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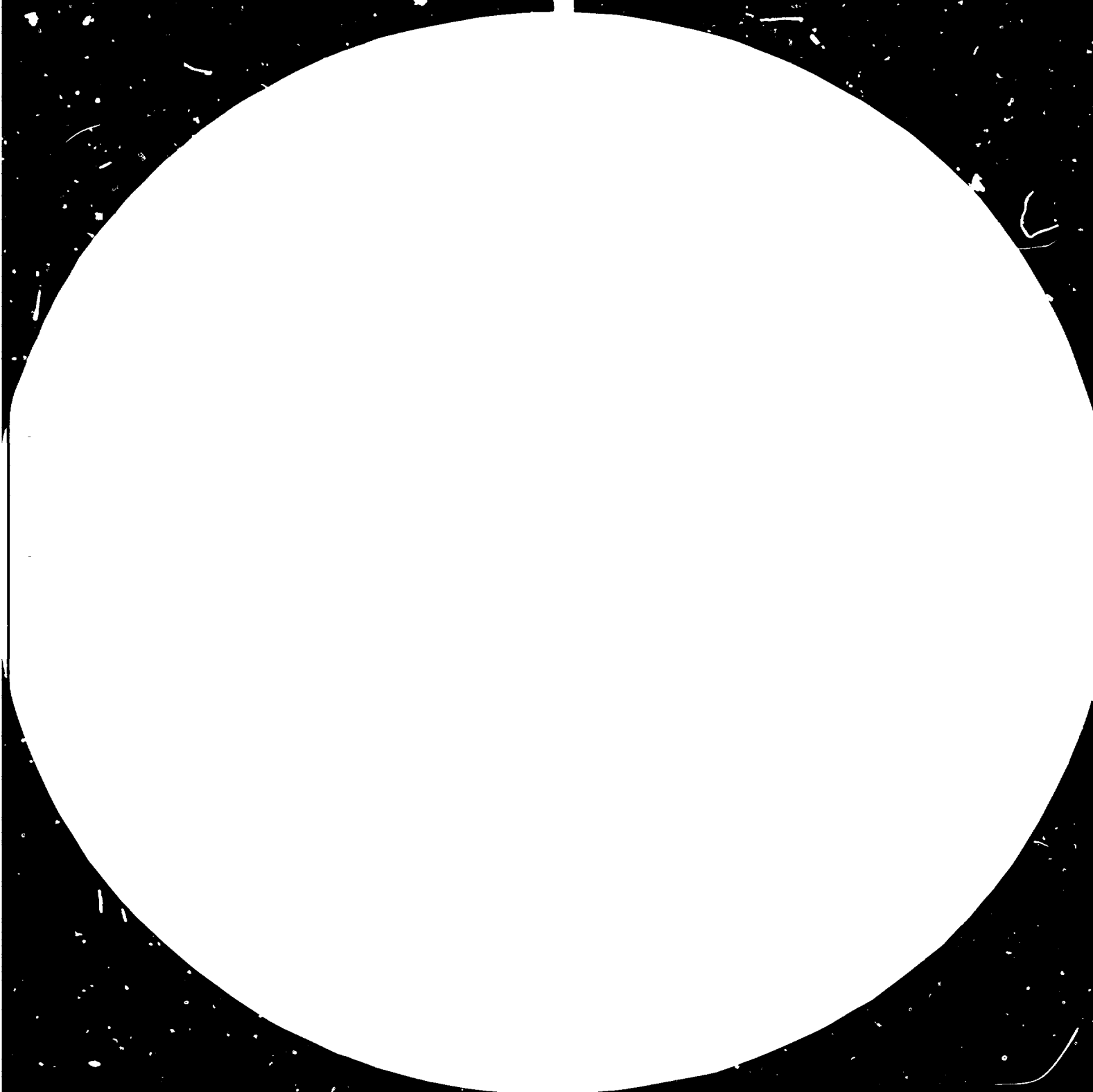

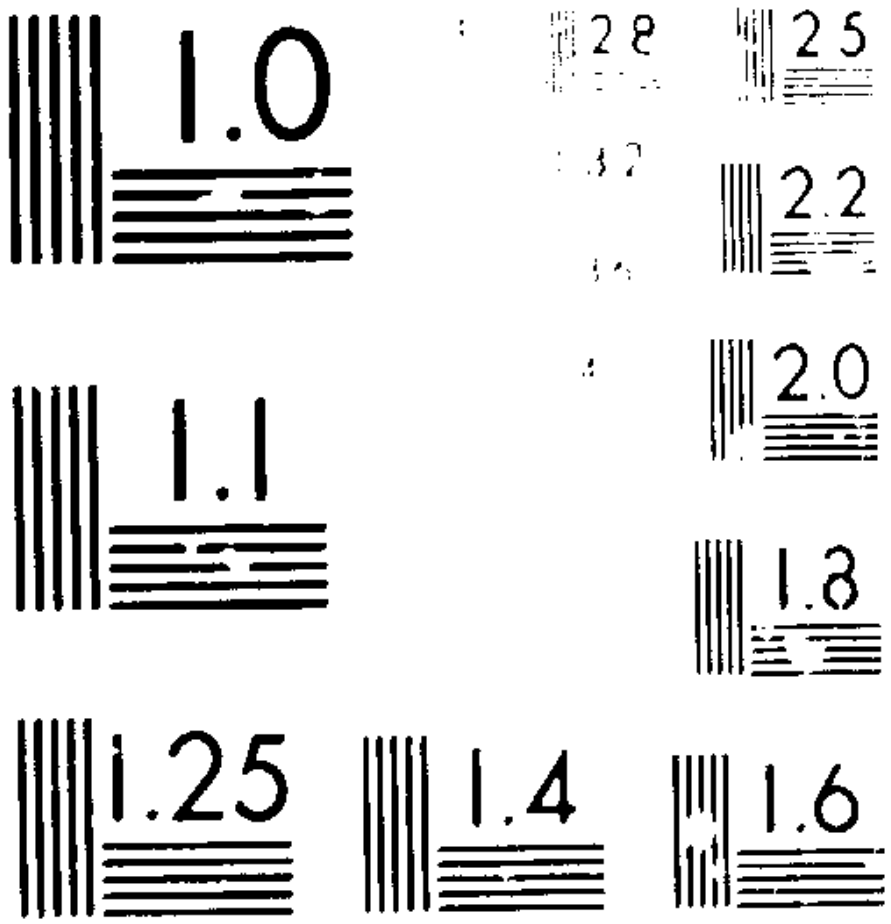
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Preparatory Meeting of Directors of
Industrial Development Finance Institutions (IDFI)
on the Creation of a Technological Information
Exchange Network (TIEN)

Bridgetown, Barbados, 26 - 28 January 1982

COUNTRY BRIEF: INDIA*

prepared by

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* The views expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. This document has been reproduced without formal editing.

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I. INDUSTRIAL DEVELOPMENT ACTIVITIES

1.01 The industrial financing system in India is a two-tier one comprising financial institutions at the national or all-India level and a variety of financing agencies at the state level. At the national level, the main purveyors of long-term finance to industry are: the Industrial Development Bank of India (IDBI) which is the apex institution, Industrial Finance Corporation of India (IFCI) and The Industrial Credit and Investment Corporation of India Limited (ICICI). In addition to these term-lending institutions, there are three other institutions namely, Life Insurance Corporation of India (LIC), Unit Trust of India (UTI) and General Insurance Corporation of India (GIC) which provide mainly investment finance to industry. Industry's need for working capital is mainly catered to by commercial banks which also provide small amounts of medium term finance. These institutions provide financial assistance in various forms such

as loans both in local currency and foreign exchange, underwriting of capital issues, investment in equity, guarantees etc. They cater to the Indian industry's requirement of funds for expansion, diversification, modernisation, exports etc.

1.02 With a view to primarily catering to the needs of small industries in different parts of the country, a network of state level financial and promotional agencies is set up. In addition to state finance corporations, most of the state governments have established industrial development or investment corporations to promote industrial projects. In order to cater to the multifarious needs of small borrowers, the all-India term-lending institutions have, through their joint effort, set up Industrial Technical Consultancy Organisations (ITCOs). Thus both qualitatively and in terms of geographical and functional coverage the institutional structure in India has developed fairly well during the last three decades. The combined sanctions of all the

financial institutions during the year 1979-80 (April-March) aggregated U.S.$ 2100 million.

1.03 An aspect of industrial financing in India, which deserves to be noted, is a fairly well-developed infrastructure of industrial services and equipment suppliers. Several consultancy organisations have developed an expertise in a wide range of industries, both in terms of basic engineering and design capabilities. The plant and equipment supplies, especially in industries which do not involve high and sophisticated technology such as textiles, cement, sugar, paper to name a few, are largely available locally. This supporting infrastructure has enabled an integration of domestic capabilities in various facets of technology and also made easy the task of evaluation of technological contents by DFIs. In fact in respect of industries referred to above namely, cement etc. it is likely that India would be a donor of technology.

After this brief description, let me turn to the subject matter of this meeting namely, evaluation of technology by Development Financing Institutions (DFIs).

II. CURRENT EXPERIENCES AND METHODOLOGY OF EVALUATION OF TECHNOLOGICAL CONTENTS OF PROJECTS

Technological Content

2.01 Before discussing current experiences and methodology of evaluation of technological contents of industrial projects adopted by the Indian DFIs, it would be appropriate to state the meaning of the term 'technological contents'. This term, from the point of DFIs, not only covers the conventional aspects of technological evaluation, namely, the choice and terms of technology transfer/procurement but also other aspects such as economic and financial implications of a technology.

Operational Constraints

2.02 In order to assess the role played by the Indian DFIs in matters pertaining to technology as defined in this paper, it would be useful to note that India is a planned economy. Planning

involves a certain degree of allocation of resources. In the case of a large majority of projects assisted by DFIs, the allocation mechanism operates through government sanctions for investment and imports. As a result, by the time a project approaches the DFI, the basic technological parameters get fixed. Moreover, several of the projects assisted by national DFIs are promoted by experienced entrepreneurs. Thus there is little scope for altering the choice at the stage when a client approaches DFI. However, DFIs carry out a thorough evaluation of the technology and risks associated with it with a view to suggest, to the extent possible, modifications which could be incorporated so as to safeguard the interest of the recipient and improve the terms of transfer.

The Appraisal Process

a) Appropriateness of Technology

2.03 The process of evaluation by DFIs also encompasses the appropriateness of technology in the

sense of it being suitable and efficient. DFIs evaluate particular technology taking into account risks involved on the one hand and absorption capacity of the client on the other. Further, aspects such as size, availability and nature of raw materials all have a bearing on technology in Indian condition because of simultaneous operation of a variety of sizes and process routes.

2.04 For example, chemical fertilisers are manufactured using naptha, fuel oil, natural gas and coal as feedstock. Soda ash is being produced from limestone and ammonia. Synthetic rubber is produced using alcohol as well as naptha. Apart from different process routes, DFIs are called upon to examine projects taking into account the availability and cost of alternate raw materials.

2.05 In the case of paper manufacture, a variety of raw materials - soft wood, bamboo, hardwood, straw and different combination of these - are used, partly due to the shortage of conventional raw material (e.g. softwood) and partly to decentralise the manufacture of paper. Suitable processes

are also adopted (e.g. mechano-chemical pulping process instead of kraft process) so that unconventional materials can be used.

2.06 DFIs in India have assisted projects of different sizes, often the primary justification for the small size being the use of locally available raw materials e.g., in the case of straw-based 'mini' paper mills and 'mini' cement plants.

b) Adaptation of Technology

2.07 Another feature of the Indian industrial scene is co-existence of imported technology especially in some areas of industry and indigenous technology in certain others. In many spheres of industry, equipment manufactures assisted by DFIs in the 1960s have developed skills and capacities not only to cater to virtually the whole of the domestic demand from end-user industries (e.g. cement, sugar) but are also exporting. In sum, over a period of years DFIs have assisted a large variety of industries involving new products, new

processes, new applications of products and the use of unconventional raw materials. Through the support of DFIs a spectrum of technological options haveemerged, DFIs not only taking risks inherent in the process but also fostering a regionally dispersed growth of industries.

c) Problems in use of Indigencus Technology

2.08 Two other aspects of DFIs role in technological choice deserve to be noted. First, DFIs have supported indigenous technologies in several areas of industrial activity. So far, however, technologies developed by national research organisations have met with limited measure of success because of hesitation on the part of industrial users. Several processes are not scaled upto plant level; whereas those which have been scaled upto that level are still looked at with some degree of uncertainity because of the absence of commercial protection.

2.09 In contrast, development of indigenous technology through in-house or co-operative R&D has met with a greater degree of success in chemical,

metallurgical and engineering industries. DFIs have encouraged the local development of technologies through gradual upgradation/ adaptation to the present day needs.

d) Improvement in Terms of Transfer

2.10 Another area in which DFIs have played an important role is improving the terms of technology transfer. Minimising the aggregate financial cost of obtaining technology is indeed one of the most important objectives. However, a technology available currently on best financial terms might not be the most suitable from the country's point of view. It might be obsolete and its returns to the economy might be low. DFIs in India have appraised technology transfer from these angles. They have also tried to improve these and other terms of transfer such as provision for an on-going relationship between donor and recipient so that the latter becomes beneficiary of the continuing R&D by the donor, provision for adequate training and involvement of technical staff of the donor and the recipient from inception till the plant comes into operation, clear

stipulation of raw material consumption and production norms, provision for trial runs and performance guarantees in detail. DFIs have advised clients to incorporate, in an unambigious manner, provisions to these effects in the legal documents signed by them. DFIs' efforts and expertise in this regard have been of particular value to medium and large companies importing new technology for the first time as well as in the case of repetitive imports of technology where recipient companies are advised to safeguard against some of the known weaknesses of the previous transfer experiences. A few examples where ICICI has perceived problems in technology transfer and has recommended steps to overcome the same are given in Annexure A by way of illustration.

2.11 It may be mentioned that the transfer of technology constitutes much more than transfer of drawings, supply of equipment and the exchange of documents. Therefore, DFIs have stressed the importance of contacts between the staff of donor

and recipient companies, assimilation of technological details by the recipient company, on-the-job experience, training for de-bugging of problems and trouble-shooting etc. DFIs have also attempted to assess capability of the donor to provide technology. It has been the experience of DFIs that drawing upon their pool of experience they have played a positive role in effecting the technology transfer.

e) Other Aspects of Appraisal

2.12 In addition to these aspects pertaining specifically to technology, DFIs also evaluate other related aspects such as adequacy, quality and prices of raw materials, especially in the case of raw material intensive industries. Availability of infrastructure, including power, energy efficiency and ecological aspects are some of the other technological contents evaluated by DFIs. Besides, conservation of raw materials, switch to non-traditional raw materials, recycling of waste, organisational and managerial aspects, marketing arrangements, etc. are some other aspects which are incorporated in a comprehensive system of project appraisal designed and developed by the Indian DFIs.

III. INFORMATION REQUIRED FOR TECHNOLOGICAL EVALUATION OF PROJECTS AND EXISTING GAPS IN OBTAINING INFORMATION

Information Needs

3.01 Before dealing with the question of information requirements and information gaps, as would be clear from the foregoing discussion, technological evaluation is much more than a comprehensive technical appraisal. While repetitive applications of technology might not seem to involve, *prima facie*, any serious problems, in practice it is seldom possible to transplant technology from one project to another without any changes. There are several parameters, not necessarily of a technical nature, which make each application of commercially tried out technology a different experience. Thus while technical data pertaining to technological matters are an important aid in appraising a project, they are not an end in themselves. While considering the question of information required for technological appraisal, this aspect needs to be borne in mind. It would be nevertheless useful to identify key information

required for appraisal of a project. The information which the Indian DFIs generally collate and analyse while appraising a project is indicated in Annexure B.

Information Gaps

3.02 Despite a diversified industrial base and fairly well developed supporting industrial services, the main gaps in data pertaining to evaluation of technology in India consist in limited information for an indepth analysis of alternate processes, sources of technology and of equipment etc. To an extent, this is a consequence of the fact, which was already stated, namely, in the Indian context DFIs are not the prime motive force in selection of technology, which is by and large fixed at the time of sanctions provided by government authorities. Partly it is also a result of the fact that several DFI clients are experienced and established. They themselves are in a position to evaluate technology, atleast in broad terms. All the same, as was mentioned earlier, DFIs have improved the terms of technology transfer and also, generally strengthened the absorptive

capacity and ability to make commercial use of technology.

Strengthening of Evaluation Capabilities

3.03 In order to improve effectiveness in performing their task, DFIs have endeavoured to improve their own staff capability. Since a number of projects are co-financed by DFIs in India, the technical staff of different DFIs has established an excellent co-ordination in appraisal of projects. Further, whenever felt necessary, advice is sought from outside experts. In sum, the Indian DFIs have developed a pool of expertise, in addition to collection of technical information, which is the mainstay of technological evaluation by DFIs.

IV. OUTLINE PROPOSAL FOR A TECHNOLOGICAL INFORMATION EXCHANGE NETWORK

4.01 While a close co-operation between all the financing agencies in India has obviated the need for a formal technological information exchange system, the experience of the Indian DFIs indicates that projects based on almost identical technologies and of the same size have had varied operational

results. This would suggest that technical information exchange network, however comprehensive it may be, cannot provide projects off-the-shelf. The limitation of the network would be still greater if it is required to act as a shelf of projects for use by various countries as some variations in even minor details (e.g. quality of raw materials, size of plant) may require adaptations and modifications. All the DFIs may not be equipped to appreciate these nuances of technology applications.

4.02 Since some of the issues involved in this regard and a possible course of action have been spelt out in detail in a separate paper submitted by me, I mention here briefly the main points. DFIs in each country should develop capabilities to evaluate alternative technologies. The technical staff of DFIs should keep in touch generally with technological developments especially in those areas of industry which are likely to absorb a significant portion of their resources. They

should also locate and enlist consultancy services in their own countries and in other countries especially the developing countries. To begin with, the TIEN could be a repository of such information. Its main role could be to facilitate and expedite bilateral negotiations between donors and recipients of technology, DFIs acting as intermediaries and playing an advisory role.

ANNEXURE A

PROBLEMS PERCEIVED IN TECHNOLOGY TRANSFER AND STEPS RECOMMENDED

Product	Problems perceived in technology transfer	Steps recommended
Anhydrous liquid Ammonia	i) There was no provision for training of local technicians in similar plants abroad.	i) The collaboration agreement was suitably amended to provide for adequate training.
	ii) Host company did not have a say in final vendor selection.	ii) Host company was involved in vendor selection.
	iii) The know-how was to be provided by three different parties and there was no comprehensive agreement tying up the responsibilities of each, which could have resulted in lack of co-ordination.	iii) A tripartite agreement with clearly defined responsibilities for the various parties was formulated.
Phosalone(technical) - pesticide	i) Phosalone was being introduced for the first time in India.	i) The company was asked to initiate seeding programmes.
	ii) The client had indicated that the plant could be used for manufacturing certain other pesticides, as a fall-back position, in case phosalone was not widely accepted.	ii) The proposal for manufacturing alternative pesticide was examined in detail and it was found that the process suggested by the collaborators was uneconomical, compared to other processes used in India.
	iii) The effluent treatment suggested by the collaborator was too sophisticated, elaborate and capital intensive.	iii) Biodegradation was suggested in place of incineration, which resulted in substantial saving in the project cost.
Newsprint using baggase	i) The process suggested was of relatively recent origin, yet to be proved commercially.	i) In view of the technological risks involved, representatives of DFI's and Indian consultants visited the plants abroad and carried our discussions with the plant representatives and foreign consultants.
	ii) The yields envisaged were not achieved in the two plants abroad where this process was used.	ii) Attempts to identify the causes for failure of the plants abroad were made.

Product	Problems percieved in technology transfer	Steps recommended
	iii) Four offers were received from international consortiums for providing the process know-how and plant & machinery. Proper evaluation of the offers was somewhat difficult, as the process was commercially not proven.	iii) The foreign collaborator was asked to establish the process parameters on semi-commercial pilot plant before undertaking detailed engineering.
		iv) Suitable performance guarantees were incorporated in the agreement.
Acrylic esters	i) Knowhow provided by the Indian promoter who had worked abroad in similar plants.	i) Before sanctioning assistance, the Indian promoter was asked to set up a pilot plant to establish the process.
	ii) The process proposed to be adopted in India was identical to the one prevailing abroad, ignoring local conditions and local materials.	ii) Results of the pilot plant were vetted by an independent consultant.
Carbon black	i) The plant was designed with low sulphur heavy stock (LSHS) as fuel since gas was not available. However, the performance guarantees and consumption norms indicated by the collaborator were based on gas fuel and for one particular type of feed stock only.	i) The collaborator was asked to confirm suitability of the process for using raw material available locally.
		ii) The collaborator was asked to suitably modify the performance guarantee clause for using LSHS as fuel.
		iii) The collaborator was requested to provide continuous assistance for updating/modifying the process, for different types of feedstocks/fuels.

Product	Problems perceived in technology transfer	Steps recommended
XLPE Cables	i) The collaborator had offered steam curing process for curing the XLPE compound. A doubt was expressed about the likely obsolescence of the process in view of more modern curing processes developed.	i) The process suggested by the collaborator was critically examined by a panel of experts who felt that the process could be used without affecting quality of the cable.
	ii) The training programme suggested by the collaborator was quite extensive in relation to the technology involved, which inflated the project cost significantly.	ii) The training programme was recast suitably.
Silicones starting from methyl chloride and chlorosilanes.	i) Knowhow developed locally, on a bench scale.	i) The company was asked to enter into an agreement with the engineering firm for properly defining the scope of services.
	ii) Pilot plant was developed by an engineering firm which was involved in doing the detailed engineering for the commercial scale plant.	ii) Necessary performance guarantees were incorporated in the agreement with the consultant.
	iii) There was lack of co-ordination and no performance guarantees and consumption norms were given.	
Semiconductor power devices	i) Very sophisticated technology involved.	i) Period of training at the collaborator's plant was extended to ensure proper assimilation.
	ii) High obsolescence rate for the product.	ii) The collaborator agreed to provide continuously updated technology during the currency of agreement to safeguard against obsolescence.

Product	Problems perceived in technology transfer	Steps recommended
	iii) DFI did not have adequate experience of the industry.	iii) The proposal was vetted by a committee of experts.
	iv) Capacity of the economic size of the plant, much in excess of local demand.	iv) The product-mix for buy-back was modified to include high value products, which improved the profitability of the project.
	v) The collaborator had agreed to buy 75% of the production. However, the product-mix for buy-back initially included mainly low value products.	
Wristwatches	i) The collaboration agreement covered only mechanical watches. It was felt that electronic analog watches were likely to have larger market share in future.	i) The knowhow for electronic analog watches was included in the scope of the agreement.
	ii) The entire equipment was supplied by the collaborator, which included second hand machines.	ii) The collaborators provided performance guarantees for the second hand machines, for a period of ten years.
	iii) DFI did not have adequate experience for evaluation of the project.	iii) The proposal was vetted by a panel of experts.

Product	Problems perceived in technology transfer	Steps Recommended
Ferro Alloys	i) The proposed process for refining was tried on pilot plant scale only.	i) Suitability of the process for local raw materials was to be established a priori.
	ii) There was no separate agreement for transfer of technology. The technology was built into the equipment.	ii) Performance guarantees were sought from the supplier of equipment.
Ball Bearings	i) In view of the sophisticated technology involved, difficulty in absorption of technology was expected.	i) Training programme was strengthened.
	ii) Equipment selection was done by the host company's technicians. Adequacy of theequipment selected was to be established.	ii) Prior approval from the collaborator for the equipment selected was sought.
	iii) No performance guarantees.	iii) The collaborator was asked to provide performance guarantees.
High Tension Insulators	i) The technical know-how was to be provided by an individual with experience in operational aspects of the plant only.	i) A supplementary agreement was signed for providing training to Indian technicians at plants abroad.
		ii) The collaborator was asked to establish the process parameters on a pilot plant.
		iii) [illegible]ment of a part of the know-how fee was deferred till successful operation of the plant.

ANNEXURE B

CHECKLIST OF INFORMATION FOR TECHNICAL APPRAISAL

a) Technical

i) Product :
- Uses.
- Need for.
- Features.
- Substitutes..
- Obsolescence.

ii) Process :
- Alternate processes available.
- Basis of selection and appropriateness.
- Process flow-chart, parameters, balances.
- Experience of other users, locally or abroad, with the process.

iii) Technical Arrangements :

1) Know-how -
- Source of technology.
- Basis of choice.
- Details of donor covering activities, size, turnover, financial performance, experience in providing technology abroad, R&D strengths.
- Terms covering know-how fees, royalty, financial participation, assistance to be provided in process, equipment selection, plant design, benefit of continued R&D efforts.
- Norms of production, trial run details, performance guarantees.

2) Consultancy Services -
- Comprehensiveness of terms of reference and scope of services.
- Evaluation covering, staff available and capability, previous assignments in similar industry, experience of other clients, reasonableness of fees payable.

iv) Plant and Machinery : Availability.
Experience of equipment suppliers.
Capability of equipment suppliers.
Basis of selection, whether through advice from collaborators, turnkey contractors, consultants, or in-house.
Competitive bids.
Obsolescence.
Overall performance capability of the plant and capacity balance.
Government policies if imported.

v) Raw Materials : Suitability.
Availability.
Adequacy.
Quality.
Prices.
Government policies if imported.

vi) Utilities : Availability.
Adequacy.
Price.

vii) Ecological Impact : Nature and analysis of effluents.
Statutory requirements regarding treatment.
Adequacy and arrangements made for treatment.

viii) Skills Required : Requirement of work force, work force skills, availability, arrangements for training.

ix) Organisation : Requirement of managerial staff for implementing and operating project.
Availability of staff.
Supplementary training.

b) Financial

i) Profitability : Inputs required and costs.
Outputs prices.

ii) Returns and Capital Service-ability : Financial structure.
Return on equity, return on investment, discounted rate of return.
Debt Service.

c) Socio-Economic

i) Employment potential - direct
- indirect

ii) Foreign exchange earnings/savings.

iii) Linkage effects - backward, forward linkages.

iv) Use of waste resources/conservation of scarce resources.

v) Skill development.

vi) Regional development.

vii) Social cost/benefit analysis -

economic rate of return
domestic resource cost.