain.

The SIRTDO staff stress the importance of this characteristic of their scheme since assistance measures elsewhere all too often destroy the recipients' self-confidence by making them feel totally reliant on the assisting agency. However, this is probably the most difficult aspect of

the scheme to replicate since it depends totally on the ability and sensitivity of the staff to provide assistance in the special SIRTDO way. The Jaipur Centre has achieved a certain degree of success in this respect, but this is undoubtedly due to the fact that the Director was one of the group of BIT staff who originally conceived of the entire scheme. It remains to be seen whether as much can be achieved along these lines elsewhere.

Design of technology

The technologies on which the small units are based and the input of the BIT staff who have worked on developing them have played a major and entirely necessary part in the success of the scheme. This input has enabled most of the entrepreneurs to take up far more complicated projects than the ordinary entrepeneur and undertake the production of the items beyond the capability of those with less direct access to R & D facilities.[1] The more sophisticated the technology, the more likely it is that the firm has remained free from competition once a market has been established. This was seen to be particularly true of a firm like Transgietz – and to a lesser extent Meditron – as opposed to firms like PIF which rely more on the marketing skills of the entrepreneur than on technological design to stay in business.

The R & D input represents a substantial subsidy to many of the units, but this should be looked at in light of the fact that: (a) the technical institute's facilities and staff time are probably better used on practical R & D rather than purely academic work; (b) heavy industry pays for some of the R & D work on products which it is interested in having developed.[2]; and (c) all small entrepreneurs in the State are in any case supposed to have access to subsidized R & D facilities.

[1] This is strengthened by the fact that the entrepreneurs are talented engineers. A commercial entrepreneur may be able to buy R & D: it is less easy to buy in a good engineer who will devote as much care and attention to the firm as the owner himself. In any case, good engineers are reluctant to join small firms (especially in rural areas) because of supposed lack of security, lack of prestige, low wages, etc.

[2] In this case, the entrepreneur is not really subsidised – he is merely paid (through SIRTDO) to carry out R & D work for the industry which will benefit from this work.

The Ranchi scheme shows clearly how (with the necessary enthusiasm and determination of a few of the staff) the existing facilities within a technical institute can be effectively utilized to assist with the promotion of small industries. It is important to stress that the SIRTDO staff appreciate the time given on short- and longer-term consultancies by various other members of the BIT staff. They have also utilized government promotional funds administered by SIRTDO to buy the services of National Laboratories and outside consultants where necessary. As was seen, this was particularly useful in the case of the metal-processing industries. It is thus important to have staff who know where to go to find supplementary R & D capacity and to have funds to pay for this.

Permanent staff

An important factor in the success of the Ranchi scheme has been the availability of the permanent staff employed by BISR. It is difficult to see how any scheme which lacks permanent staff could effectively promote more than a few small scale units. As was seen, the Jaipur Centre was able to accomplish quite a lot through having a permanent and enthusiastic staff – even though the support of a technical institute and government promotional funds were lacking. By comparison, the effective utilization of government funds provided to the engineering colleges in Bihar may well be hindered by the fact that no provision has been made for the salaries of permanent staff.

Of course, not just any staff will do. The common element with the permanent staff in the Ranchi and Jaipur centres is that they are very talented engineers and that they are genuinely interested in applying their talent to helping other people to start up successful small industries. In other words, providing salaries to pay for permanent staff is not enough. The people who run schemes based on the Ranchi model have to be both capable and enthusiastic.

Bank loans

The willingness of the United Commercial Bank to experiment with a change in its normal lending procedures to small industries has been very important. Without the special agreement reached with the Bank, it is likely that most of the entrepreneurs would have been financially incapable of starting a business of their own. As one of the entrepreneurs put it: 'As a new graduate, with no experience and no money to

invest in a complicated venture myself, no bank manager would have given me the time of day if I had not been sponsored by SIRTDO.' It would seem to be an essential point to be considered by any technical institute intending to launch new graduates into small-scale industry. It is encouraging that similar agreements are being worked out between United Commercial Bank and IIT Madras and several technical colleges in West Bengal.

Admittedly, the Jaipur centre has thrived without the need for a special banking arrangement, but conditions were different there. In particular, the entrepreneurs already had some work experience and some financial backing behind them. In addition, the environment for small-scale industrialization is very favourable in Rajasthan – banks are less nervous about lending to small units and people are less nervous about investing everything they have in starting a new business venture. If these conditions do not exist, a special banking arrangement is obviously very important.

Marketing

All the SIRTDO entrepreneurs described how the scheme had assisted them in acquiring markets for their products. In some cases, the staff ensured that the products and technologies related to market needs – surveys revealed that there was a demand for a specific product or large industries or government departments approached BIT/SIRTDO about recommending a small unit which could produce a needed commodity.

In other cases, where the entrepreneur chose a product for which the market was less well established, he normally found that acquiring orders was easier by virtue of having the sponsoring agency's name behind him. All the Ranchi entrepreneurs utilize the fact that they are SIRTDO – sponsored when competing for orders. Similarly, all the Jaipur entrepreneurs advertise the fact that they are sponsored by BISR. This system seems to work well because the customers know that there are good testing facilities and technical experts backing up a SIRTDO/BISR sponsored industry, and because experience has shown that the products coming from such industries are good value for money.

The Ranchi centre has succeeded in acquiring markets for its entrepreneurs partly because of being in the midst of a heavy industrial belt. As was seen in Jaipur's case however, it is possible to acquire good markets even if there are no large industries in the immediate vicinity.

Quality control and testing facilities

Quality control has been important both in terms of gaining and maintaining markets, and many of the entrepreneurs have been helped by being able to use the testing facilities of the BIT laboratories. The main point to emphasise here is that the benefit lies in having easy and quick access to testing facilities rather than the fact that they are available free or at a nominal charge. Various testing facilities are available at subsidised rates throughout the country for the use of all small entrepreneurs (see page 7). However, these are invariably located at some distance and delays are experienced in complying with bureaucratic procedures and in receiving test results. This can be a cause of great concern for an entrepreneur who has a product which needs a quality control certificate for every batch or every item.

As was seen, while most of the mechanical- and electronic-based entrepreneurs remarked on the usefulness of having access to convenient testing facilities, the chemical-based industries such as Bihar Drugs have experienced difficulties because of the lack of such facilities in Bihar. This should be rectified when the new SIRTDO Pharmaceutical Testing Centre is built.

Central Service Facilities

In the same way, SIRTDO's central service facilities have been an important factor in the success of many of the firms. Firms such as PIF use these facilities to augment their own machinery when large orders are being undertaken. The metal-processing firms frequently utilize the central facility for making and repairing dies. The electronic firms utilize the central photo-etching equipment when double-sided or very high quality printed circuit boards are required.

Again, although these services are available at a very low cost, it is the convenience factor which seems to be more important than the price. To have work done in a normal government or commercial central facility centre would take much longer and would often result in lower quality. Entrepreneurs who have had to use outside centres in the past comment on how inconvenient and unsatisfactory this can be. For instance, the owner of Precision Foundry spent almost a month running back and forth to

Calcutta to have the dies made for transmission clamps.

By comparison, facilities in the SIRTDO central workshop are put at the disposal of a SIRTDO entrepreneur almost immediately on request. Also, the staff in the workshop try their hardest to do their best for the entrepreneurs – whether this means working very hard and working overtime to help finish orders on time, or applying their skill to produce high quality dies. Entrepreneurs do not get this sort of special treatment in outside centres.

Moral support and guidance

Most of the entrepreneurs mentioned the value of having the constant support and guidance of the SIRTDO staff during their early, difficult years. This aspect of the scheme should not be overlooked; it is extremely important when dealing with new graduates who have no commercial experience and who are unused to taking risks and making major decisions.

Similarly, the amount of time and energy involved in discussing problems with the entrepreneurs, working through decisions, and weighing up probabilities of certain actions succeeding should not be underestimated. If the staff had insisted on keeping to strict working hours rather than becoming totally involved in the scheme, many decisions would have remained unmade and much less would have been achieved in respect of entrepreneurial development. One of the points the SIRTDO scheme brings out most clearly is that training people to become entrepreneurs and giving them the confidence to take risks is a very people-intensive business.

The entrepreneurs

A scheme for entrepreneurial and small-industry development will, of course, be of little use if the basic 'raw material' – the potential entrepreneur – does not possess the necessary qualities of intelligence, skill, enthusiasm and common sense upon which the scheme can build.

There can be no denying that the SIRTDO entrepreneurs possess these qualities. They are certainly very different from the ordinary commercial entrepreneur – and when talking to them, one gets a sense of people participating in an exciting experiment rather than in running a business.

Their ability for hard work is outstanding. Running a small industry single handed (or even with the help of a partner) is no easy matter – they are marketing manager, bill collector, financial adviser, chief designer, personnel manager and production manager all rolled into one: a never-ending list of functions which make up the daily routine of a small entrepreneur. Not everyone could cope with this type of existence and it is easy to see why most engineering graduates still prefer the ease of a paid job. The SIRTDO entrepreneurs however tend to see this as a challenge and, with the constant support of the SIRTDO staff, tackle each setback with enthusiasm. This enthusiasm must affect the BIT students who can hardly be unaware of the dynamic group of people running industries right on their doorstep. Thus, the new generation becomes conditioned at an early stage in its education.

The qualities of the entrepreneurs have obviously played an important part in the scheme and, to a certain extent, this must be attributed to the careful screening process which the staff implement before giving sponsorship to an entrepreneur.

Some problems

No scheme is without its weaknesses and failures and it is appropriate to point out some of those involved in the SIRTDO scheme.

First, many of the entrepreneurs seem to be reluctant to leave the 'nursery' estate. As mentioned earlier, only three entrepreneurs have actually moved off on their own, even though there are many more who seem to be capable enough of operating independently of the scheme. The entrepreneurs gave a variety of reasons for this. There is the direct cost involved in moving to another location. This was mentioned particularly by the heavier electro-mechanical and metal-processing firms where installation costs account for about 20% of total fixed investment costs. The indirect costs involved in closing down production during the move was also mentioned by several entrepreneurs as being a restraining factor.

Many of the entrepreneurs said they needed to stay close by so as to be able to make full use of the testing equipment and central facility workshop. In this case, the restraining factor was said to be the lack of a suitable nearby site on which to build a new factory. Some of the entrepreneurs, including the owners of PIF, Meditron and Precision Found[illegible] have in fact purchased some land nearby. T[illegible] are, however, reluctant to proceed with building new factories until the

government has installed a road, water and power connections and other necessary infrastructure.

Also, some of the entrepreneurs (such as the owner of Bihar Drugs) although independent enough at the current scale of operation, have continued to cling to the scheme because they needed it to get further financial backing without collateral.

Owing to the continued occupation of the sheds by the existing entrepreneurs, there are currently no vacant sheds in which to locate new BIT graduates seeking SIRTDO sponsorship. Construction of some new sheds on the 'nursery' estate is of course progressing: and if the full expansion plans of eighty 'nursery' sheds are realized, this should solve location problems for the immediate future. However, it seems that the process of moving entrepreneurs from the 'nursery' stage to the 'self-reliant' stage could be examined rather more closely to see if it can be improved.

Another problem is that SIRTDO entrepreneurs still often experience enormous difficulties in respect of power cuts, acquisition of raw materials, extension of cash credit limits and late payment of bills. These are, of course, the sort of problems which have led to the closure of many small industries in Bihar, and although SIRTDO may not have found a way of eliminating such problems, it has perhaps enabled its entrepreneurs to operate at a profit in spite of them.

The SIRTDO staff are of course very conscious of these problems but do not want to get too involved since they feel that this would defeat the purpose of training the entrepreneurs to solve their own problems rather than expecting other people to do everything for them. On the other hand, for the purpose of showing how a well-integrated scheme can lead to successful small industry development, the staff are obviously interested in trying to work out how changes in policy and/or small industry assistance measures could help to alleviate such problems for the small-scale sector as a whole. With this end in mind, various schemes are being given consideration for implementation by SIRTDO or the government. For example, much time and effort has been put into looking at the various advantages and disadvantages of SIRTDO purchasing its own generator for the 'nursery' estate to combat power cuts. In addition, various measures which would improve the raw material supply problem are being proposed for government consideration and implementation.

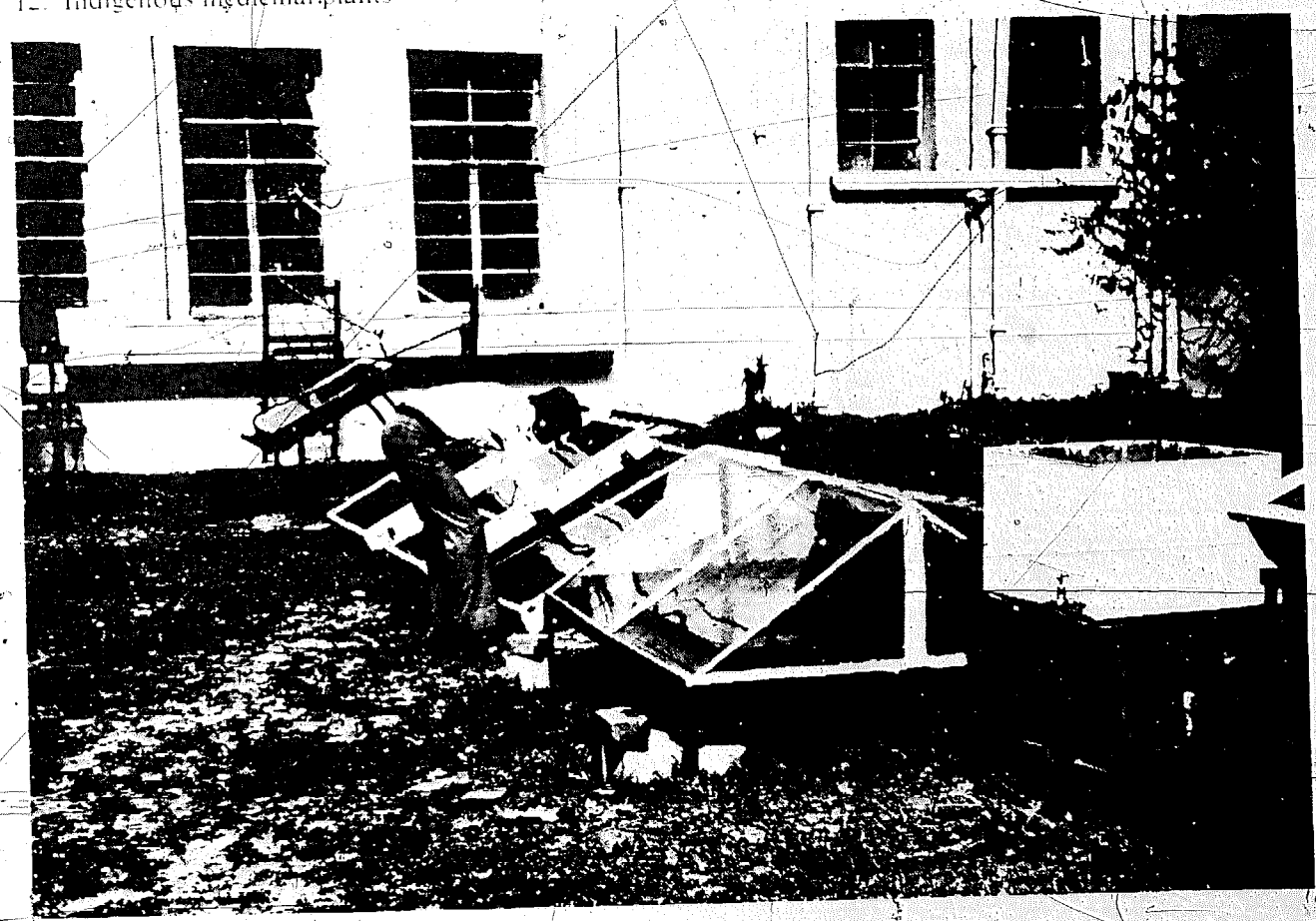
At a general level, the SIRTDO staff are often asked to present evidence (based on the experience of their own units) to various committees evaluating policy measures at the State and Central Government level. Through this mechanism, they can have an influence on the general environment under which their own units and other small industries in Bihar and the rest of India operate. For instance, it was the evidence of the SIRTDO staff which helped to increase the power subsidy for small industries.[1]

The final problem relates to the implications of expansion of the scheme. SIRTDO's strength comes mainly from the input of the five BIT staff members with back-up from the permanent staff provided by BISR. Despite the fact that the scheme has now been operating for many years, very few of the other BIT staff members have expressed any interest in becoming fully involved on a continuing basis. With no help from this source, it would have been difficult for the staff to cope with expansion even to the present level if it had not been for the willingness of earlier entrepreneurs to provide guidance and help to new entrepreneurs.

Obvious questions arise about the ability of the existing staff to cope with the proposed expanded total of eighty entrepreneurs (even if existing entrepreneurs do help out). The State Government has been asked to create some permanent posts at SIRTDO and these will certainly be needed. However, it will be interesting to see whether the quality of entrepreneurs remains the same once the ratio of entrepreneurs to core staff is further increased.

[1] From an economic analysis of the SIRTDO units, it had been proved that it was difficult to be economically viable with the lesser rate of subsidy.

12. Indigenous medicinal plants



13. Solar energy devices

6 AN APPROACH TO RURAL INDUSTRIALIZATION AND RURAL DEVELOPMENT

Introduction

Given the objectives of the small industry scheme and the prevailing philosophy behind it, it should come as no surprise to find that SIRTDO has also been involved in rural industrialization and rural development.

This side of SIRTDO's work started when one or two of the core BIT staff decided that the objective of showing how to utilize the existing facilities, staff and students of BIT to help the surrounding area could be extended beyond the limits of small-scale industry development. Thus, they embarked on the process of developing technologies which could enable people in nearby villages to improve their incomes and standard of living without seeking an external job. The rural development programme is also very much concerned with building up the confidence which people have in their ability to do things for themselves.

The main focus of the present study was the small industry scheme. However, this chapter on rural industrialization and development has been included both because it relates to the small industries and because the work is so potentially important in its own right.

Rural industries

Oil extraction

The first rural development project to be initiated was based on the cultivation of medicinal and oil-bearing plants and the extraction of essential oils. Investigations revealed that many villagers in the area had spare land on which food crops could not be grown without irrigation and had spare time to devote to any activity making use of this land. They did not, however, have access to any technology or skills which they could utilize to earn extra income from this land. The programme started with the experimental non-irrigated cultivation of more than 100 plant species of medicinal value of which 12 were found to be suitable for the Chota Nagpur region. Following commercial trials, many neighbouring farmers were trained in the cultivation of these plants and marketing facilities were created for them.

SIRTDO's involvement did not stop here. It was found that farmers who had taken a cartload of plants to the market would sell the whole lot for Rs 20 – Rs 30 towards the end of the day if it looked as if the only alternative was going to be to take it back home again. To solve this problem, SIRTDO developed a small distillation plant (costing about Rs 2,000) for village use. This meant that the farmer now only had to carry a bottle of liquid which would sell for Rs 120 a litre. Although this oil still needed further purifying, at least some of the processing could be done in the village, thus raising income levels. About a dozen distillation plants have been sold so far.

Still not satisfied, SIRTDO is now trying to make the whole production process completely rural by encouraging the installation of small solvent extraction plants in small townships so that the oil received from farmers does not have to go to large industries in the big cities for further processing. A pilot plant in the price range of Rs 1 lakh to Rs 1.5 lakhs has been developed, and a small-scale unit sponsored by SIRTDO will be the first firm to experiment with this idea. This sort of integrated planning is often talked about, but this is one of very few examples of how it is actually being put into practice.

Lac processing

While the essential oils project has introduced an entirely new activity in the villages, one of SIRTDO's other rural development projects – that based on the development of technology for first level *lac* processing[1] – has been aimed more at improving traditional technology and raising skill levels in an existing income-generating activity.

A major share (about 20%) of the world's *lac* production comes from a small area of the Ranchi district. *Lac* is the secretion of small insects which live in the forests in this area, and it is the basic raw material used in making lacquers of all types. Villagers in the area have collected the branches on which the secretion is found, scraped the lac from the surface and sold the

[1] *Lac* has several uses. It is used in furniture polishing, floor finishing, electrical installation, varnishes, gramophone records and in printing ink.

resulting 'stick lac' to small and medium industries in the nearby townships. Further processing is carried out by these firms, and they send 'seed lac' to Calcutta and overseas where it is used in the manufacture of final products.

SIRTDO discovered that although the price for seed lac was fairly constant at about Rs 6 per kg, the price paid to the villagers for stick lac was variable and often far below the Government fixed lowest price of Rs 2 per kg. It was concluded that the villagers could be helped considerably if they were given the technology and training for converting stick lac to seed lac in their own villages.

After investigating the technology used in the processing factories in nearby townships, it was decided that the most efficient results could be achieved through the use of a hand-operated crusher, followed by manual cleaning. A village within the tribal lac-growing district was selected to be the location of a training-cum-production centre, with the land and well water being provided by the village head. A factory from outside the immediate area agreed to supply trainers and an old broken hand-operated crushing machine which was easily repaired by SIRTDO staff. The factory also provided old stick lac at a low price for use during training.

The technology which was introduced is as follows. The stick lac is repeatedly crushed in the hand machine and then sieved until all the lac is taken out. The crushed lac is then put in cleaning pits - about 20 kg at a time - and repeatedly cleaned with water. The dirty water is strained through a cloth and the fine powder collected on the cloth kept separately. Caustic soda is used for finishing the cleaning operation and to obtain a shining colour. The fine dust collected from straining the dirty water is dried, crushed and further cleaned since this can also be sold as 'dust lac'. The crust left over after the waste water dries in the cleaning pits is found to form a very powerful manure. This is used by the village head in return for use of his land and well water.

About twenty people have been trained so far and now produce seed lac on the equipment in the training-cum-production centre. Interestingly, the cost of the entire centre plus all expenses for the first training course of ten people was only Rs 3,343. About two-thirds of this cost was recouped by selling the seed lac produced during the training course.

Rural artisan training

At a slightly different level, SIRTDO has been involved in the preparation of training modules for use in training programmes aimed at rural youths. This started with a request by the Chota Nagpur Catholic Cooperative Society to develop modules for use in pumpset mechanic courses and cycle mechanic-cum-fitter courses. The first courses were carried out in a specially allocated building on the SIRTDO site while the methods and modules were being perfected. After the fifth course, the responsibility for training was handed over to CCCS and the courses are now carried out at the Society's Agricultural Training Centre at Namkom, which is just outside Ranchi town.

Pump-set and cycle mechanics

Each of these courses lasts three months and after this each trainee is given a tool kit valued at about Rs 250 with which to start up his own service industry in his village.[1] About 140 cycle-cum-fitter mechanics have now been trained of whom an estimated 70% are thought to be engaged in profitable self-employment. The estimated gross income of these fitters is currently in the region of Rs 3,000 per annum. About 76 pumpset mechanics have been trained of whom about 30% are now self-employed and involved in maintenance and repair of pumpsets in their own areas. Many of the others took up paid employment as semi-skilled workers after their training.

One of the problems which is now being faced by this valuable programme is the rising price of hand tools. SIRTDO feels it is important to keep the price of a tool kit in line with expected annual earnings and savings in the rural areas. Investigations at village level revealed that any sum of money much in excess of the amount an average family could expect to save in a year (Rs 200) was completely outside the range of comprehension. The staff of SIRTDO believe that if a scheme to create self-employment in a village is to work, it must be based on a capital investment which is within the range of comprehension.[2]

As a way of overcoming this problem, SIRTDO hopes to acquire its own die-making and copying machine so that it an give dies to

[1] For a list of tools included in these kits see Annex VIII.

[2] This indeed may well be the case since this scheme appears to be working while so many schemes elsewhere in the world which have been based on far more expensive tool kits given out by well-meaning donor agencies have failed.

small-scale industries which it would sponsor for the making of hand tools. Having given the firm a die free of charge, it would ask for a certain percentage of the tools made from the die to be given back at a reduced cost. The firm would then be free to sell the rest of the hand tools made from the die at the market prices and SIRTDO would supply the hand tools to the rural development training programmes at a low price.

Work experience programme

An important offshoot of this particular programme has been the work SIRTDO has been doing on the development of training modules for use in elementary technical training for boys in secondary schools in rural areas. When the Work Experience Programme was introduced for schools in 1979, the heads of some of the missionary schools in the District who had heard about the training modules for rural youths approached SIRTDO about the possibility of using these modules to assist in the training of their senior pupils during the forty hours of the school year which were to be set aside for work related activities.

SIRTDO felt that the existing modules would be unsuited to this purpose, but believed that a real gap did exist in respect of appropriate technical training for this level of pupil. As a consequence, SIRTDO has now developed training modules which are being tried out in two rural secondary schools. Training is spread over the last three years of schooling and there is a distinct module for each year. The first involves the identification of materials, hand tools, and their uses and simple measurements; the second involves the making of simple items such as mugs from tin plate; and the third is trade specific. This appears to be working very well and will, it is hoped, come into use in many other rural secondary schools in the State.

So much interest has been generated in the area around the schools which are currently using the modules that the teachers have now asked SIRTDO if it would be possible to develop further modules for the training of school dropouts and village youths in general. These would be for use in courses to be conducted in the school compound in the evenings.[1]

Tasar rearing and silk reeling

The remaining area in which SIRTDO has developed training modules is that of *tasar* rearing and silk reeling and spinning. SIRTDO took up this programme at the request of the Central Tasar Research Station (part of the Central Silk Board) which is located in Ranchi and which provides the staff for carrying out the training of rural artisans in the purpose-built sericulture shed near the SIRTDO building. The programme aims to give training to marginal farmers and villagers in the scientific method of planting Arjun and Asan plants, the rearing of silk moth cocoons, and the reeling and spinning of silk.

The idea of the programme is that those small and marginal farmers who have land not suited for food crops could grow Arjun and Asan plants and start rearing cocoons. They could then either sell these or do the reeling and spinning of silk themselves. Additionally, it was envisaged that those villagers who had no land could buy cocoons from neighbouring tasar rearers and earn income through reeling and spinning. So far seventeen people have been trained in tasar rearing (which is a three month course) and fifteen people have been trained in reeling and spinning (which is a six month course). It has been shown that, as a result of this training, it is possible to get yields of tasar approximately double those normally attained in the area.

Technological developments worthy of mention in this sericulture programme are as follows. First, in respect of actual rearing of tasar, improvements on the traditional practices have included learning the appropriate time to watch for and scare off birds, physically shifting worms from one plant to another so as to ensure an adequate food supply, and learning how to spot diseased worms so that they can be removed and destroyed before the whole crop is lost. Second, growers are now supplied with disease-free layers (DFL's). These are secured from the SIRTDO sericulture centre and are the cocoons hatched from the eggs of a disease-free butterfly.[2] The cocoons are stored in the sericulture shed at SIRTDO which has certain architectural

[1] Hand tool requirements will be very great for this type of programme and increase the strength of the argument mentioned on the previous page.

[2] When the female butterfly has laid her eggs (500 in a batch) she is destroyed and inspected under laboratory conditions to check for signs of disease. If no disease is found, the eggs are retained for storage, hatching and distribution.

features designed to keep the cocoons cool since they die at high temperatures. The roof of the building is made of country tiles and simply washing the concrete floor in the summer creates an adequate cooling effect in the building through evaporation. Third, improved equipment for reeling and spinning has been developed by CTRS, with SIRTDO providing modifications from time to time as needed.

Rural development

At still another level are those technologies such as small irrigation dams and low cost building materials which have been developed by SIRTDO to meet the needs of people in the rural areas.

Irrigation dams

In the case of irrigation dams, it was found that villagers were already building their own earth dams. These were frequently carried away by flash floods or silted up and often breached by the farmers themselves in order to protect their fields. What was needed was a dam which would let through silt and heavy flows of water at the beginning of the monsoon but collect sufficient water towards the end of the monsoon to allow for winter irrigation. Existing technologies involved a good deal of expense and the use of materials and skills not commonly found in the villages.

An arch foundation dam was designed which fulfilled all requirements. It made use of local materials and available rural skills; it required no machinery other than normal agricultural tools; the construction method was simple so as to develop confidence among the villagers; and the cost of construction was in the range of a few hundred to a few thousand rupees depending on the size of the area to be irrigated. Two dams were successfully completed under SIRTDO's guidance and supervision, and, encouragingly, the villagers in the surrounding areas have now built a number of similar dams on their own.

This last point is extremely important since it is the proof that this was a truly appropriate technology which was introduced in an appropriate way. In particular, it recognised the importance of keeping the method simple enough for the villagers to grasp quickly and the importance of involving them fully in the building of the first dams so that they were confident enough to go on to making more dams without the need for external assistance. This is the point which is so often overlooked when trying to disseminate so-called appropriate technologies.

Low-cost building materials

Also in the civil engineering field, mention should be made of the work being done by the BIT civil engineering department in developing low-cost building materials for rural development. This is particularly important at a time when an acute shortage of cement and a continuous rise in the price of building materials have reduced the pace of development – especially in the rural areas.

A major breakthrough has been achieved in the production of rice-husk and fly-ash cementitious materials using a new, simple, and cheap technique. The strength of the material is claimed to be comparable to that of Portland cement but has a longer curing time.[1] It is calculated that small-scale units based on this process can be economically viable even with production rates as low as one tonne per day, and so can be located throughout the rural areas. The department has also developed low-cost bricks using rice husk. These do not require firing and can be made at a cost 20% – 30% lower than conventional bricks.[2] Corrugated roofing sheets have been developed using waste products such as animal hairs and coconut fibres. These, it is claimed, are as strong as asbestos sheets although cheaper and heavier. All these technologies, besides helping to improve conditions in rural areas by providing lower cost building materials, also promise to create a larger number of jobs through manufacture in small scale units throughout the rural areas.

Future directions

It is interesting to note that SIRTDO's planned future projects and programmes are focused more on rural development than they have been in the past. Developments in existing fields such as mechanical engineering and electronic control are becoming more concerned with serving rural and agricultural needs or with splitting up the production process so that a large number of families can be paid to do work in their own homes in the villages. At the same time, the

[1] Rice-husk cement made 1:2:4 with water content of 0.55 has attained a strength of 150kg/cm^2 after 28 days.

[2] The compression strength is comparable to second-class fired bricks and water absorption is less than 15%.

newer fields being expanded, such as agro-processing and civil construction, are, by nature, rurally oriented.

Low-cost farm vehicle

In the mechanical engineering field, one of the most interesting developments is that of a low cost farm vehicle. The starting point for this project was a consultancy carried out by SIRTDO staff to evaluate an OXFAM-funded pump-set project. It was discovered that the villagers to whom diesel pump-sets had been distributed felt that they should be able to make more use of a valuable piece of machinery (especially the engine) which was only being utilized for about four hours a day for irrigation purposes. The various ways in which an engine could be used to meet felt needs in the villages were considered and it was decided that the most useful thing for it to do initially would be to power a simple farm vehicle. An old chassis was purchased from a scrap yard and the diesel engine fitted. After some modifications to the gear box and other parts of the vehicle, it was found that the whole thing worked quite well.[1]

The first prototype is currently being tried out in some neighbouring villages by farmers using it to transport their crops. Once technical performance is proved satisfactory, SIRTDO will proceed to identify an entrepreneur who can start manufacturing these simple vehicles. Since there are approximately 5,000 pump-sets in the neighbourhood, there should be no lack of demand for this product. To make it an even more attractive proposition, R & D work is now proceeding in the Mechanical Engineering Department of BIT with respect to developing a suitable small plough which can be attached to the vehicle for ploughing small plots of land. SIRTDO will also be developing a training module for maintenance and repair of these vehicles. This will probably be integrated with the existing three month training course for pump-set mechanics. This sounds like a very well thought-out and useful programme and it will be interesting to see how it works out in practice.

Solar energy devices

The other interesting projects being undertaken by the Mechanical Engineering Department are those relating to solar energy. The most promising of these is the small solar water heater which is currently being tested for acceptability and utility in a few rural dispensaries. If this proves satisfactory, then the Ministry of Health is likely to place orders to supply every dispensary in the State.

Other solar projects which could prove appropriate for rural use are a solar still which gives ten litres of distilled water per day and costs Rs 300; a simple solar pump which pumps 25 cm^3 of water per second; and a solar drier for preservation of surplus fruits and vegetables in the villages.

Decentralized production of electronic components

In the electronics field, the ways in which electronic components could be produced by large numbers of people in their own homes in the villages are being examined. This is largely a problem of training, organisation and management, combined with a technology appropriate to the task in hand. This idea grew out of observations by the BIT staff that uneducated and unskilled workers in two of the SIRTDO units (Meditron and PCB House) had been able to pick up quite intricate tasks (such as assembling printed circuit boards) after only a few days training; and as long as the task demanded of them did not vary, they could continue working with a minimum of supervision. It was decided therefore that instead of thinking only in terms of more electronic units organised on existing lines, it might prove more appropriate to try out units organised on the principle of distributive management.

This needs some explanation. The existing units could be said to be organised on a centralised management basis whereby all work is carried out under supervision in one place and all workers are trained by the owner/manager after they have been employed. The only way to expand in such units is to employ and train more workers and expand the physical size of operations. If this process goes on for long enough, the sheer size of the workforce and the management problems involved (not to mention the economic considerations) will start to dictate rationalisation of production in favour of more automation – a process which will then displace those workers who have been trained to deal with the techniques of manual production.

The new small-scale units would have a differ-

[1] It is interesting to note that the idea for this arose partly from a SIRTDO staff member having read about the Tinkabi tractor from Swaziland in the ITDG publication *Tools for Agriculture*.

ent basis for production. By and large the pattern would be similar to the one which exists between the manufacturing giants such as TELCO and their small-scale ancillary units. In this case it would be a small-scale unit which is distributing orders for different components and these would be produced by individual families using their own machinery in their own homes. R & D work is already progressing in the electronics department of BIT to identify the different components which could be made (after very little training) using a simple manual press. The mechanical engineering department of BIT will then do the research work on the dies and simple presses for producing the various components. When the equipment is technically satisfactory, SIRTDO will develop modules for training villagers how to make various components and will give each trained person their own press. This will be done through the Rural Artisan Programme. Once sufficient numbers of people have been trained, small-scale electronic industries will be sponsored by SIRTDO to provide a market for all the different components capable of being made in the surrounding villages. These industries will employ a number of 'agents' who will travel to the villages to distribute raw materials and to collect and pay for finished components. These will then be collected together in the small-scale unit for assembly into the final product.

This of course is a variation of similar schemes which have been tried elsewhere. One of the major problems with existing schemes has been that of identifying appropriate patterns of ownership and control for commercial operations. In most cases, control has either been in the hands of entrepreneurs, who have tended to exploit the people whom the technologies are intended to benefit, or government has controlled operations and the necessary entrepreneurial approach to production and marketing has been lacking. It will be interesting to see if the SIRTDO scheme, relying on its own particular brand of 'non-exploitative' entrepreneurship, can succeed where others have failed.

Finally, the two newer areas of SIRTDO's work - low cost building and agro-processing - by being based on raw materials which are found throughout the rural areas are particularly appropriate in terms of small-scale, decentralised industrialization.

Low-cost housing

The Low Cost Materials Development and Research Cell[1] is continuing with its work on reducing the cost of the main components in a building - roofing, bricks and cementitious materials. The basis for all technological developments is that commercial units set up to produce these products must be small-scale, rural-based, and should utilise local resources and a minimum of power.

A recent request from the State Government to SIRTDO has been for assistance with the building of 200 government low-cost dwellings for tribals and harijans within a low and fixed budget. If SIRTDO can deal with this successfully, there would seem to be endless possibilities for gaining work in low-cost government housing schemes of this type, and therefore a good market for any entrepreneur wishing to start a small scale business producing low-cost building materials.

Agro-processing equipment

With respect to work on agro-processing, developments relate mainly to requests for assistance coming from people in the surrounding villages. Technologies include a bullock-powered tractor; solar crop driers; ferro-cement storage bins; extrusion cookers; vegetable preservation methods (e.g., spray drying); and manually operated post-harvesting equipment for breaking, winnowing and grinding pulses.

SUMMARY

Since the work of the permanent staff and most of the BISR and government funds are limited to the development and promotion of small-scale industries, many of the accomplishments in the rural development field have been achieved largely through the interest and hard work of a few of the core BIT staff. There are to date no specific plans of either BISR or the Government to give institutional support to this side of the programme and without this it is unlikely that much more can be accomplished. This would be disappointing, for it is obvious that the rural development activities have a great deal of potential in terms of improving rural incomes and living standards in the region.

[1] The Cell is located in the Civil Engineering Department of BIT.

7 SUMMARY AND CONCLUSIONS

At the risk of being repetitive, it is worth highlighting the main characteristics of the Ranchi scheme and discussing the more important lessons which are to be learned from it.

The first and most important point relates to the small group of BIT staff who have been responsible for the development and implementation of the scheme. The philosophy behind their approach and the time and effort invested by them and the scheme's permanent technical personnel are the basis upon which everything else rests. The SIRTDO story shows how much can be achieved by a small core group of genuinely interested people who have the right sort of attitude towards development.

Second, the scheme illustrates how engineering graduates can be motivated to start small businesses and how they can be trained to acquire entrepreneurial talents. The point which comes over clearly is that this cannot be done by means of a short, theoretical training course. It is a lengthy process which can take up to five years and which involves creating the sort of environment in which the trainee feels secure enough to learn by doing.

Third, the Ranchi model illustrates how a variety of agencies (in this case, a technical institute, an institute of scientific research, a commercial bank and the industries department of the State Government) can work effectively together towards the common objective of developing and supporting small industries. Under the specific conditions existing in the Ranchi area, the inputs of all these agencies were necessary to make the scheme work properly. Under different (and more favourable) conditions, one or more of the agencies may not be needed. This is well illustrated by the example of the Jaipur Centre which involves only an institute of scientific research and has accomplished a great deal without being integrated with a technical institute, a bank or a government department. The main lesson to be learned is that the key component of the model is a core group of permanent staff who are interested in practical industrial research and who are willing to apply their skills and energies to support small entrepreneurs. This would seem to be an important point to remember when thinking of trying to implement similar schemes in other locations.

Fourth, with regard to the issue of replicability, the Ranchi scheme demonstrates that once a good idea has been proved viable in practice, interest will be generated in trying to do the same thing elsewhere. To date, this has led to: The Bihar Government trying out similar schemes in all the engineering colleges in the State, the Uttar Pradesh Government offering support to the BISR Centre in Allahabad; the United Commercial Bank encouraging technical institutes in West Bengal and elsewhere to copy the Ranchi model so that its job of lending to small industries is facilitated; and governments from countries outside of India asking for advice and assistance in starting similar schemes. The first location outside India to which the model is likely to be transferred is Nigeria. This would be a joint venture involving BIT/BISR, a Nigerian technical college and the Ministry of Industries of the Federal Government of Nigeria.

Fifth, the study shows how the staff, students and facilities of an academic institution can be utilised to help with the development of the area in which it is located. The ultimate aim of the BIT staff is to increase the rate of small-scale industrialization in the area surrounding BIT and to assist with the establishment of one small industry for every ten villages and one rural artisan for every village in the immediate vicinity. There is still a considerable way to go before this objective – which amounts to creating 300 small industries and establishing 3,000 rural artisans – is fulfilled. A lesson to be learned from this is that small industry development and rural development are not fields in which rapid results can be expected.

ANNEX I. LIST OF MACHINERY AND EQUIPMENT IN CENTRAL SERVICE FACILITY

Workshop

Heavy duty lathe
High precision centre lathe
Horizontal mill with vertical attachment
Radial drilling machine
Portable drill
Double end grinder
Hydraulic surface grinder
Portable grinder
Slotting machine
Band saw and shaft grinder
Band saw and emery belt
Tool and cutter grinder
Universal sheet plate edging, bending and folding machine
Planner machine
Gas welding equipment
Portable spot welder
Engraving machine
Portable gantry of 5 tonne capacity
1 h.p. air compressor

Electrical

Oscilloscopes
Audio frequency generator
Dark room camera
Lithotex vacuum frame, bench swirler, arc lamp and etching machine
Universal drafting machine
IC power supply
Mixed modular power supply
Variable transformer models
Vacuum coating unit
Solid stage micro-spot welder

Carpentry

Heavy duty wood turning lathe
Vertical sand saw
Slotting machine
Portable drill
Portable blower
Heavy duty grinding machine

Miscellaneous

Ammonia printing machine
TV set
Remington typewriter
Photocopier
Boiler for solvent extraction plant
Distillation plant with condenser

ANNEX II. PRODUCTS AND PROCESSES DEVELOPED FOR ENTREPRENEURS

Entrepreneur	*Item*
A M/s Transcon	1 Conveyor belt speed relay
	2 Tachometer (measures revolutions)
	3 Contactless proximity switch
	4 Tramp metal detector
	5 Earth leakage relay
	6 Automatic star – delta starter
	7 Emergency light
B M/s Steelmelt	8 Crawler chain elements
	9 Traction resistance
C M/s Mercurium	10 Testing of high-tensile fasteners
	11 Standardising dies
D M/s Praveen Industries and ...	12 Gravity die casting process for transmission clamp
E M/s Precision Foundry Works	13 Motor housing casting
F M/s India Instrument	14 Control panels
	15 Amplifiers
	16 Temperature monitor
	17 Control parts
G M/s PCB House	18 Complete printing technology
	19 Screen printing technique
	20 Voltage stabilizers
H M/s Sphinx	21 Grizley feeder
	22 Cylindrical pressure tank
I M/s Alcast	23 Aluminium pressure die castings for defence items
J M/s P.I.F.	24 Pneumatic mine-car axle catcher
	25 Chain creeper
	26 Wagon hauler
	27 Bomb calorimeter
K M/s Technomek	28 Coal sampler
	29 Sand thrower
	30 Blower
L M/s Star Engineering.	31 Reciprocating coal feeder 300 TPH
	32 Reciprocating coal feeder 400 TPH
	33 Picking conveyor (tyre mounted)
	34 Idlers
M M/s Bihar Drugs Laboratory	35 Formulations for injectables
	36 Formulations for oral preparations
	37 Malt extract methods
N M/s Bhola Industries	38 Distillation unit
	39 Portable carbide gas generator
O M/s Transgietz Ent.	40 Dry type transformer
	41 HV Transformer protection unit
	42 HVCT and PT
	43 HV Relay coils
P M/s Meditron	44 Control elements for machine tools
	45 Electronic toys
	46 Medical equipment repair
Q Micage	47 Mica processing methods
R M/s Balaji Construction Works	48 Design of sheds and buildings
S M/s Nutrients India	49 Soya products
	50 Solvent extraction process and plant
T M/s Paedic Laboratories	51 Formulation – liquid paediatric
U M/s Chemit India	52 Formulation for adhesive
V M/s Inbomi	53 Deep drawn dies for TATA truck component
	54 Dies for other automotive component
X M/s Products Engineering	55 Special machinery for heavy machine components

ANNEX III. LIST OF PROJECTS UNDERTAKEN ON BEHALF OF LOCAL INDUSTRIES

Item	*Sponsor*	*Total expenditure Rs*	*Source of finance Rs*	*Period of time to complete*
1 Dry type transformer	CIL	60,000	CIL 60,000	2 years
2 Thyrister drive for jig boring machine	HMTP	13,500	HMTP 13,500	6 months
3 Amplidyne existing amplifier	HEC	12,980	HEC 12,980	3 months
4 Cross-weld detector and 5 Ultrasonic on-line tube inspection system	ITC	225,000	ITC 115,000	2 years
6 Run away coal tub protection system and 7 Water level monitor system and 8 Mine-car weighing system and 9 Goaf temperature Monitoring system	CMPDI	145,000	CMPDI 172,500	
10 Lock relay	HMBP		HMBP 5,000	3 months
11 X-Y-Z amplifier	HMBP	22,500	HMBP 22,500	3 months
12 Slag cement and 13 Thermal relay and 14 Operating theatre camp	DTD	118,000	DTD 100,000	6 months

CIL = Coal India Limited
HMTP = Heavy Machine Tool Plant
HEC = Heavy Engineering Corporation
ITC = Indian Tube Company
CMPDI = Central Mine Planning Design Institute
HMBP =
DTD = Directorate of Technical Development

ANNEX IV. LIST OF MACHINERY AND EQUIPMENT IN THE SMALL INDUSTRIES STUDIED

Perfect Innoculators and Fabricators

Lathe, 8′ bed, heavy duty
Lathe, 6′ bed, tool room precision
Drill (radial type) 1″ capacity
Power Hacksaw - 16″
Shaping machine, 24″ stroke
Arc welding set, 300 amps
Arc welding set, 200 amps
Hand grinder
Flexible shaft grinder
Angle grinder
2 Hand drills
Vertical drilling-cum-milling machine-capacity 25 mm } arrived December 1980
Lathe, 8′ bed, heavy duty } arrived December 1980

Precision Foundry

Oil-fired furnace
Coal-fired furnace (self-made)
Lathe
Hacksaw machine
2 Drilling machines
Bench grinder
Hand grinder
Welding set
Gas cutting set
Several dies

Mercurium

Cold header
Trimmer
Thread rolling machine
Centre lathe
Draw bench
Power press
Nut cutting machine
Nut threading machine
Pointing machine
Grinder

Perfect Forgings

Forging press (screw press)	300 tonne
Power press	100 tonne
Power press	50 tonne
Power press	5 tonne
Lathe	
Drill	
Grinder	
Hacksaw machine	
Eye rolling machine	
Double ended adjustable grinder	
Taper rolling machine	
Wood turning lathe	
Hardening furnace	
Coal-fired furnace	
Cooling chamber	

Meditron

2 Winding machines
Electronic and electrical testing equipment such as oscilloscopes
Various hand tools

Transgietz

H.T. Winding machine for transformer
L.T. Winding machine for transformer
Vacuum impregnation plant
Baking oven
Oil filtration plant
Radial drilling machine
Treadle shear machine
Oxyacetylene welding set
Spray painting machine and compressor
Brazing set
Control panel for testing transformer
Trolley
Gantry
Measuring instruments
Arc welding set
Pipe bending machine
Sheet bending machine
Miscellaneous hand tools

Bihar Drugs

Pyrogen free distilling still
Autoclave
Drying chamber
Bottle brushing unit
Bottle rinsing machine
Air conditioner
Voltage stabiliser
Exhaust fan
Filtration unit
U.V. lamp
Chemical balance
Physical balance
Bottle capping machine
Vial capping machine

Ranchi Rolling Mill

6" Mill with rollers and 5 tonne flywheel
110 kW, 3-phase motor with liquid starter
250 RVA step-down transformer
Oil fired furnace (capable of heating 8 tonnes of steel)
Shearing machine (capable of shearing up 1½" of steel)
Tanks, pumps etc. for recirculating cooling water
Arc welding equipment
Gas cutting equipment
12' lathe and accessories
10" grinder

Inbomi

Temperature controlled press
Heat treatment furnace
Sprayers and hand tools
Power saw
Shearing machine

ANNEX V BANKING PROCEDURES

All the units sponsored by SIRTDO are financed through the United Commercial Bank. Loans are given for fixed capital and for working capital.

Fixed capital

The Bank gives a term loan for fixed assets such as machinery and equipment. The loan is to be repaid within five years and the interest rate is 14%. Technical graduates from a recognised institution are eligible to receive up to 7% interest subsidy on the term loan. This is paid by the Government of India, through the State Government, directly to the Bank. None of the SIRTDO entrepreneurs are currently receiving this subsidy.

Normally, the entrepreneur collects quotations for machinery from different suppliers and then decides from whom he should purchase his machinery. After approval from SIRTDO, an order is placed and against a pro-forma invoice the Bank sends a manager's cheque directly to the company concerned. Some companies will not agree to supply machinery against a manager's cheque (because of administrative delays) so SIRTDO has persuaded the Bank to allow the entrepreneur to make payment for machinery by draft if this should prove necessary. Additionally, if it proves necessary to pay cash for equipment, SIRTDO has persuaded the Bank to allow the entrepreneur to draw out cash on an overdraft account for this purpose.

The Bank is a member of the Credit Guarantee Corporation which entitles it to take advantage of the credit guarantee scheme run specifically for small scale industries by the Industrial Development Bank of India. This means that term loans in the priority sector (small industries and agriculture) get an automatic grace period on repayment of up to two years. Outside of this scheme, acquiring a grace period on repayment of a term loan is somewhat complicated.

Margin money/seed money

Normally, the Bank supplies 75% of the capital needed to start a small enterprise and the prospective entrepreneur must find the remaining 25%. This 25% is known as margin money.

The Government subsidises this margin money for small scale enterprises by issuing up to Rs 20,000 or up to 20% of the total capital as a soft loan. This 'seed' money repayable over 10 years at an interest rate of 3%. If the small scale enterprise folds up, then the Government takes a fairly lenient view about repayment.

The Government can consider giving more 'seed' money as a special case to technical entrepreneurs. None of the SIRTDO sponsored entrepreneurs have received this extra money as yet, but SIRTDO is still working towards unravelling the administrative complications involved.

Working capital

Cash credit limit

This is the limit up to which the entrepreneur is allowed to borrow. A certain amount (worked out between the Bank and the entrepreneur) is sanctioned against raw materials, factory expenses and stock of finished products.

Every month, within the first week, the entrepreneur has to submit a stock statement which itemises the materials and total value of goods in stock. The entrepreneur's drawing power (DP) within the month will be calculated on the basis of the value of goods in the factory and the prearranged margin. For example, if the value of goods in the factory is Rs 70,000 and the margin is fixed at 20% then the drawing power will be:

$$\text{Rs } 70{,}000 - \left(\frac{20}{100} \times 70{,}000\right) = \text{Rs } 56{,}000.$$

In other words, within the month the entrepreneur will be entitled to issue cheques up to a value of Rs 56,000.

If there are any particularly heavy transactions in the middle of the month, then the entrepreneur can issue a new stock statement and his drawing power will go up.

Overdraft limit

If the entrepreneur's drawing power is Rs 56,000 but he has to draw beyond that to the extent of Rs 20,000, then he can use his overdraft limit (if this has been sanctioned). Items which can be paid for out of this account include initial investments, pre-operative expense, advances paid for buying raw materials, and various miscellaneous expenses such as an electricity surcharge or enforced safety equipment which was not foreseen at the time of taking out the initial loan.

When the overdraft limit is used for purchase

of raw materials, this is adjusted and debited from the cash credit limit when the stock statement is issued.

Bill purchase limit

When an entrepreneur has supplied a consignment of goods to a company, he may be able to draw a bill against that company's name for the value of the contract. This bill can be purchased by the Bank and the amount credited to the entrepreneur's cash credit limit.

For example, an entrepreneur may have an order worth Rs 20,000 ready for shipping. Instead of waiting for the goods to reach their destination and for the recipient to process payment to him, the entrepreneur can take the transport receipt from the haulage contractor and take this to the Bank which will credit his account with Rs 20,000 and send the transport receipt to the purchasing company's Bank. This Bank will then forward the receipt to its client after debiting his account. Of course, not all companies agree to this sort of transaction. Indeed, Government purchase cannot be done this way – it operates on the basis of payment after 60 days.

Sometimes, the BP limit can be used for purchasing a bill for which payment will be received within the agreed 60 days, even though the transaction described above between the two Banks does not take place. In this case, the Bank must have an undertaking from the entrepreneur that the cheque for payment of the goods will be drawn against the Bank's name so that no-one else can cash the cheque.

Special facilities

Other special facilities are available in the working capital category but are not widely used. For example, packing credit can be made available to an entrepreneur in cases where bills issued to customers have been pending for a long time. There is a very high rate of interest on packing credit and Banks are reluctant to issue it at all because they feel the entrepreneur may become lazy in regard to chasing bills.

ANNEX VI: OPEN MARKET PRICES OF RAW MATERIALS 1973 - 1980
(Rs per tonne)

	Alloy Steel	Aluminium	Scrap Steel	Mild Steel
1973	2,500	2,000	600	1,500
1974	4,000	3,000	900	1,600
1975	5,500	4,500	1,000	1,800
1976	7,000	5,000	1,150	2,000
1977	8,500	6,500	1,350	2,200
1978	9,000	7,000	1,500	3,500
1979	11,000	12,000	2,000	4,200
1980	13,000	15,000	2,500	5,200

ANNEX VII: PROFILES OF SELECTED ENTREPRENEURS SPONSORED BY THE BISR CENTRE AT JAIPUR

Lumen Engineers

Mr Mathur of Lumen Engineers produces automobile reflectors. He started this line of production in the BISR building using a vacuum coating unit which was designed and fabricated with the help of BISR staff. Having ensured that the process was economic, he then used BISR facilities to make his own improved vacuum coating unit. This cost him 0.70 lakhs whereas an imported machine would have cost Rs 4 or 5 lakhs and would have resulted in his product being hopelessly uncompetitive. Mr Mathur attributes his success to this factor plus the fact that he had time to learn how to handle a business and build up his self-confidence while under BISR's wing.

Swastik Electronics

Mr Ramesh of Swastik Electronics produces television hardware. The most essential part of this production process is having good quality dies. The dies, costing about Rs 2 or 3 lakhs, were made in the BISR workshop for the entrepreneur. He could not have afforded to set up in this line of business if it had been necessary to pay to have the dies made. The dies remain the property of BISR and are rented by the entrepreneur. Mr Ramesh has now been waiting several months for supplies of cement to finish making the floor of his shed. Until this is done, he cannot use his own press and so BISR is assisting by allowing his workers to carry out production on the press in the central workshop. Without this assistance, there would be no turnover and Mr Ramesh would be unable to cover costs relating to rent, interest, etc.

Auto-Electricals

Dies have also been a problem for Mr Mehta who had just started his firm – Auto Electricals – which will produce electromechanical and electronic direction-indicating flashers for cars. In his case, there was a market waiting for as many items as he could produce and finance was readily made available. It was impossible however to find a private company which would undertake his 'small' order for production of the dies he needed. Although BISR had originally suggested that he should use a commercial die maker because this might prove quicker, the dies ultimately had to be made in the BISR workshop. Without this assistance, Mr Mehta would have been unable to start production.

Radetron

Finally, in the space of five years Mr Gupta and Mr Agarwal built up Radetron under BISR sponsorship from a makeshift unit producing a few voltage stabilizers to a flourishing business employing 20 people and with an annual turnover in excess of Rs 12 lakhs. The entrepreneurs attribute much of their success to the two and a half years they were being 'nursed' in the BISR building during which time they could iron out many problems and also build up their confidence to make decisions and take risks. They also feel that the use of BISR's name has helped in acquiring markets.[1]

[1] All the entrepreneurs use BISR's name for marketing purposes. However, BISR strictly monitors the quality of products and insists that entrepreneurs stop using its name if quality falls below standard.

ANNEX VIII: TOOL KITS GIVEN TO RURAL ARTISANS AFTER TRAINING

Pump mechanic tool kit

1. Hammer, 1 lb
2. Screwdriver, 8″
3. Cutting plier, 6″
4. Double-ended Spanner, 6 to 19 (6 pe)
5. Ring spanner, 24 × 26
6. Tabular spanner, 1/8 × 3/16
7. Tabular spanner, 1/4 × 5/16
8. Tabular spanner, 3/8 × 7/16
9. Tabular spanner, 1/2 × 9/16
10. Adjustable wrench, 12″
11. Clamp vice
12. Oil can
13. Pipe wrench
14. Hacksaw frame
15. Flat bastard file, 10″
16. Round 2nd cut, 10″
17. File handle
18. Flat chisel
19. Pin
20. Valve grinder
21. Grinding paste

    Socket handle to be made

Cycle-cum-fitter tool kit

1. Hammer, 1 lb
2. Screwdriver, 8″
3. Cutting plier, 6″
4. Adj. wrench, 12″
5. Vice, 3″
6. Oil can
7. Hacksaw frame
8. File, half round, 10″ 2nd cut
9. Handle
10. Wheel truing machine
11. Spanner wrench, 2 pc
12. Cycle foot pump
13. Big wrench for ball-bearing cup
14. Dumb-bell wrench
15. Spoke nipple key
16. Flat combination spanner
17. Flat chisel, 1/2″
18. Pin punch
19. Scissors
20. Rim straightener
21. Scale
22. Rail
23. Flat bastard file, 12″
24. Flat 2nd cut file, 6″
25. Triangular 2nd cut file, 10″
26. Round bastard file, 8″
27. Knife, 2nd cut, 6″
28. Half round, 2nd cut, 10″
29. File handle, large
30. Try square, 6″ master
31. Outside callipers, 6″, B
32. Inside callipers, 6″, B
33. Dividers, 6″, B
34. Jenny callipers
35. Steel scale, 12″
36. Tin cutter, 10″
37. Hand drill, 1/4″
38. File handle, small
39. Flat chisel, 1/2″

Additional tools

1. Flat chisel 1″
2. Pin punch
3. Hacksaws
4. 1/8″ Drill bits, 2 Nos
5. 3/16″ Drill bits, 2 Nos
6. 1/4″ Drill bits, 1 No

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