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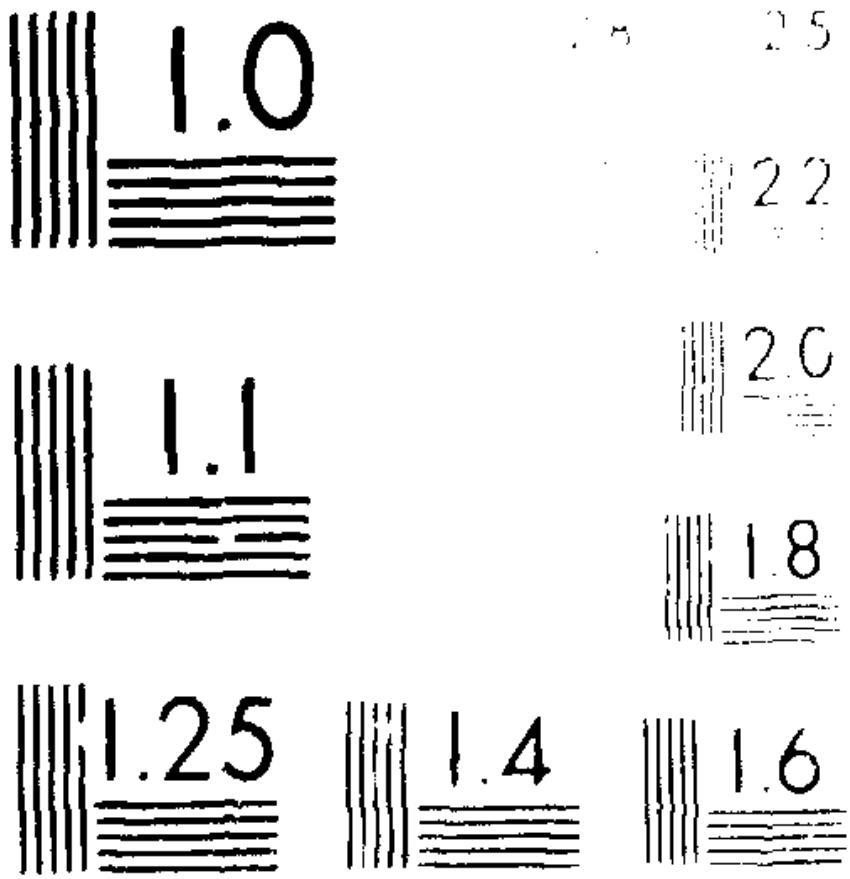
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org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Feasibility Study
for
Production of
HIGH DENSITY POLYETHYLENE PIPES
in
BHUTAN

11870

Prepared by

POLYOLEFINS INDUSTRIES LIMITED
Mafatlal Centre, Nariman Point,
BOMBAY-400 021. (India)

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1982

FEASIBILITY STUDY

FOR

HIGH DENSITY POLYETHYLENE (HDPE) PIPE PRODUCTION

IN

BHUTAN

DP/BHU/80/004

PREPARED BY

POLYOLEFINS INDUSTRIES LIMITED
MAFATLAL CENTRE
NARIMAN POINT
BOMBAY - 400 021

UNDER THE TERMS OF AGREEMENT DATED 29TH JUNE 1981
WITH UNITED NATIONS INDUSTRIAL DEVELOPMENT
ORGANIZATION, VIENNA

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EXECUTIVE SUMMARY

1. GENERAL :

Polyolefins Industries Ltd. submitted a proposal for carrying out a Techno-Economic Feasibility Study for High Density Polyethylene (HDPE) Pipe Production in Bhutan to United Nations Industrial Development Organisation (UNIDO), Vienna, in April, 1981. The details of the scope of study are as per our letter No. P:SALES dated April 24, 1981. This proposal was accepted by UNIDO vide their Purchase Order No. 15-1-0038, Con. No. T 81/36 of 29th June, 1981.

2. PROJECT BACKGROUND AND HISTORY :

Bhutan, traditionally an agricultural country, has taken initial steps towards industrial development. The country is in the process of formulating various policies for investments in industry and also in the process of development of infrastructure required for such industrial development.

Out of 5,000 villages in the country, hardly 10% of the villages have the facility of safe drinking water. Therefore, the Government of Bhutan has drawn up a massive plan to provide safe drinking water to almost all the villages by the end of the decade. All the water supply schemes are designed based on HDPE piping material which is presently imported and as such, it was considered to evaluate the feasibility of putting up a manufacturing unit for HDPE pipes in Bhutan.

The proposed project is basically a domestic market-oriented one and the entire production is expected to be used for various water supply schemes in the country. The important factor to be considered is that most of the water supply schemes are funded by various aid agencies and the purchases are

effected on international bidding. The proposed unit will have to compete in such international bidding on prices and quality of finished goods, which is not difficult if proper technology and equipment are selected. However, if an assurance to use the pipes manufactured by the proposed unit, subject to quality standards, is forthcoming, it will go a long way.

The economic and industrial policies are in the process of being evolved and each unit is governed by the approvals granted. Needless to mention, the proposed project will have favourable governing policies as the same is part of socio-welfare schemes and is expected to be a Government-owned project. General guidelines for economic and industrial policies as prevailing are quite favourable.

The prime factor that goes in the background of this project is delay in execution of various schemes at present, because of the following two factors - (a) long waiting period for pipes between order and delivery; and (b) rising costs of freight.

3. MARKET AND PLANT CAPACITY :

General market survey for HDPE pipes in Bhutan indicates that there is no other significant market except water supply schemes. Over a period of time, other segments of the market as discussed in the report can be developed. Technical services for installation, after sales, is an important aspect in this project. Besides this, no special marketing strategy is envisaged.

The estimated total market and expected share of the proposed unit is given below :

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Year	Estimated total market (MTA)	Expected share (MTA)
I	510	300
II	640	550
III	750	750
IV	860	800
V	920	810

Based on the above demand estimate, the annual production programe is formulated. It should be noted that production of HDPE pipes involves scientific planning as different sizes and different pressure ratings of pipes are required at the same time in the market. This calls for a proper production planning. Since changes from one size to another size do not involve much down-time, it is desired that production programmes should be made for every fifteen days. While doing production planning, available inventory, inventory levels, and expected market requirement are to be considered. We have formulated an annual production programme for five years which is summarised below :

Year	Annual Production (MTA)
I	367
II	645
III	871
IV	931
V	931

To meet the above production requirement, we have recommended installation of 3 extruders to start with and addition of one more extruder in the third year. The recommended plant capacities are as under :

Year	Capacity (MT)
I	675
II	675
III	950

4. MATERIALS AND INPUTS :

The only raw material required is High Density Polyethylene (HDPE) and is available from India as well as from the international market. The price comparison is in favour of purchasing the same from the international market and we recommend that it will be advantageous to buy the raw material from the international market.

In the extrusion process, continuous, stable, uninterrupted power supply and water are the two main utilities required. Our analysis of the recommended site indicates that the utilities will be available in required quantities.

Various auxiliary materials and factory supplies are available in Bhutan. Only one or two items, such as Silicone Grease would be required to be imported from India.

The total requirement of HDPE for the recommended production programme is given below :

Year	Qty/MT	Value/US$ (000)
I	335	402
II	568	682
III	794	953
IV	850	1,020
V	850	1,020

Requirement of auxiliary materials and factory supplies is considered @ 1% of sales revenue based on our own experience. Since there are many small items required in production, packing, maintenance, etc. it is not considered necessary to list them at this stage in this report.

As regards power and water requirement, the consumption norms are one kwh per kg. and 25 M^3 per tonne respectively. The estimated requirement of these utiiities are as under :

Year	Power		Water	
	Kwh	'000 US$	M^3	'000 US$
I	367,000	26	9,175	1
II	645,000	45	16,125	1
III	871,000	61	21,775	1
IV	931,000	65	23,275	1
V	931,000	65	23,275	1

5. LOCATION AND SITE :

Most of the industrial development in Bhutan is in the plains like Gaylephung and Phuntsholing, where infrastructural facilities are being developed. Keeping in view the infrastructural requirement and giving emphasis to the requirement of uninterrupted power, we recommend Gaylephung as suited site for the proposed project.

6. PROJECT ENGINEERING :

The layout proposed is based on recommended plant capacity. Requirement of built-up area for plant and office works out to 1,100 sq. metres. Based on our survey, we anticipate the construction cost of approximately US$ 100/- per sq. metre and expected time required for civil construction is of 9 months.

The Extrusion Process Technology involved in the proposed unit is available from West Germany, Finland and India. For socio-economic reasons, we have recommended Indian technology available from M/s. Polyolefins Industries Ltd. and also Indian equipment. It may be added here that since the market requirement of pipes does not exceed beyond 90 mm OD, the Indian equipment are more suited from the angle of cost benefit of initial investment and also operating and maintenance costs.

7. PLANT ORGANISATION AND OVERHEAD COSTS :

Since this is a project having a ready local market, technology is the main cost component. Hence, "Production Cost" is going to be an important cost factor. Marketing, Finance and Administration are the basic need of any production unit. Out of this, administration and finance will form part of the overhead cost.

In our study, we have designed the following cost centres :

i. Production
ii. Marketing
iii. Finance and Administration

8. MANPOWER :

Most of the requirement of manpower can be made available locally. The necessary training can be imparted by the delegates of technical collaborators. However, we strongly recommend requirement of the following delegates from the collaborators :

i. General Manager - For 3 years

ii. Technical Service Manager - For 3 years

iii. Production In-charge - 2 delegates for 2 years.

The total manpower requirement in the first phase is 50 and after expansion, it is 59.

We recommend nomination of the local General Manager and Technical Service Manager in the beginning of the third year to work as under-study for six months at the collaborator's plant and for six months at the local unit.

9. IMPLEMENTATION SCHEDULE :

The commercial production shall commence in the 15th month from the date of decision to invest. From our experience, we do not anticipate any unforeseen delays in implementation. However, proper planning and control on execution is a must for any timely execution of the project. The critical areas are delivery of plant and equipment and construction of plant building.

10. FINANCIAL AND ECONOMIC EVALUATION :

The summarised table for total investment is given below :

		Local ('000 US$)	Foreign ('000 US$)	Total ('000 US$)
1.	Land Development	30	-	30
2.	Civil Works	88	22	110
3.	Technology Cost	29	120	149
4.	Equipment	-	276	276
5.	Pre-Production Capital Cost	54	-	54
6.	Furniture, etc.	10	-	10
	Total Fixed Investment	211	418	629
7.	Working Capital	185	45	230
	Total Investment	396	463	859

The total investment is proposed to be financed as under :

	'000 US$
Equity Capital	125
Borrowings from Bank	734
Total :	859

It is to be noted here that there are no specific public policy and regulations on financing the projects in Bhutan. In addition, all the financing is done by Government for the Project. There exist no financing institutions in this country.

The financial analysis is carried out based on the financing pattern given above. The results are presented below :

i.	Break-even point	:	65%
ii.	Net Present Value ('000 US$)	:	1451
iii.	Pay-back period	:	19 months
iv.	Average Return	:	89%
v.	Gross Profit: Sales(%)	:	42
vi.	Net Profit : Sales(%)	:	40
vii.	Net Profit : Equity(%)	:	772
viii.	Foreign Exchange Savings:		8,530 T. US$

The above results are average of five years' operations. The summarised statement of production and manufacturing cost are as under :

('000 US$)

	Year I	Year II	Year III	Year IV	Year V
Factory Costs	551	898	1,218	1,303	1,309
Management & Marketing Cost	63	79	105	58	61
Operating Cost	614	977	1,323	1,361	1,370
Financial Cost	32	45	-	-	-
Depreciation	151	108	100	72	53
Total Manufacturing Cost	797	1,130	1,423	1,433	1,423

11. CONCLUSION :

The project will fulfil the socio-economic need of providing safe drinking water to the rural and urban population of Bhutan. This will eliminate the possibility of spreading water-borne health hazards.

The project will bring a sophisticated technology into the country and will provide employment opportunities to Bhutanese educated talents at different levels for running an industry.

The major advantages can be listed as under :

(a) Foreign exchange saving of a high magnitude
(b) Profitable venture
(c) Development of skilled manpower

However, the following drawbacks also need careful consideration :

(a) The project depends on only one market segment.

(b) It is presumed that the rural/urban water supply piping systems will continue to be designed with HDPE pipes as material of construction.

This project has a very high degree of probability of implementation for the following reasons :

(a) The required technology, raw material and equipment are available.

(b) Market is available readily.

(c) Very sound financial project.

(d) Provides direct and indirect employment opportunity for the local people; and

(e) Saves very precious foreign exchange.

* * *

CHAPTER - 1

PROJECT BACKGROUND AND HISTORY

1.1 PROJECT BACKGROUND :

The need for local manufacture of High Density Polyethylene (HDPE) pipes in Bhutan is felt to meet the internal requirements for Rural Water Supply Schemes.

Bhutan Government is very keen to cover all their villages with the piped water supply schemes. As of today, out of 5,000 villages, only 248 villages are covered with water supply schemes by the end of Fourth Five Year Plan. 1981-82 was a Plan Holiday period and the Fifth Plan has started effective April 1, 1982.

Due to inbuilt advantages of HDPE pipes, particularly in the hilly terrain, extensive use of HDPE pipes for the Rural Water Supply Scheme was found during various visits conducted. However, it was noted that except in one case, all the Urban Water Supply Schemes are using GI/CI pipes.

Based on discussions with Engineers of the Public Works Department, Bhutan, the following advantages of HDPE pipes make them the most ideal piping material as compared to the conventional pipes for water supply schemes taking into consideration the terrain of that country :

(a) With 0.955 GM/CC density, HDPE pipes are light in weight which reduces transport cost of the piping material.

(b) HDPE pipes are flexible and pipes in diameter upto 90 mm (ISO Standards) can be easily coiled in 50 meter to 200 meter coils, thus reducing the jointing cost and installation time.

.. 2

(c) HDPE pipes have proved the most suitable piping material in hilly and mountainous terrain because they can take the shape and contour of the terrain without the need for additional fittings, such as bends, etc.

(d) HDPE pipes can be used for temperatures as low as (-) 40°C. Even if water freezes inside the pipeline, it has been observed that pipes do not burst because of high flexibility.

As mentioned above, all the rural water supply schemes have HDPE pipes as the base material of construction. These schemes are designed by the Engineers of Public Works Department, Government of Bhutan, under the technical guidance of UNICEF.

The requirement of HDPE pipes for the Fifth Plan period was drawn out. Based on this requirement, it was thought necessary to evaluate the feasibility of manufacturing HDPE pipes in Bhutan itself, since imports of such hugh quantities involves the outflow of foreign exchange to the tune of US$ 2.5 million per year and in addition, timely delivery was a continuous problem.

1.2 ECONOMIC AND OTHER POLICIES :

Bhutan has a population of approximately 1.20 million. Traditional Chinese, Buddhist, Indian and Western cultures are prevalent in the country.

Agriculture is the main livelihood of the people, though cultivation is only restricted to the stripe of plain land in Southern and Eastern parts of Bhutan.

Initial steps towards industrial development in Bhutan has started on a major scale. Handicrafts, food processing, distilleries are the main industries in the country at present.

The Government of Bhutan is in the process of formulating various industries into categories such as Small Scale (capital investment of Ng 1 lakh to Ng 15 lakhs), Medium Scale (capital investment of Ng 15 lakhs to Ng 25 lakhs) and Large Scale (capital investment of above Ng 25 lakhs). Predominantly, industrial development in Bhutan is introduced in plains like Gaylephung, Phuntsholing, Samchi, Chuka, etc., where efforts by the Government have been made to develop infrastructural facilities.

Some of the social development schemes in the country are also being undertaken by United Nations Organizations like UNDP, UNIDO and UNICEF, who are financing as well as undertaking various developmental schemes.

Bhutan is following the Five Year Plan system and the administration is in the process of decentralisation at present. They have recently completed the Fourth Five Year Plan and the present period, i.e. April, 1981 to March, 1982 has been declared as a long Plan Holiday. The Fifth Five Year Plan will commence effective April, 1982. Complete decentralisation will come into effect at the end of this long Plan Holiday and all 'Dzongda' or District Heads shall be vested with administrative powers, including powers for purchases. This system is expected to help Bhutan to build up several self-sufficient districts.

Each District Head shall take full responsibility in implementing the Plans for which the necessary guidance and finance shall be provided by the Royal Government.

Most of the fiscal policies and industrial licensing policies in Bhutan have been derived from the British system with necessary native changes. It has been given to understand that there will be no Excise Duty on production of HDPE pipes.

However, there will be a Sales Tax on the sales of HDPE pipes at the rate of 5%. The following will be the fiscal outflow for the project that is being studied :

(a)	Trade Income Tax :	$\frac{7}{8}$ of turnover
(b)	Profits Royalty :	1% of Profit
(c)	Health Tax :	1.2% of turnover
(d)	Industrial Registration Cost:	3 to 4% of capital investment.

1.3 PROJECT PROMOTER :

The Government of Bhutan is facing considerable difficulty in raising foreign exchange and technical know-how for solving water supply in the country and hence, requested UNDP/ UNIDO assistance in the field. Preliminary discussions have already been held with UNDP and UNIDO and a decision has been taken to carry out a full-scale feasibility study to evaluate the possibilities of production of HDPE pipes in the country.

In Bhutan, the private sector is not allowed to retain more than 20 per cent of the shares of any joint venture industrial unit. While working out the detailed financial studies of this project, we have taken the following financing pattern based on our discussions with the Industries Department :

(a) 20% of the fixed investment from local partner.

(b) 80% of the fixed investment from Royal Government of Bhutan.

(c) Working capital requirement from Royal Government of Bhutan.

For the financing cost on total investment (fixed investment and working capital), we have assumed 16 per cent rate of interest.

1.4 HISTORICAL BACKGROUND :

In Bhutan, M/s. Deki Polyethylene Products is manufacturing HDPE pipes at Gaylephung with an installed capacity of 100 MT/ annum. However, due to non-availability of good technology and poor performance of equipment, they were not able to manufacture quality pipes. At present, their plant and equipment are under modification which will enable them to achieve installed capacity.

Government of Bhutan and the various world aiding agencies involved in various social welfare schemes have observed that the supplies of imported HDPE pipes were erratic because of the following two factors :

(a) rising cost of transport; and
(b) long waiting period between order and delivery.

These factors have led the authorities to look into the feasibility study and economics of manufacturing HDPE pipes internally to meet their requirement of these pipes.

* * *

CHAPTER - 2

MARKET AND PLANT CAPACITY

2.1 DEMAND AND MARKET STUDY :

HDPE pipes can be used for the following applications in Bhutan :

(a) Rural and Urban Water Supply Schemes
(b) Farm Irrigation
(c) Sewerage Disposal Schemes
(d) Bio Mass Gas Pipes
(e) Telephone Cable Conduits

Even though at present the use of HDPE pipes is only in Rural Water Supply Schemes, it is gathered that the other applications can be explored once the local manufacture of pipes commences.

We have studied the requirement of pipes for rural and urban water supply schemes in the country. Based on these studies, the demand projections for HDPE pipes of various diameters are worked out considering the following factors :

(a) Cost - benefit analysis vis-a-vis GI pipes
(b) Technical Superiority
(c) Local availability.

This data is further used to project the possible market penetration of HDPE pipes by the proposed unit. These market projections are then used for determining the plant capacity.

In the following paragraphs, application of HDPE pipes and market estimates are discussed.

2.1.1. RURAL WATER SUPPLY :

Based on the Public Works Department figures, Bhutan has got approximately 5,000 villages scattered in hilly and plain areas. Rural Water Supply Schemes were first introduced in 1974. They were started as a joint venture of UNICEF and PWD, Bhutan, with 14 experimental schemes. Ever since that time, all Rural Water Supply Schemes have been worked out jointly by UNICEF and PWD, Bhutan, for the entire country. In implementation of these schemes, UNICEF takes the responsibility of material procurement and financing whereas the installation of piping material is carried out departmentally by PWD, Bhutan, under UNICEF's guidance. UNICEF is procuring the material through its Procurement and Programme Section at New Delhi.

a. Fourth Five Year Plan Retrospect :

The Fourth Five Year Plan which ended in March, 1981, had a target for completion of 328 Rural Water Supply Schemes for an equal number of villages. Out of the 328 targeted schemes, at the end of the Fourth Plan, 248 schemes had been completed by UNICEF and PWD. As per the Department officials, the reason, for only 65 per cent achievement, was primarily inadequate and delayed supply of pipes. Based on UNICEF recommendations, only HDPE pipes are used in all their Rural Water Supply Schemes, except in the exposed sections of the schemes where GI pipes were used since the pipes had to be laid above ground.

Annexure - 2.1 gives the purchases of HDPE pipes during the Fourth Five Year Plan. All the Rural Water Supply Schemes executed in the Fourth Five Year Plan are mainly in Eastern and Southern Bhutan. A brief description of an average scheme is given below :

Source	:	Perennial streams, rivers
Supply	:	Gravity flow
Available head	:	30 M - 150 M. Ave. 60 M.
Water treatment	:	Nil
Storage arrangement	:	Reservoirs - mainly surface/ overhead
Average length	:	5 Kms.

b. Fifth Five Year Plan :

Salient features of the Fifth Five Year Plan for Rural Water Supply Schemes are given below :

Total number of villages	:	5,000
Per capita requirement of water	:	45 litres per day
No. of persons per household	:	4 to 10
No. of households in a village	:	20 to 30
Average population in a village	:	200
No. of schemes planned to be covered	:	1,500
Pipes to be used	:	All HDPE except GI pipes for exposed portions.

Annexure - 2.2 gives the phase-wise and village-wise planned execution of the Rural Water Supply Schemes in the Fifth Five Year Plan.

Annexure - 2.3 gives the requirement as drawn out jointly by UNICEF/PWD, Bhutan, for HDPE pipes to achieve the targeted coverage of villages. It is expected that all the villages in Bhutan will be covered by the end of The International Drinking Water Supply and Sanitation Decade, as declared by the United Nations.

c. Special Features of Rural Water Supply Schemes :

In Rural Water Supply systems already installed, the usage of Hydraulic Ram is encountered in less than 1 per cent of the cases. For example, out of the total 200 schemes completed by the fourth phase of the Fourth Five Year Plan, only in one case a Hydraulic Ram was used. However, Hydraulic Rams are used for forcing water from the streams to the distribution network where the available head at the suction point is inadequate. Such usage has been found in approximately 10 per cent of the total number of Rural Water Supply Schemes. Use of pressure-break tanks is found in 20 per cent of the schemes. In some places, the pressure-break tanks have been eliminated by using small lengths of GI pipes in plance of HDPE pipes.

Based on the above data, estimated pipes requirement of different sizes for the Rural Water Supply Schemes in each phase of the Fifth Five Year Plan are given in Annexure - 2.4.

2.1.2. URBAN WATER SUPPLY :

Urban Water Supply Schemes were started in Bhutan in the year 1961. Phuntsholing was the first town to have piped water supply system. Urban Water Supply installations are carried out departmentally by Bhutan PWD. At present, 13 major townships in Bhutan, out of 21 major townships, have piped water supply schemes.

Till the completion of the Fourth Five Year Plan, only GI and CI pipes were used for these schemes. Only in one scheme use of HDPE pipes was considered.

Discussions with PWD officials present a positive picture for utilisation of HDPE pipes in these schemes. The performance of HDPE pipes and the cost advantage over conventional

pipes based on the experience of Rural Water Supply Schemes will be factors in favour of HDPE pipes.

Annexure - 2.5 gives the details of various piping materials used for the Urban Water Supply Schemes completed in the 13 major townships.

Annexure - 2.6 gives the population details of the townships for which water supply through pipeline distribution is yet to be provided.

Annexure - 2.7 gives the GI and CI pipes purchased for Urban Water Supply Schemes during 1977-81, and converted to the equivalent HDPE tonnage.

Based on the available data, it is projected that each township will require approximately 15 MT of HDPE pipes. Thus, the total quantity required for the remaining townships will be approximately 120 MT of HDPE pipes. (Total Fifth Five Year Plan period).

2.1.3. SEWAGE DISPOSAL :

All the towns in Bhutan have the sanitary system at present. In the year 1974, a proposal for a sewage system for Thimpu town was submitted to UNICEF alongwith design comprising of RCC pipes of various diameters, The proposal involving an expenditure of Ng 60 million (US$ 6.0 million) is awaiting approval of UNICEF for financial assistance.

Though some quantity of HDPE pipes will be used in this application, in our studies it is not considered as it may be required only after the Fifth Five Year Plan.

2.1.4. FARM IRRIGATION :

In cultivable land in Bhutan, the distribution of crops is dependent upon the altitude and prevailing climatic conditions. The main crops, in general, are barley, wheat, potatoes, maize, etc.

Scientific irrigation was started in Bhutan by the Agriculture/ Irrigation Department in 1961. At present, the Agriculture Department, which is divided into seven sub-divisions, supplies the pipes free of cost to the farmers. The installation jobs and maintenance of these pipes are done by the individual farmers with assistance of local agencies.

The department has been able to cover approximately 70,000 acres of land under irrigation during 1961 to 1981, of which approximately 20,000 acres had been covered during the Fourth Five Year Plan.

In 1978, M/s. Deki Polyethylene Products did pioneering work in HDPE pipes for irrigation in Bhutan. However, it seems that HDPE pipes did not become popular due to non-availability of quality product and lack of training for installation and maintenance. As per planned estimates, approximately 15,000 acres more land will be covered during the Fifth Plan.

To project the possible demand, we have considered the fund allocation for this department in the Fifth Five Year Plan. Based on this allocation, it is possible to project requirement of approximately 15 tonnes of HDPE pipes per year during the Five Year Plan period.

2.1.5. BIOMASS GAS DISTRIBUTION, CABLE CONDUIT AND OTHER APPLICATIONS

HDPE pipes can be used for Biomass Gas distribution. In Bhutan,

such gas distribution pipe lines can be considered in tea estates. This application can be explored only after initial start up since cost of selling is higher and involves technical service.

Cable Conduits made from HDPE pipes can be produced in any required length. While installing gas or water mains, an additional number of conduit lines can be laid down at the same time for future use. When required, it is possible to introduce cable in a simple manner through these lines without any new construction work.

This application needs intensive efforts and hence in our study we have not considered it as an important factor for decision-making.

In addition, some small quantity of pipes would be required for :

(a) Effluent disposal systems
(b) Construction water lines.

We have assumed a very moderate quantity of 25 MT per year in the Fifth Five Year Plan period for all applications covered in this para.

2.1.6. EXPORTS :

There is some demand for HDPE pipes in the North Eastern region of India and also in Nepal. These pipes are extensively used for UNICEF-aided water supply schemes in these areas since the terrain and other parameters make the product an ideal piping material in these areas for water supply. However, possibilities of penetration in this segment are not considered in this study for the following reasons :

(a) The project is primarly considered for internal requirements of Bhutan.

(b) There are nineteen manufacturers of HDPE pipes in the Eastern region of India, with an annual installed capacity of 8880 MT. Annexure - 2.8 gives the list of these manufacturers and their individual installed capacities. However, it has been observed that these manufacturers use rework raw material or raw materials that are sub-standard, consequent upon which pipes manufactured are not of the required technical specifications. This factor will give opportunity to the proposed unit for export to this part of India mainly in UNICEF-aided programmes. Nevertheless, this has not been considered in our projections for plant capacities.

(c) In Nepal also, there are six manufacturers of HDPE pipes as given in Annexure - 2.9. However, if the capacity exists, there is a possibility of penetrating this segment of the market since the quality of local manufactured HDPE pipes is not upto the mark. UNICEF, in fact, is importing most of its requirement of HDPE pipes. However, the penetration will call for time, money and capacity (or investment for additional capacity). As such, in making our studies, we have not considered this market.

2.1.7. TOTAL MARKET AND DEMAND PROJECTIONS :

Based upon the above analysis and related available data, we have presented the total available market and sales projections in Annexure - 2.10 for the Fifth Five Year Plan period. The possible penetration factor as given in Annexure - 2.10 depends upon the Rural Water Supply Schemes which almost account for 95% of the projected sales.

Even though there are possibilities of conversion of GI pipes market to HDPE pipes market from the existing pattern of purchases, this has not been taken into account.

As discussed in paragraph 2.1.6, we have not considered any export sales. The differential of 100 MT/annum approximately in total demand and capacity of the proposed unit will possibly arise due to these factors and this difference will be taken care of by the capacity of the present unit, viz., M/s. Deki Polyethylene Products.

2.2 MARKET STRATEGY :

The important market segment is Water Supply Schemes executed by Government. At present, the procurement of pipes is done by UNICEF for the Water Supply Schemes. Needless to mention, an understanding/guarantee regarding the preferential treatment for future purchases from the proposed unit by UNICEF will strengthen the project operations.

All the designs for rural water supply schemes are already made in HDPE and the requirement for the next five years is drawn. It is unlikely that any other material of construction will be used. However, the unit should have an effective after-sales service department to ensure that the pipes are properly installed and the schemes are executed in time.

This technical service cell is required to subserve the following causes to ensure continuous market acceptance :

(a) To arrange for the development, fabrication and procurement of required HDPE or non-HDPE fittings for the project.

(b) To design, develop or procure necessary welding equipment to instal the pipes.

(c) To train various personnel for welding and maintenance of the schemes.

(d) To develop sub-contractors to take up installations at various work sites.

It is also necessary for the unit to have a competent quality control expert who will not only test the finished product, but also the raw material. Even if UNICEF agrees to give preferential treatment, no compromise on quality will be accepted by them.

2.3 PRODUCT PRICING :

The final selling price of the product can be based on any of the following methods :

(a) Cost plus method
(b) Competitive product cost
(c) Substitutive product cost.

If the "cost plus" price is higher than the other two methods, the project will not be viable. This is because the market will not accept the product as cheaper competitive/substitutive material will be available.

In our studies, we have arrived at the product price based on prices of substitutive/competitive product prices. These prices are also compared with the actual cost of manufacture to find out whether the recommended prices will be commercially viable or not.

It will be observed that in our studies, we have compared the prices of GI pipes locally available (substitutive material) and landed prices of HDPE pipes (competitive material) that have been recently imported. This data is presented in Annexures - 2.11 and 2.12.

The recommended price of HDPE pipes is taken as one which is the lesser of the two available product prices (reference : Annexure - 2.13). To quote one sample calculation, the prices are arrived at as under :

The landed price for 90 mm OD HDPE pipes as purchased by UNICEF is US$ 8.27/meter and the local price of GI pipes (80 mm NB) is US$ 4.26/meter. Our recommended price for locally manufactured HDPE pipes is US$ 4.26/meter. In fact, in lower diameter pipes, we have recommended a reduction of 10% and 15% from the lowest prices of imported HDPE pipes or local GI pipes.

Schedule 2.1 gives the estimates of sales revenue based on recommended sales prices for five years and schedule 2.2 gives projections of sales and distribution costs.

2.4 RECOMMENDED PLANT CAPACITY :

Based upon the total market and projections of sales (refer Annexure - 2.10) and present capacity of the local manufacturer, the following plant capacities are recommended :

1st year	..	675 T.
2nd year	..	675 T.
3rd year	..	950 T.

At the end of the third year, a review should be made regarding further expansions based on actual achievements in the first three years. However, this report takes into consideration only the peak capacity of 950 tonnes at the end of the third year and onwards.

2.5 PRODUCTION PROGRAMME :

Although the production of HDPE pipes is a single product activity, it involves scientific planning for the following reasons :

(a) Different diameters and pressure rating of pipes have different throughput ratios on the same machine.

(b) Marketing requirement of different diameters of pipes in different months can always vary.

While working out a production programme, optimum utilisation of available machine hours based on the varying market requirement is to be worked out.

Schedule - 2.3 gives working of quantities required to be produced for the expected market penetration. It should be noted that quantities to be produced will be more than the quantities required for the market because of :

(a) Inventory levels
(b) Production rejects, and
(c) Process wastage.

Based on this schedule, Schedule - 2.4 gives the yearly production programme for the five years. However, we would like to caution here that the monthly production programme will vary based on the procurement requirements of the procuring authorities.

The entire exercise done in these two Schedules is based on three extruders to start with, and fourth extruder in the third year. It is recommended that at the end of the fourth year, a review should be made for installation of fifth extruder. Though as seen today, a market is available for five extruders, we have not considered this because it would be more appropriate to compare the results of four-year projections with actual results and subsequently take the decision for additional investment.

2.5.1. AFTER SALES REQUIREMENTS :

HDPE pipes are designed to last for 50 years, when manufactured with good technology and of appropriate quality. If pipes are used under stipulated conditions, after-sales requirement is

only to attend to minor repairs, if any. Hence, this requirement can be neglected.

2.5.2. FITTINGS :

Availability of HDPE and non-HDPE fittings are a major requirement in HDPE piping systems. Non-HDPE fittings are available in the open market at Phuntsholing or can be purchased from Calcutta. However, HDPE fittings such as bends and tees will have to be fabricated at the proposed unit. On an average, the requirement of HDPE fittings is taken at 8.33% of the total pipes requirement. No separate quantities are considered in the production programme for this requirement since it would be possible to fabricate these fittings from the pipes in storage. Pipe ends required in very small quantity of 0.5% will be imported for the time being.

2.5.3. RESERVES DUE TO OPERATIONAL REASONS :

Normally, no reserves are required, as running hours of the machine have been taken as 7,200 hours/year, after considering normal operational requirement, etc. Moreover, in the market of piping materials every scheme is different from the other and exact size-wise requirement cannot be forecasted. However, it is desirable that some reserves are built in case of 90 mm and 32 mm pipes mainly because the production rate of these pipes is low. This aspect has been considered by us in the production programme while working out the storage requirement.

2.5.4. ALTERNATE PRODUCTION PROGRAMME :

Basically, there is only one technology involved - Extrusion Process Technology. In this type of unit, the production programme will include the length of pipes to be produced and the sizes of pipes, depending on market requirement. It is always advisable to make a production programme every fortnight,

considering the inventory level, market requirement and operational economies. It is observed that, with availability of different dies/moulds for different sizes, it is possible to alter production programme without wasting much time and without much technical problems. The reasons for recommending the fortnightly review of the production programme are as under :

(a) To keep inventory at desired levels and at the same time to make material available for the schemes in progress, flexibility in production programme will help.

(b) It is important to know that for the range of production at the proposed unit, only two sizes of die heads will cover the entire range of production. As such, changes from one size to another size will not involve much down time.

(c) Long range plan will involve high inventory carrying cost.

(d) The product range proposed can economically be operated on short-range planning.

2.5.5. QUALITY SPECIFICATIONS :

For HDPE pipes most of the specifications, e.g. Finland standard, Indian Standards (ISI) or German Standards (DIN), are derived basically from ISO R 161 and necessary native modifications are made. For places with low temperature of 20°C, German standards are recommended and for places where the average temperature is 27°C, Indian standards are recommended.

The equipment like moulds/dies can be so designed that they can be used for manufacture of pipes with both DIN as well as ISI specifications. Annexure 2.14 gives the ISI and DIN specifications for HDPE pipes.

2.5.6. WASTES & EFFLUENTS :

In extrusion process of manufacture of HDPE pipes, there are no wastes and effluents generated which are harmful to health.

During the manufacture of HDPE pipes, there are rejects on quality grounds due to fluctuations in power supply, raw material quality. There is also loss of raw materials approximately to the extent of 3% during the extrusion process. Normally, it is observed that combined percentage of rejection on the above two grounds work out to about 13 per cent, of which 10 per cent of the material can be re-used along with virgin material as laid down in ISI specifications. Such re-use upto 10 per cent with proper precautions will not have bad effects on the rate of production and quality of finished products.

2.6 PLANT CAPACITY :

In an extrusion process of HDPE pipe, the rate of production of pipes is dependent on the following factors :

(a) Quality of raw material

(b) Adequate and continuous availability of power and water

(c) Size and pressure ratings of pipes.

2.6.1. NORMAL CAPACITY :

In normal working conditions the rate of production of the extruder manufactured by K.M. & Windsor (India) Ltd., India - (the reasons for selecting this machine are given in the following pages) for different sizes of pipes is given below :

Pipe dia. (mm)	Rate of Production (kg/Hr)
20	18
32	22
50	30
63	40
90	50

2.6.2. FEASIBLE CAPACITY :

The process of manufacture being a continuous one, in working out the production capacity 7,200 hours for a year are taken, leaving the balance hours for normal maintenance, change of dies, etc. Though each month production will fully depend on the sizes that will be manufactured, on an average 35 kg/hr output is considered and as such, the capacity of one extruder under normal working parameters is approximately 225 MT to 250 MT per year.

We have recommended installation of 3 machines to start with and the fourth machine is to be added in the third year. In Schedule 2.4, it can be seen that the utilisation of all the machines will be almost above 90 per cent except in the first year where utilisation is about 70 per cent. This is because the manufacturing operations are only nine months in the first year and initial start-up will reduce the production rate.

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CHAPTER - 3

MATERIALS AND INPUTS

3.1 RAW MATERIALS :

The prevailing prices of pipe grade HDPE in the international market are approximately US$ 1,050 per tonne. The landed cost in Bhutan will work out to approximately US$ 1,200 per tonne. It is understood that there will be no Import Duty in Calcutta as well as in Bhutan. As against this international price, the price for the same if imported from India will work out to approximately US$ 2,465 per tonne. This price of Indian raw material is inclusive of prevailing Indian Excise Duty and Sales Tax. It is given to understand that there is a provision by which Government of Bhutan will get refund of Sales Tax and Excise Duty from the Government of India. Considering this provision, the landed price of Indian raw material will work out to approximately US$ 1,800 per MT. Though there is a ban on export of HDPE, the comparison is made just to indicate that it would be advantageous to import raw material from the international market.

As prices of raw material are cheaper by more than 30 per cent in the international market as compared to Indian prices, we recommend that the raw material should be purchased from abroad. In our studies, we have taken a landed price of US$ 1,200 per tonne, ex-Gaylephung.

3.2 UTILITIES :

In the extrusion process for HDPE pipes, continuous stable, adequate power supply and water are the two main utilities required. Based on the data collected by us, it is found possible that at Gaylephung, these two utilities are available as per the requirement for the proposed unit.

3.3 AUXILIARY MATERIALS AND CONSUMABLES :

Various auxiliary materials are required, some of which in fact do not go into the manufacturing process. Some of these are needed as safety requirements for the operating personnel and some of them are needed for the maintenance and machinery. The details of such materials are as under :

(a)	Packing materials :	Hessian cloth, straps, seals
(b)	Process consumables :	Printing ink, thinner, Kerosene, wax pencils, silicone grease
(c)	Maintenance consumables :	Cotton waste, Kerosene, pressure hoses, grease
(d)	Safety materials :	Asbestos and cotton handgloves.

The total cost of all these is approximately around 1% of the total manufacturing cost. During our survey, it was found that most of the required consumables and auxiliary materials can be purchased in Bhutan. Only one or two items, such as Silicone Grease, would be required to be bought from Calcutta. The quantities required of each of the items are not significant and hence we have not drawn itemwise consumption details.

3.4 SUPPLY PROGRAMME OF RAW MATERIAL :

The project will be based on imported raw material and as such, it would also be essential to hold a minimum three months' requirement of raw material at the plant site.

It is observed that there are always some losses in transit while transporting the raw material and it would be advisable to cover the transit insurance of raw material.

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3.5 ESTIMATES OF PRODUCTION COST - MATERIALS & INPUTS :

Schedule 3.1 gives the details of projections for costs of material and inputs for five years. While working out this cost, we have considered various aspects of costs based on our experience with the technology.

The basis of the estimates worked out is as under :

(a) Raw material price of US$ 1,200/- per tonne landed at Gaylephung. This is total foreign cost and while working out consumption of raw material for the production programme as given in Schedule 2.3, we have considered re-use of 10 per cent rejects.

(b) Consumption of auxiliary materials and consumables is taken at 1% of sales revenue of which 25% is expected to be foreign cost. This is based on our own experience.

(c) Requirement of power is one Kwh per Kg. of production and of water is 25 M^3 per tonne of production. These consumption norms take into consideration normal requirement of power and water for factory administration also.

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CHAPTER - 4
LOCATION AND SITE

4.1 AVAILABLE SITES :

Industrial development in Bhutan is at a take off stage. Most of the development is predominantly noticed in plains like Gaylephung, and Phuntsholing where infrastructural facilities are being developed.

Most of the industrial area at Phuntsholing is saturated and very little plain area is available, whereas enough land is available at Gaylephung.

In Gaylephung industrial area, the plots are available on a very nominal rent. The proposed unit will require approximately 72,000 sq. ft. of land and we have been given to understand that the rent will be US$ 0.10 per sq.ft. per year. In case it is desired to promote the proposed unit as a joint venture with local partner, possibilities of expansion of the present unit, i.e. M/s. Deki Polyethylene Products should be considered.

4.2 TRANSPORT FACILITIES :

Gaylephung is linked with rail heads by roads. It is about 50 kms. from North Bongaigaon, an Indian railhead and is about 190 kms. apart at South East of Bhutan.

4.3 COMMUNICATION :

At present, Gaylephung needs development as far as communication links are concerned in comparison to Phuntsholing which is linked with Calcutta and Thimpu through telephone. However, this should not be taken as a major hindrance since it is expected that area next to develop is likely to be Gaylephung.

4.4 UTILITIES :

4.4.1. POWER :

Both these industrial places receive power from India. Bhutan's own power generation project, known as Chuka Hydel Project, when commissioned, will make Bhutan self-sufficient in power. This project which has a generating capacity of around 252 MW power is expected to be commissioned by 1985.

During our visit, we have been given to understand by the Department of Power that at Phuntsholing, there is a lot of fluctuation in power supply whereas at Gaylephung, the supply is more stable. The main requirement in the extrusion process is continuous and stable power supply and therefore, Gaylephung is better as far as power is concerned.

4.4.2. WATER :

Both the industrial places have sufficient capacity overhead tanks which supply water to the industry. In addition, the proposed unit will have its own storage tank.

4.5 ENVIRONMENTAL IMPACTS :

HDPE is a thermoplastic containing only carbon and hydrogen and is considered as an inert material. Therefore, during pipe production, there is no formation of any harmful gases or ingredients. In view of this, there are no constraints or no requirement as far as environmental safety aspects are concerned while considered HDPE pipe extrusion plant.

4.6 SELECTION :

To summarise, keeping in view the infrastructural requirement and giving emphasis to the requirement of a continuous uninterrupted power supply, Gaylephung is more suited site for the proposed project.

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CHAPTER - 5

PROJECT ENGINEERING

5.1 LAYOUT :

Based on the market requirement, it is observed that the range of diameter of pipes required to be manufactured is 20 mm to 90 mm. This range of diameter can be economically manufactured on an extruder having 65 mm diameter screw. As discussed in the earlier pages, we have proposed installation of 3 extruders to begin with, added the fourth extruder at the end of the second year and review the progress for future expansion at the end of the third year. Based on these recommendations, a proposed layout drawing is annexed herewith as Annexure - 5.1.

5.2 CONSTRUCTION OF BUILDING :

During our survey, we have gathered information that there are a few local contractors available who can undertake construciton of industrial buildings as required for the proposed unit. Besides this, the Public Works Department of Government of Bhutan undertakes jobs of site development and construction of industrial sheds. The selection of the competent contractor can be done under supervision of proposed technical collaborators. Detailed engineering design will have to be necessarily made by the foreign collaborators.

Cement and wood are locally available. At present, the cost of cement is approximately US$ 100 per MT. However, required steel will have to be imported from India and the landed cost of imported steel from India is approximately US$ 600 per MT. Based on these figures, approximate construction cost will be US$ 100 per sq. metre. Total built-up area required as per the proposed layout is 1,100 sq. metres and minimum time for plot development, civil works, construction and laying pipelines etc. will come to 9 months.

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CHAPTER - 6
TECHNOLOGY

6.1 PROCESS :

HDPE pipes are manufactured by extrusion process. The process consists of feeding raw material through a machine hopper and plasticizing by the application of heat and pressure. The resultant melt at a temperature between 190^{o}-220^{o}C is forced through a die of desired size. The emerging soft tube is supported by vacuum from outside or from inside by compressed air and cooled in sizing die and cooling troughs. The pipe so formed is pulled by a haul-off/traction unit and cut or coiled (as required) to the desired lengths. Pipe rejects, if any, are reduced to smaller chips in a chopper-crusher/grinder and again reprocessed by mixing with virgin material, maximum upto 10% as p tted by I.S.I. standards.

The basic machine required for extrusion of HDPE pipes is a single screw extruder. The two most important parameters of judging a pipe production stream are :

(i) Output rate of the extruder
(ii) Quality of the pipe being made.

The above two factors are controlled by many factors associated with the pipe production stream such as :

1. Screw speed
2. Screw and Barrel design
   - (i) Channel depth
   - (ii) Length of screw
   - (iii) Length of metering zone
   - (iv) Helix angle
   - (v) Compression ratio

(vi) Mixing elements
(vii) Play between screw and barrel
(viii) Screw cooling

3. Temperature profile of the barrel and die head
4. Pre-heating of the granules
5. Viscosity of melt
6. Die design
7. Cooling of the extruder
8. Performance of the down-stream equipment.

All these factors influence the performance of the extruder either singly, in combination or in total.

6.2 AVAILABLE TECHNOLOGY :

Technology for the above process is available with the following leading companies :

1. Euro Plast
Rohrwerk GmbH
Post Fach 130160 Bruchstrasse
D-4200 Obernhaunsen (Holden)
West Germany.

2. Wick u Hoeglund
10, Vasa
Finland.

3. Polyolefins Industries Ltd.
Mafatlal Centre, 11th floor
Nariman Point
Bombay - 400 021, India.

There are many manufacturers of HDPE pipes in the world, but basically, the technical know-how has been passed by the above three manufacturers. Of the above three, M/s.Euro Plast are operating with a capacity of 8000 MT/annum. and M/s. Wick u Hoeglund and Polyolefins are operating with capacities of 10,000 MT/annum each.

6.3 TECHNOLOGY REVIEW :

Raw material costs are the most significant portion of the total costs assigned to HDPE pipe production. This is on an average in the range of 40 per cent to 45 per cent. The difference in cost of production can be mainly on account of achieving optimum extrusion process conditions described above and reducing the process loss. Therefore, choice of appropriate technology, choice of equipment, and choice of raw materials will be very important parameters.

Of the three companies having the process know-how, the selection of the process is done on the following parameters :

(a) Availability of technical manpower and the cost involved for the same.

(b) Choice of equipment, considering the local operating conditions and the cost.

(c) Geographical and social considerations and their effect on total investment cost and cost of production.

Of the three licence holders, two of them are from Western countries and one, i.e. Polyolefins Industries Ltd., is from India.

As far as technology for the extrusion process is concerned, technically it is the same. It would be desirable that equipment design and procurement should be made on recommendation from the technical collaborator.

We recommend Indian technology for the following reasons :

(a) As far as the process is concerned, there are no major differences in input/output ratios of any of the above three companies.

(b) As per our experience and knowledge, the Indian process, technical personnel and equipment will be cheaper as compared to the other two process holders.

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(c) The socio-economic relationship of India and Bhutan is favourable to obtaining technology from India.

However, detailed quotations should be obtained from all the three process holders and equipment should be ordered with their recommendations.

6.4 TECHNOLOGY COST :

Based on our above recommendations, we have given the estimates of Technology cost in Schedule 6.1 for obtaining technology from Polyolefins Industries Ltd., India.

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CHAPTER - 7

MACHINERY AND EQUIPMENT

7.1 EQUIPMENT REQUIRED :

As discussed above in Technology, the main equipment required for the extrusion plant is the extruder. This extruder comprises of screw, barrel, gear box, thrust housing, feed hopper and main motor. Besides the main equipment, the accessories needed are die heads with sizing dies, cooling tanks, traction unit, cutting unit and coiler. In addition, the auxiliary equipment needed will include compressor, grinding, cutting saw, cooling tower, transformer, testing equipment, pumps, valves and material handling equipment.

7.2 AVAILABILITY OF EQUIPMENT :

All this equipment is available from India as well as other countries. Annexure - 7.1 gives a techno-commercial comparative statement of various available equipment for the required plant capacity from the three leading manufacturers. The total working cost is based on a recommended capacity.

At present, there are no duties on import of machinery and equipment in Bhutan.

7.3 SELECTION OF EQUIPMENT :

Besides financial analysis, on technical points we recommend buying of the plant and equipment from the Indian manufacturer for the following reasons :

(a) For the pipe sizes required to be manufactured, it is not economical to use the extruders from Germany and England.

(b) Easy accessibility to equipment manufacturer in case of breakdowns and technical problems.

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(c) Easy follow up by the technical collaborators, since the recommended collaborator is from India.

(d) Possibility of sending local engineers to the manufacturer's site for training.

However, the final selection of equipment should be done in consultation with technical collaborator.

The selection of size for the extruder is based on the range of pipe sizes required for the market. Since Bhutan market needs most of the pipes in the range of 20 mm dia. to 90 mm dia. we have considered extruder with 65 mm dia. screw. The higher size of screw, i.e. 90 mm is not considered because it will be under utilisation of the investment. 65 mm screw size can produce pipes from 20 mm diameter to 110 mm diameter.

7.4 ESTIMATE OF COST :

The estimates of Equipment investment costs are given in Schedule 7.1, based on the prevailing market price for such equipment in India.

Schedule 7.2 gives Cost Estaimtes for civil works for implementing the proposed unit.

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CHAPTER - 8

PLANT ORGANISATION AND OVERHEAD COSTS

This project, basically, is technology-oriented and cost involved is mainly "Production Cost". Marketing, Finance and Administration are the basic need for any production unit and arising out of this concept, there exist overhead costs.

Marketing cost is mainly for technical services and administration of despatches, whereas financial cost is for book keeping, costing and for day-to-day financial operations.

Schedule - 8.1 gives estimates of overhead costs. We have designed the following cost centres in working the overhead costs :

(a) Production

(b) Marketing

(c) Finance and Administration

The concept in our study has been mainly of a production unit in an established market and hence we would recommend that the entire overhead cost should be allocated to Production. However, this will need a review after 3 years when the unit will start developing new segments of market. At that time, the main cost centres will be production and marketing. Necessary allocations will have to be worked out at the appropriate time.

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CHAPTER - 9

MANPOWER

9.1 AVAILABILITY :

In Bhutan, there are two technical institutes imparting education to the local people - (a) Devithan Diploma Standard Institute and (b) Barkhandi ITI Standard Institute.

The Department of Manpower Development and Planning of Bhutan Government arranges for placement of the candidates coming out of these Institutes. Each industry has to give its requirement of personnel to this department. There are few Bhutanese engineers also available who obtained their degrees from foreign universities. All the candidates who pass through the above two Institutes are absorbed in different industries. The general standard of salaries at both the places is same and is given below :

Type of Personnel	Salary per month in US$
a) Engineers	75
b) Diploma-holders	45-50
c) Commercial and Book-keeping Assistants	45-50
d) ITI Technicians	35-40
e) Unskilled labour	30

It was observed during our visits that local unskilled labour for industry is not available since most of the local people prefer to work in their fields.

Most of the unskilled labour comes from Nepal or from Bihar, a north Eastern State in India.

It is also proposed that the following personnel will be

deputed by the technical collaborators for a period of two years :

(a) General Manager
(b) Technical Service Manager

In addition to the above two senior managers, two foreign technical personnel to train the local engineers and operators will be required for a period of two years. The term of General Manager and Technical Service Manager will be reviewed after two years but for financial study taken as 3 years.

9.2 REQUIREMENT :

As discussed above, the manning of the proposed unit is planned based on local recruitment, except the following :

(a)	General Manager	- Delegate from technical collaborators for a period of 3 years.
(b)	Technical Service Manager	- Delegate from technical collaborators for a period of 3 years.
(c)	Production In-charge	- 2 Delegates from technical collaborators for a period of 2 years.

The total personnel requirement for the first two years is proposed to be 50 which includes commercial and marketing staff. When an additional extruder is installed in the third year, the requirement will go up to 59. On completion of the second year, it is proposed that both the delegates nominated for production should hand over charge to the local Engineers and on completion of third year, the General Manager and Technical Service Manager also should hand over the management to the local people. While working out the manning table requirements, this aspect has been taken into account. Schedule 9.1 gives the requirement of manpower for each of

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the 3 cost centres, i.e. Production, Management and Marketing.

9.3 MANPOWER COST :

Based on the requirement of manpower presented in Schedule 9.1, the detailed working of manpower cost for each of the cost centres is made and given in Schedule 9.2. It will be observed that after the third year, there is no foreign cost involved. Indirect cost taken into account is based on our experience with local conditions.

9.4 TRAINING :

The cost of training key personnel prior to the commencement of production is considered in pre-operation expenses. The rest of the people will be trained in the first two years directly on the job by the delegates of technical collaborators. In the third year of operation, we have taken cost of local General Manager as well as local Technical Service Manager in addition to delegate of technical collaborators. It is proposed that these two designated local Managers in the third year should be sent for a specified period to the technical collaborators for training in top management and for the balance period, they should work in that capacity as General Manager-designate as well as Technical Service Manager-designate, directly under the foreign delegates. The proposed Organisation Structure is given in Schedule 9.3.

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CHAPTER - 10

IMPLEMENTATION SCHEDULE

10.1 CRITERIA :

We have taken the following criteria into account while working out the project implementation schedule :

	Activity	Approx. time required
1.	Starting Point	Decision to invest
2.	Finalisation of agreement with technical collaborators	2 months (1st & 2nd month)
3.	Finalisation of specifications and floating quotations for equipment	1 month (3rd month)
4.	Receipt of quotations, scrutinising them and placing orders	1 month (4th month)
5.	Recruitment and training of personnel	6 months (6th - 12th month)
6.	Finalising plant layouts and civil construction details	2 months (3rd - 4th month)
7.	Site development, construction of plant building and electrical installations	6 months (4th - 10th month)
8.	Delivery of Equipment	9 months (4th - 13th month)
9.	Commissioning & trial run	1 month (14th month)
10.	Plant on commercial production	15th month onwards.

Based on the above activities, Schedule 10.1 gives the chart of project implementation schedule. It should be noted here that based on our experience, there would be no unforeseen delays in this schedule. However, critical areas that are to

be considered are the delivery period for equipment and construction of plant building. Simultaneous activities will have to be monitored and that will be scope of responsibility of the technical collaborators.

10.2 PROJECT IMPLEMENTATION COST :

Schedule 10.2 gives estimates of cost during the implementation period. This takes into account expenses required to be incurred on building up of necessary infrastructure, training of manpower, statutory requirement and cost involved in it, etc. The financing cost to be incurred for borrowings required during this implementation stage is also considered in these estimates.

Schedule 10.3 gives the initial investment cost upto start-up period. This schedule does not take into account additions to equipment during the third year.

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CHAPTER - 11

FINANCIAL AND ECONOMIC EVALUATION

11.1 TOTAL INVESTMENT COST :

The total Investment Cost and requirement of working capital is given in Schedules 11.1 and 11.2. Schedule 11.1 is prepared based on Cash Outflow for the construction and start-up period.

The financing of the initial investment is recommended as under :

		'000 US $
Owners' Equity	..	125
Bank Loan	..	734
Total	..	859

As can be seen from the cash flow table given in Schedule 11.3, the proposed expansion of one additional extruder will be financed from internal generation.

11.2 NET INCOME :

The net income statement based on recommended sales prices, production programme and manpower cost is given in Schedule 11.4. Based on these operations, we have given projected Balance Sheet in Schedule 11.5.

From the Balance Sheet it can be seen that retained profits have been taken as reserves. Capitalisation of the same is not considered and dividend liability is charged on original equity. Needless to mention, dividend on capitalisation will reduce the net worth by the amount of dividend.

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11.3 FINANCIAL EVALUATION :

We have applied the following criteria to evaluate the financial viability of the project.

11.3.1. NET PRESENT VALUE :

Cash flow table and calculation of Net Present Value is given in Schedule 11.6. We have worked out NPV at the end of five years of commercial production and at discount rate of 16 per cent. Since only five year span is considered for NPV, the written down value of fixed assets is taken as salvage value and current asset is taken at cost.

Since NPV is favourable, the Project is recommended as viable on this criteria.

11.3.2. AVERAGE RATE OF RETURN :

The average rate of return on initial investment based on five years' average Net Income for this project is 89%. By any standard, this rate is quite significant and we have no hesitation to strongly recommend this project.

11.3.3. PAY-BACK PERIOD :

Based on Net Income Statement and initial investment, the pay back period works out to above 19 months, which can be termed as quick return of investment.

11.3.4 BREAK EVEN ANALYSIS :

Based on the Net Income statement given in Schedule 11.4, the Break Even Analysis for each of the five years is worked out and is given hereunder :

Year	Break Even Quantity (M.T.)
I	162
II	169
III	176
IV	148
V	143

The above break even analysis is based on average selling realisation of US$ 3,513 per tonne and raw material price of US$ 1,200 per tonne. In Annexure 11.1, break even analysis for different sales realisations and different raw material prices are presented. It can be seen from this Annexure that even at raw material price of US$ 1,400 and sales realisation of US$ 2,500 per tonne, the break even quantity works out to 415 M.T. per annum. This quantity is approximately 65 per cent capacity utilisation of the proposed plant before implementing third year expansion.

11.3.5. FOREIGN EXCHANGE OUTFLOW :

In Annexure 11.2, we have drawn foreign exchange spending account for 5 years in the following two situations :

(a) Assuming that the piping material required during the five year period subject to limitations of capacity to be manufactured by the proposed unit will be totally imported HDPE piping material, at the present prices, the foreign exchange outflow for 5 years for these purposes works out to 13,666 T. US$.

(b) As against these imports, the foreign exchange outflow for 5 years of implementation of new project including lump sum payment for technology, engineering fees and recurring payment for raw materials and royalty comes to 5,136 T. US$. We have also taken into account an assumption that foreign delegates will repatriate 50% of their earnings in free foreign exchange.

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Thus, this account shows that over 5 years, there will be a saving of 8,530 T. US$ by implementing this project.

11.4 FINANCIAL EVALUATION :

Impact of the project on the national economy is unquestionable. Financial analysis as given in break-even analysis and pay-back period is very encouraging. Even if the pricing is reduced by 33% than the prevailing imported prices of HDPE pipes, the project is commercially viable. Foreign exchange savings as explained in Annexure 11.2, also merit consideration for making this investment decision.

* * *

ANNEXURES

ANNEXURE - 2.1

HDPE PIPES PURCHASED FOR RURAL WATER SUPPLY SCHEMES DURING FOURTH FIVE YEAR PLAN (1976-1981)

Pipe Sizes (MM)	Pressure Rating (Kg/cm^2)	Phase 1 (Mtrs.)	Phase 2 (Mtrs.)	Phase 3 (Mtrs.)	Phase 4 (Mtrs.)	Phase 5 (Mtrs.)	Total (Mtrs)
20	10	2,500	80	3,200	70,910	100,077	176,767
32	6	13,000	2,500	25,400	93,452	68,510	202,862
50	6	9,600	7,400	50,500	165,996	71,041	304,537
63	6	-	14,000	32,400	20,412	34,496	101,308
90	6	-	-	1,800	1,316	23,765	128,189

ANNEXURE - 2.2

PHASEWISE AND VILLAGEWISE PLANNED EXECUTION OF RURAL WATER SUPPLY SCHEMES IN THE FIFTH FIVE YEAR PLAN

Sr. No.	District	Total No. of Schemes	Phasewise Coverage				
			I	II	III	IV	V
1.	Maa	30	3	5	6	6	10
2.	Paro	113	15	23	21	24	30
3.	Thimpu	120	14	19	24	25	38
4.	Gaga	11	3	2	2	2	2
5.	Wangdi/Phodrang	132	21	24	29	30	28
6.	Tongsa	43	6	8	8	9	12
7.	Jakar	49	6	8	10	12	13
8.	Shemgang	59	6	8	9	19	17
9.	Punakha	47	8	9	10	10	10
10.	Daga	32	6	7	6	6	6
11.	Gaylegphug	98	14	19	18	20	27
12.	Phuntsholing	176	21	20	37	45	53
13.	Chirang	63	7	11	13	12	20
14.	Samrug Jonkhar	96	12	15	20	26	23
15.	Lhuntshi	66	6	14	13	13	20
16.	Mongor	134	17	23	21	35	38
17.	Sumar	17	3	2	3	4	5
	Total	1500	200	250	300	350	400
	Percentage to be covered in each phase %	100	13.33	16.67	20.00	23.33	26.67

ANNEXURE - 2.3

REQUIREMENT OF HDPE PIPES FOR RURAL WATER SUPPLY DURING FIFTH FIVE YEAR PLAN AS DRAWN OUT JOINTLY BY UNICEF AND PWD, BHUTAN

Pipe Size (MM)	Pressure Rating (Kg/cm^2)	Quantity (Kilometres)	Equivalent Tonnage as per DIN Standards (MT)	Share in Total Requirement (%)
20	10	1,875	251.250	08
32	6	2,625	590.625	16
50	6	1,500	795.000	22
63	6	750	634.500	18
90	6	750	1,281.000	36

ANNEXURE - 2.4

ESTIMATES OF REQUIREMENT OF HDPE PIPES FOR RURAL WATER SUPPLY SCHEMES DURING FIFTH FIVE YEAR PLAN

Pipe Size (MM)	Pressure Rating (Kg/cm^2)	Phase I MT	Phase II MT	Phase III MT	Phase IV MT	Phase V MT	Total MT
20	10	38	48	56	66	77	285
32	6	75	96	114	131	152	568
50	6	103	132	156	180	209	780
63	6	85	108	128	148	170	639
90	6	169	216	256	295	342	1,278
	TOTAL	470	600	710	820	950	3,550

NOTE: The total requirement of 3,550 MT of Fifth Five Year Plan as drawn out jointly by UNICEF and PWD, Bhutan, is proportionately distributed in the ratio of requirement of each size and in the ratio of requirement for each phase.

ANNEXURE - 2.5

USE OF VARIOUS PIPING MATERIALS FOR COMPLETED URBAN WATER SUPPLY SCHEMES

Sr. No.	Township	Population	Pipe Size (MM)	Pipe Material	Quantity (Metres)
1.	Thimphu	15,000	200	CI	5,334
			150	CI	2,590
			125	CI	1,829
			100	GI	124,663
			75	GI	49,225
2.	Phuntsholing	12,000	200	CI	457
			150	CI	4,145
			100	GI	1,433
			75	GI	1,981
			50	GI	21,488
3.	Garbhang	7,000	75	GI	1,036
4.	Gaylephug	10,000	100	GI	3,864
			75	GI	3,644
5.	Samrudjonkar	10,000	150	CI	2,490
			125	CI	1,448
			50	GI	762
6.	Toshigang	7,000	NA	NA	NA
7.	Mongar	5,000	63	HDPE	2,347
8.	Tonges	5,000	63	GI	115
9.	Samchi	8,000	NA	NA	NA
10.	Sibsoo	4,000	NA	NA	NA
11.	Damphu	5,000	NA	NA	NA
12.	Chemgang	500	63	GI	1,341
			50	GI	2,377
13.	Doothang	3,000	0	GI	122

NA: Not Available

ANNEXURE - 2.6

POPULATION DETAILS OF THE TOWNSHIPS WHERE URBAN WATER SCHEMES ARE TO BE PROVIDED

Township	Population
Paro	6,000
Hao	4,000
Punakha	2,000
W'Phudrang	3,000
Diafam	3,000
Jakar	6,000
Bhangtar	2,000
Lhumtshi	1,500

ANNEXURE - 2.7

GI AND CI PIPES PURCHASED FOR URBAN WATER SUPPLY SCHEMES DURING 1976 - 1981

Pipe Material	Pipe Size (MM)	Quantity Purchased (Metres)	Equivalent HDPE Pipes		
			Size (MM)	Pressure Rating (Kg/cm^2)	Quantity (MT)
GI	15	16,700	20	10	4,054
	20	13,558			
	25	8,030	32	6	2,493
	32	3,048			
	40	1,829	40	6	0.636
	50	11,192	50	6	6.032
	80	595	90	6	1.017
	100	11,718	110	6	29.680
CI	125	5,500	125	6	18.023
	150	10,000	160	6	53.290
	200	7,600	200	6	63.475
TOTAL					178.700

ANNEXURE - 2.8

HDPE PIPE MANUFACTURERS IN THE EASTERN REGION OF INDIA AND THEIR INSTALLED CAPACITIES

Sr. No.	Name & Address	Installed Capacity Tonnes/ Annum
1.	Climax Pipes Pvt. Ltd. 5/2 Dealerjong Road Cossipore Calcutta 2	900
2.	EMCO General Plastic Industries Pvt. Ltd. Rampur, Budge Budge Road 24 Parganas, W. Bengal	900
3.	Jessore Combs 117 Baitak Khana Road Calcutta 9	300
4.	Jayshree Plastics Neel Ganj Road Agarpara, 24 Parganas W. Bengal	540
5.	Orissa Plastics Balasere Orissa	1,200
6.	Plastic Enterprise Fact: Howrah Off: 38 Strand Road Calcutta 1	300
7.	Plastic Concern 15, Daspara Road Calcutta	180
8.	Teelamat India Rampur, Budge Budge Road 24 Parganas W. Bengal	150

ANNEXURE - 2.8
(CONTD..2)

Sr. No.	Name & Address	Installed Capacity Tonnes/Annum
9.	Unique Plastic Industries 6 Canal Road Calcutta 53	225
10.	Utkal Agro Industries Balasore Orissa	300
11.	Shree Narayanee Pipes 5, Dilaranj Road Calcutta 2	540
12.	Himalaya Industries Arundhati Inds. Estate Shed Nos. 23 & 24 Agartala - Tripura	250
13.	Plastic Exports 25, Strand Road Calcutta 1 Factory: Howrah	250
14.	I.D.S. Steel & Engg. Arundhati Inds. Estate Agartala Tripura	450
15.	Gautam Plastic Inds. Pvt. Ltd. 10 Pollock Street Calcutta 1	240
16.	Associated Polymers Devi Mandir Lane Lilushi, Howrah	480
17.	Pioneer Plastic Works 86 B. L. Shah Road Calcutta 53	700
18.	Pioneer Plastic Industries Calcutta	675
19.	Plastic Moulders 38 Strand Road, Calcutta 1	300
	Total:	8,880

ANNEXURE - 2.9

HDPE PIPE MANUFACTURERS IN NEPAL

1. Balajur Industries District
   Balajur
   Kathmandu

2. Laxmi Plastics
   Kathmandu
   Nepal

3. Nepal Plastics
   Kamal Pokhari
   Kathmandu
   Nepal

4. Climax Nepal Pipe Industries Pvt.Industries
   Industrial Dist.
   Balajur
   Nepal

5. Narayani Plastic Udyog
   P O Box No.1978
   Bagh Bazar
   Kathmandu
   Nepal

6. Cables & Plastics Pvt. Ltd.
   HETA UDA Industrial Estate
   HETA UDA
   Nepal

ANNEXURE - 2.10

PROJECTIONS FOR TOTAL DEMAND OF HDPE PIPES AND PROJECTIONS OF SALES BY PROPOSED UNIT

Plan Phase	Rural Water Supply Schemes		**Urban Water Supply Schemes		***Others		Total		Penetration Factor
	Total Market MT	Projected Sale MT	Total Market MT	Projected Sale MT	Total Market MT	Projected Sale MT	Total Market MT	Projected Sale MT	%
I	470	276	15	9	25	15	510	300	59
II	600	516	15	13	25	21	640	550	86
III	710	710	15	15	25	25	750	750	100
IV	820	763	15	14	25	23	860	800	93**
V	950	779	15	11	25	20	920	810	82**
TOTAL	3550	3044	75	62	125	104	3750	3210	

** Only nine months operating period considered.

Though 100% penetration will be possible, maximum available production capacity is limitation.

*** No definite market estimates are available for these segments. However, based on our experience and market situation the estimates have been worked out.

ANNEXURE - 2.11

PRICES OF GI PIPES

Pipe Size NB	Heavy*	Heavy** (Indian Tube make)	Medium**	Light** (Tata make)	Light ** (Non-Tata make)
(MM)	US$/ Mtr.	US$/ Mtr.	US$/Mtr.	US$/Mtr.	US$/Mtr.
15	1.81	1.65	1.01	1.14	0.68
20	-	1.94	1.34	1.48	-
25	2.70	2.93	1.82	2.07	1.31
32	4.10	3.63	2.38	2.43	-
40	6.00	4.15	2.62	3.05	1.89
50	-	5.76	3.64	3.93	2.56
65	-	7.41	4.67	5.50	3.57
80	10.00	9.80	5.94	6.39	4.10

(Conversion Rate - 10 Ng = 1 US $)

NOTE: * Information gathered from UNICEF purchases during October, 1980. The prices are FOR-Calcutta.

** Information gathered from authorised dealer, M/s Deki Corporation and the prices are FOR-Calcutta and are exclusive of Sales Tax.

ANNEXURE - 2.12

LANDED PRICES OF HDPE PIPES

Pipes Dia		Size of coil or length	Load per Truck	Freight cost per Metre*	Manufac-turers' Price of Pipes**	Landed Price of HDPE Pipes	Lowest GI Pipe Price***
NB (MM)	DD (MM)	(Mtrs.)	(Mtrs.)	(US $)	(US$/ Mtr.)	(US$/ Mtr.)	(US$/Mtr.)
15	20	200	8,000	0.06	0.47	0.53	0.70(Light)
20	25	200	7,000	0.07	-	-	1.40(Medi.)
25	32	100	3,000	0.17	0.80	0.97	1.36(Light)
32	40	100	2,500	0.20	-	-	2.16(Med.)
40	50	50	600	0.83	1.90	2.73	[illegible](Light)
50	63	50	500	1.00	3.00	4.00	2.66(Light)
65	75	5	3,000	0.17	-	-	3.72(Light)
80	90	5	2,500	0.20	6.07	6.27	4.26(Light)

* Based on transport charges of US$ 500 per truck from Bombay, India.

** Information gathered from UNICEF purchases during October, 1980. The prices are Ex-factory, Bombay (Exomet Plastics, Bombay).

*** As per Annexure-3.11 and transport cost from Calcutta to Phuntsholing.

ANNEXURE - 2.13

RECOMMENDED SALES PRICES FOR HDPE PIPES (EX-GAYLEPHUG)

Pipe Size NB (MM)	DD (MM)	Pressure Rating DIN Specn. Kg/cm^2	Weight in Kg. per Metre Kgs.	Lowest Price based on Ann.3.12 US$/Mtr.	Equivalent Price per Kg. US$	Recommended Price* US$/Kg.
15	20	10	0.12	0.53	4.42	3.75
20	25	10	0.17	-	-	-
25	32	6	0.20	0.97	4.85	4.12
32	40	6	0.29	-	-	-
40	50	6	0.44	1.96	4.45	3.78
50	63	6	0.69	2.66	3.85	3.46
65	75	6	0.98	-	-	-
80	90	6	1.39	4.26	3.06	3.06

NOTE: * While recommending the market prices, we have considered 15% less prices in case of 20, 32 and 50 Ø pipes and 10% less in case of 63/Ø pipes as compared to lowest price of HDPE/GI pipes as worked out in Annexure-13. No reduction is envisaged in case of 90MM pipes since recommended lowest price is of GI pipes and the same is already much lower as compared to landed prices of HDPE pipes.

ANNEXURE - 2.14

ISI AND DIN SPECIFICATIONS FOR HDPE PIPES

IS:4984:1978 : Indian Standard Institute specifications for High Density Polyethylene Pipes for potable water supplies, sewage and industrial effluents

DIN 8074 (Nov. 1977) : German Standard specifications for pipes from High Density Polyethylene

A. SPECIFICATIONS FOR PIPES:

Pipe Sizes & Pressure Class		IS:4984:1978					DIN:8074 (November, 1977)				
		Pipe OD in mm	Tolerance	Wall thickness mm		Avg. Weight Kg/Mtr.	Pipe OD in mm	Tolerance	Wall thickness mm		Avg. Weight Kg/Mtr.
mm	Kg/cm^2			Min.	Max.				Min.	Max.	
20	10	20	+0.3	2.3	2.8	0.134	20	+0.3	2.0	2.4	0.117
32	6	32	+0.3	2.3	2.8	0.225	32	+0.3	2.0	2.4	0.196
50	6	50	+0.5	3.6	4.2	0.539	50	+0.5	2.9	3.4	0.440
63	6	63	+0.6	4.5	5.2	0.845	63	+0.6	3.6	4.2	0.688
90	6	90	+0.8	6.4	7.3	1.709	90	+0.9	5.1	5.9	1.390

B. SPECIFICATIONS FOR FITTINGS:

i) IS:8360:1976 - Indian Standard Institute specification for injection moulded High Density Polyethylene fitting for potable water supplies.

ii) IS:8360:1977 - Indian Standard Institute specifications for Fabricated High Density Polyethylene fittings for potable water supplies.

C. CODE OF PRACTICE:

i) IS:7634:1975 - Indian Standard Institute code of practice for potable water supplies.

ii) IS:7634:1975 (Part-II) - Indian Standard Institute code of practice for laying and jointing of Polyethylene (PE) Pipes.

iii) DIN:19630 - German Standard regulations for laying pipe lines for gas and water supply.

SOME FIGURES
OF THIS DOCUMENT
ARE TOO LARGE
FOR MICROFICHING
AND WILL NOT
BE PHOTOGRAPHED.

ANNEXURE - 7.1

TECHNO-COMMERCIAL COMPARATIVE STATEMENTS OF EQUIPMENTS

Sr. No.	Name of manufacturer and technical particulars of equipments	Pipe dia. & output range	Quoted Price	Delivery period and other conditions
1.	M/s Reifenhauser K.G. Maschinen Fabrik 5210, Troisdorg, West Germany Pipe Extruder having screw dia. of 90 mm (L=25 D) along with Die heads, dies, cores, caliberators, feeder cooling tanks, haul off, cutting machine and coiler.	40 mm ø to 180 mm ø 160-280 Kg/ hour depending upon pipe size and operating conditions	DM 5,20,535 approx. US$ 208,200*	6 months after receipt of clear order. Price is FOB European north sea port. Duties and commissioning charges not included. Payment: 100% against irrevocable L/C confirmed by European Bank to be opened not later than two months before scheduled date of shipment.
2.	Leesona Daniels Engg. Ltd. Bath Road, Stroud, Gloucestershire GL53TL, England Pipe Extruder having screw dia. of 65 mm (L=25D) or 90 mm (L=28D) along with vacuum caliberating bath, extension cooling bath, set of dies, cores, caliberators, haul off unit table, cutting and coiling machine.	i. 20 mm to 90 mm ø on 65 mm machine. Maximum output 100 kg/hr.	£ 91,935 US$ 165,500	Approx. seven months from receipt of clear order. Price is FOB British Port. Payment 30% cash with order, 70% by confirmed irrevocable L/C. All duties etc. extra
		ii. 20 mm to 200 mm ø on 90 mm machine. Maximum output 220 kg/hr.	£ 100,480 US$ 180,800	
3.	R.H.Windsor(India) Ltd. Thane, India. Pipe Extruder having (L=21D) screw dia. of 65 mm or 90 mm along with die heads, dies, cores, caliberators, cooling tank, haul off unit, cutting machine.	20 mm ø to 110 mm ø on 65 mm machine. Maximum output 70 kg/hr.	US$ 59,750 Exclusive of taxes, freight etc.	15 months from the date of receipt of firm order. Payment: 25% irrevocable security deposit with order. Balance before despatch.
		75 mm ø to 160 mm ø on 90 mm machine. Maximum output 200 kg/hr.	US$ 161,000 Ex.works exclusive of taxes, freight etc.	

Notes:
* (i) Prices of die heads etc. considered upto 110 mm ø only.
(ii) Equipment not suitable for the proposed unit.
(iii) Prices subject to change and applicable as prevailing at the time of delivery.

Notes:
(i) 90 mm screw dia. not suitable for the proposed unit.
(ii) Prices subject to change and will be applicable as prevailing at the time of delivery

Notes:
(i) Prices are subject to variation without notice.
(ii) 90 mm machine is not suitable for the proposed unit.

ANNEXURE - 11.1

BREAK-EVEN ANALYSIS

(AT DIFFERENT RAW MATERIAL PRICES AND SALES PRICES)

Raw Material Price US$/MT. →	1200	1250	1300	1350	1400
Sales Price A. realisation US$ / MT. ↓					
2,500	338	355	373	393	415
2,700	287	299	312	326	340
2,900	250	258	268	278	289
3,000	234	242	250	259	269
3,100	221	227	235	243	251
3,200	209	215	221	228	235
3,300	198	203	209	215	222
3,400	188	193	198	204	209
3,500	179	184	188	193	198

NOTE : (i) Variable Cost taken as US$ 1,375 per tonne.

(ii) Fixed cost taken at US$ 3,80,600 is as projected for 3rd year since that is the maximum per year cost.

(iii) Before expansion, maximum production achievable is 645 MTA and at 60% break-even capacity utilisation comes to 387 MTA.

ANNEXURE - 11.2

FOREIGN EXCHANGE ACCOUNT
(FOR FIVE YEARS)

A. REQUIREMENT TO IMPORT HDPE PIPES :

Note : Quantities taken for sales have been considered for imports over five years.

Dia. of Pipes	Projected sale for five years	Conversion into metres as per ISI specifications	Price per metre	Total Foreign Exchange required
(mm)	(MT)	(Metres)	(US$/Mtr.)	('000 US$)
20	257	19,17,910	0.47	901
32	514	22,84,444	0.97	2,216
50	706	13,09,833	2.73	3,576
63	578	6,84,024	4.00	2,736
90	1,155	6,75,834	6.27	4,237
		TOTAL TO IMPORT PIPES		13,666

B. REQUIREMENT TO IMPLEMENT PROJECT :	('000 US$)
i) Technology and Equipment Cost	495
ii) Operation cost including royalty and repatriation by foreign delegates at 50% of their earnings	4,641
TOTAL TO IMPLEMENT AND OPERATE PROJECT	5,136
C. SAVINGS IN FOREIGN EXCHANGE OUTFLOW OVER FIVE YEARS	8,530

SCHEDULES

SCHEDULE - 2.1

ESTIMATE OF SALES REVENUE

(BASIS: MARKET PRICE RECOMMENDATION)

Pipe Dia.	Year I		Year II		Year III		Year IV		Year V	
	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
(MM)	MT	'000 US $	MT	'000 US $	MT	'000 US $	MT	'000 US $	MT	'000 US $
20	24	90	44	165	60	225	64	240	65	244
32	48	198	88	362	120	494	128	527	130	536
50	66	249	121	457	165	624	176	665	178	673
63	54	187	99	342	135	467	144	498	146	505
90	108	330	198	606	270	826	288	881	291	890
TOTAL	300	1054	550	1932	750	2636	800	2811	810	2848
Average Realisation		3513		3513		3515		3514		3516

Note: The sales estimates are for local market only. No export sales are anticipated.

SCHEDULE - 2.2

PROJECTED SALES AND DISTRIBUTION COST

Particulars	Year I		Year II		Year III		Year IV		Year V	
	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign
	US$	US$	US$	US$	US$	US$	US$	US$	US$	US$
Personnel	2,700	29,400	2,900	32,360	7,600	35,546	8,300	-	9,000	-
Travel & Other Costs	3,600	5,000	3,780	5,250	3,969	5,512	6,667	-	7,000	-
TOTAL	6,300	34,400	6,680	37,610	11,569	41,058	14,967	-	16,000	-
GRAND TOTAL (US $)	40,700		44,290		52,627		14,967		16,000	

Notes: 1. The selling cost includes 50% cost of General Manager.

2. Effective fourth year, no foreign expert is required.

SCHEDULE - 2.3

WORKING OF QUANTITIES FOR PRODUCTION PROGRAMME

QNTY./MT.

		Year I	Year II	Year III	Year IV	Year V
1.	Project Sales	300	550	750	800	810
2.	Minimum Storage requirement	25	21	21	10	-
3.	Process rejects and wastage	42	74	100	121	121
	Total Production Planning required	367	645	871	931	931

SCHEDULE - 2.4

YEARLY PRODUCTION PROGRAMME

BASIS :

(i) 3 Nos. Extruder to start

(ii) In the first year, only nine months' operation considered

(iii) In the third year, one additional extruder considered

(iv) Diameterwise distribution is based on the diameterwise requirements drawn out jointly by UNICEF/PWD, Bhutan, for rural water supply in Fifth Plan

PRODUCTION PROGRAMME

Pipe Dia (MM)	Year I		Year II		Year III		Year IV		Year V	
	Quantity (MT)	Occupation (%)	Quantity (MT)	Occupation (%)	Quantity (MT)	Occupation (%)	Quantity (MT)	Occupation (%)	Quantity (MT)	Occupation (%)
20	29	9.93	52	13.40	70	13.51	74	14.29	74	14.29
32	59	16.57	10	21.88	140	22.09	148	23.36	148	23.36
50	81	16.66	142	21.90	192	22.20	205	23.73	205	23.73
63	66	10.18	116	13.71	158	13.71	167	14.50	167	14.50
90	132	16.29	231	21.38	311	21.59	337	23.33	337	23.33
	367	69.63	645	92.27	871	93.10	931	99.21	931	99.21

SCHEDULE - 3.1

ESTIMATES OF PRODUCTION COST

(MATERIALS AND INPUTS)

('000 US $)

Sr. No.	Item	Year I			Year II			Year III			Year IV			Year V		
		For.	Loc.	Tot.	For.	Loc.	Tot.	For.	Loc.	Tot.	For.	Loc.	Tot.	For.	Loc.	Tot.
1.	Raw Materials:															
	High Density Polyethylene@	402	-	402	682	-	682	953	-	953	1020	-	1020	1020	-	1020
2.	Consumables:															
	As discussed*	2	8	10	5	14	19	6	20	26	7	21	28	7	21	28
3.	Electricity**	-	26	26	-	45	45	-	61	61	-	65	65	-	65	65
4.	Water***	-	1	1	-	1	1	-	1	1	-	1	1	-	1	1
	TOTAL	404	35	439	687	60	747	959	82	1041	1027	87	1114	1027	87	1114

@ Raw Materials @ US $ 1200/- per tonne and consumption is taken based on production programme after considering 10% of rework material consumed in the same year.

* 1% of sales revenue, of which 25% is expected to be foreign cost.

** 1.00 kwh per kg. of production and @ Ng 0.70 per kwh.

*** 25 m^3 per tonne @ Ng 0.50 per m^3.

SCHEDULE - 6.1

ESTIMATES OF TECHNOLOGY COST

1. Technology Selected: Extrusion Process technology to process High Density Polyethylene.

2. Specifications: i. DIN-8074/75 (German specifications)
ii. ISI-4984/78 (Indian specifications)

3. Supplier: Polyolefins Industries Ltd.
Mafatlal Centre, Nariman Point
Bombay - 400 021.

4. Costs:

4.1 Lumpsum Payment:

Technological Services	Foreign Cost ('000 US$)	Local Cost ('000 US$)	Total Cost ('000 US$)
a) Engineering Services	75	-	75
b) Installations of Equipments. One Senior Engr. for 90 days.	10	14	24
c) Procurement, Inspection and supervision of plant fabrication in India	25	-	25
d) Commissioning of plant and technology transfer	10	15	25
Total	120	29	149

4.2 Royalty Payments: (As 4% of annual sales for five years)

Year	Anticipated Sales ('000 US $)	Royalty* @ 4% ('000 US $)
I	1,054	42
II	1,932	77
III	2,636	105
IV	2,811	112
V	2,848	114
	Total	450

*All payment : in US$

SCHEDULE - 7.1

ESTIMATES OF EQUIPMENT INVESTMENT COSTS

Sr. No.	Item Description	Qty.	Unit Cost	C O S T					
				Phase I*			Phase II**		
				Foreign	Local	Total	Foreign	Local	Total
		Nos.	('000 US$)	('000 US$)			('000 US$)		
1	2	3	4	5	6	7	8	9	10
1.	PRODUCTION EQUIPMENT								
	1.1 Single Screw Extruders 65 mm screw size with hopper drier, vacuum sizing tanks, Auxiliary cooling unit, traction unit, cutting unit, pyrometer and set of dies/inserts	3+1	68	204	-	204	75	-	75
	1.2 Winder (Coiler)	2+1	2	4	-	4	2	-	2
	Sub-Total (1)			208	-	208	77	-	77
2.	SERVICE EQUIPMENTS								
	2.1 Medium Pressure compressor	1	3	3	-	3	-	-	-
	2.2 High Pressure compressor	1	2	2	-	2	-	-	-
	2.3 Grinder and circular saw	1	10	10	-	10	-	-	-
	2.4 Cooling Tower	1	4	4	-	4	-	-	-
	2.5 Measuring Instruments and tools etc.	One lot	1	1	-	1	-	-	-
	2.6 Material Handling equipment, weighing scale, jack.	1 each	5	5	-	5	-	-	-
	2.7 Transformer	1	12	12	-	12	-	-	-
	2.8 Piping System	-	-	20	-	20	-	-	-
	2.9 Spares	-	-	1	-	1	-	-	-
	Sub-Total (2)			58	-	58	-	-	-
3.	TESTING EQUIPMENTS								
	3.1 Pipe test bath with adaptors of all sizes	-	-	10	-	10	-	-	-
	TOTAL COST -			276	-	276	77	-	77

* To start with.

** To instal at the end of 2nd year and hence 10% cost escalations considered.

All prices are subject to change.

SCHEDULE - 7.2

ESTIMATES OF INVESTMENT COST FOR CIVIL WORKS

Sr. No.	Item Description	Cost		Total ('000 US$)
		Foreign ('000 US$)	Local ('000 US$)	
1.	SITE PREPARATION & DEVELOPMENT:			
	1.1 Plot development (6700 sq.mtrs.)	-	30	30
2.	BUILDING AND SPECIAL CIVIL WORKS:			
	2.1 Construction of shed, office etc.			
	Approx.1100 sq.mtrs. @ Rs.100/- sq.mtr.	22	88	110
3.	OTHERS:			
	3.1 Miscellaneous Furniture	-	10	10
	TOTAL	22	128	150

SCHEDULE - 8.1

OVERHEAD COSTS

(IN '000 US$)

Cost Head/ Item	Basis	Year I	Year II	Year III	Year IV	Year V
1. PRODUCTION						
1.1 Maintenance	3% TFI**	12	12	15	15	15
1.2 Insurance	1.5% TFI**	6	6	8	8	8
1.3 Communications	Lumpsum	-	-	-	-	-
1.4 Recurring land charges	Ing/sq. ft.	7	7	7	7	7
1.5 Royalty	4% Sales	42	77	105	112	114
Sub-total		67	102	135	142	144
1.6 Depreciation						
(a) Building	5% (WDV)	7	7	6	6	6
(b) Machinery	15%* (WDV)	143	100	93	65	46
Total Depreciation		150	107	99	71	52
Total Prodn.Overheads		217	209	234	213	196
2. MARKETING						
2.1 Insurance	0.5% Sales	5	10	13	14	14
2.2 Communications) 2.3 Travel)	0.5% Sales	5	10	13	14	14
Total Marketing Overheads		10	20	26	28	28
3. FINANCE AND ADMINISTRATION						
3.1 Communications	Lumpsum	1	1	1	1	1
3.2 Licence fees	Lumpsum	1	1	1	1	1
3.3 Furniture	10% (WDV)	1	1	1	1	1
Total Fin.& Adm Overheads		3	3	3	3	3
TOTAL OVERHEAD COST		230	232	263	244	227

* Total depreciation calculated on machinery is 30% (due to 24 hours/ day operation) based on reducing balance.

SCHEDULE - 8.1
(CONTD..2)

** Total Fixed Investment: (In '000 US$)

		Phase I	Phase II
(i)	Equipments	276	353
(ii)	Civil Works	140	140
		416	493

For working Depreciation, following costs of incorporated assets are added in equipment costs :

		'000 US$
(a)	Technology Cost	149
(b)	Industrial registration cost (approximately)	24
(c)	Pre-operation Costs (Appr.)	10
(d)	Financing cost during construction	20
	Total	203

SCHEDULE - 9.1

MANNING TABLE

REQUIREMENT OF MANPOWER

(Fig. in Nos.)

Department	Shift	PHASE I Foreign	PHASE I Local	PHASE I Total	PHASE II Foreign	PHASE II Local	PHASE II Total
1. PRODUCTION							
1.1 Production In-charge	General	2	-	2	-	2	2
1.2 Shift In-charge	I	-	1	1	-	1	1
	II	-	1	1	-	1	1
	III	-	1	1	-	1	1
1.3 Maintenance Engineer	General	-	2	2	-	2	2
1.4 Operators	General	-	2	2	-	2	2
	I	-	3	3	-	4	4
	II	-	3	3	-	4	4
	III	-	3	3	-	4	4
1.5 Semi-Skilled Workers	General	-	3	3	-	3	3
	I	-	2	2	-	3	3
	II	-	2	2	-	3	3
	III	-	2	2	-	3	3
1.6 Unskilled Workers	General	-	7	7	-	7	7
	I	-	2	2	-	2	2
	II	-	2	2	-	2	2
	III	-	2	2	-	2	2
1.7 Fitter	General	-	1	1	-	1	1
1.8 Electrician	General	-	1	1	-	1	1
Sub-Total (1)		2	40	42	-	48	48
2. MANAGEMENT							
2.1 General Mgr.	General	1	-	1	1*	1*	2
2.2 Administration Officer	General	-	1	1	-	1	1
2.3 Accounts	General	-	1	1	-	1	1
2.4 Stores	General	-	1	1	-	1	1
2.5 Stenographer	General	-	1	1	-	1	1
Sub-Total (2)		1	4	5	1	6	7
3. MARKETING							
3.1 Technical Service Mgr.		1	1	2	1*	2*	3
3.2 Clerk/Typiest		-	1	1	-	1	1
Sub-Total (3)		1	2	3	1	3	4
TOTAL (1+2+3)		4	46	50	2	57	59

*In 3rd year local General Manager and Technical Service Manager will be under training.

SCHEDULE - 9.2

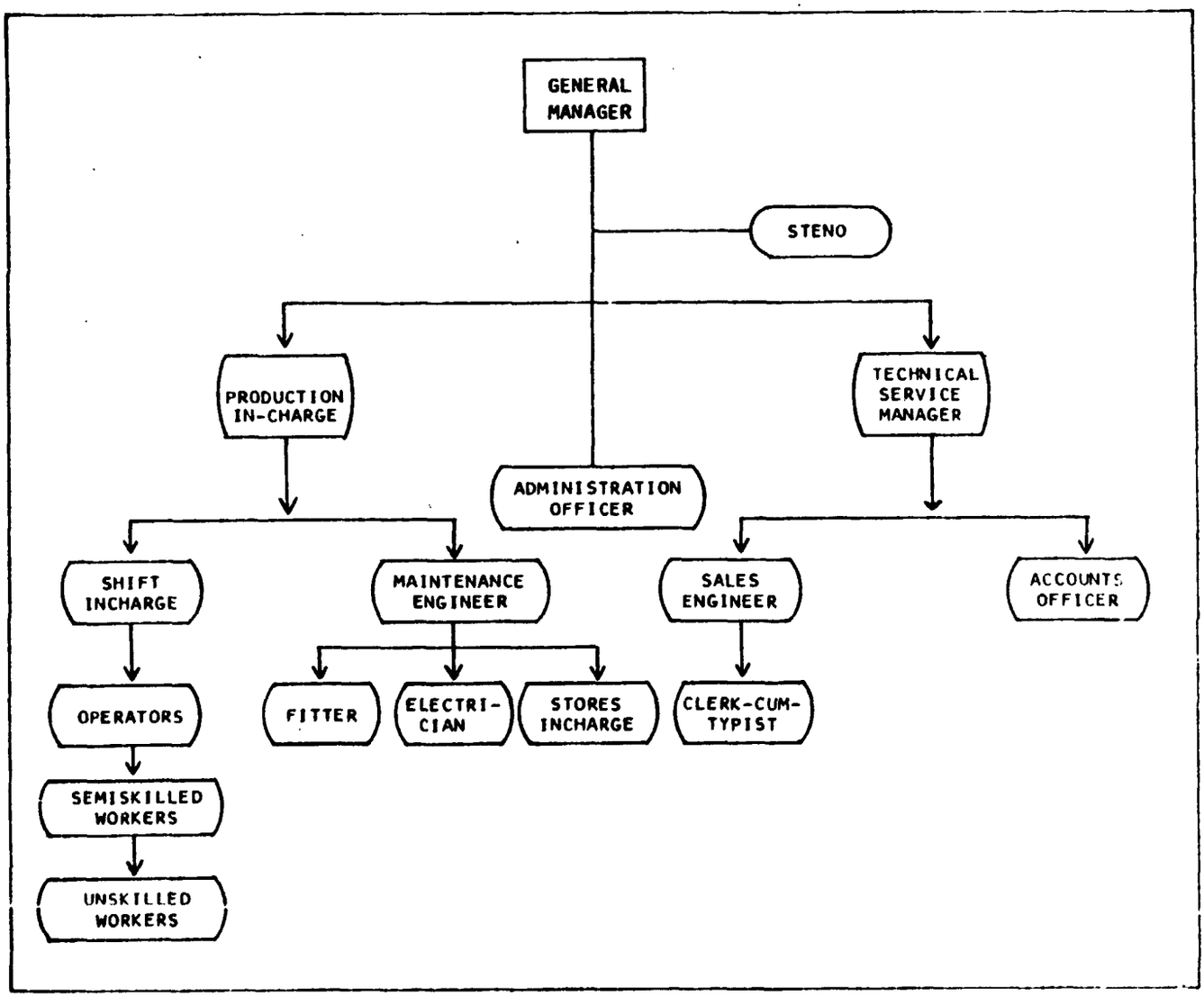
MANPOWER COST

(In '000 US$)

	YEAR I			YEAR II			YEAR III			YR.IV	YR.V
	For.	Local	Total	For.	Local	Total	For.	Local	Total	Local	Local
1. PRODUCTION											
1.1 Production In-Charge	12.0	-	12.0	13.2	-	13.2	-	3.6	3.6	4.0	4.4
1.2 Shift Incharge	-	2.7	2.7	-	3.0	3.0	-	3.3	3.3	3.6	3.9
1.3 Maintenance Engr.	-	1.8	1.8	-	2.0	2.0	-	2.2	2.2	2.4	2.6
1.4 Operators	-	5.4	5.4	-	5.9	5.9	-	8.3	8.3	9.2	10.1
1.5 Semiskilled Workers	-	4.3	4.3	-	4.8	4.8	-	5.8	5.8	6.4	7.0
1.6 Unskilled Workers	-	4.7	4.7	-	5.1	5.1	-	5.6	5.6	6.2	6.8
1.7 Electrician & Fitter	-	1.2	1.2	-	1.3	1.3	-	1.5	1.5	1.6	1.7
Sub-Total	12.0	20.1	32.1	13.2	22.1	35.3	-	30.3	30.3	33.4	36.5
Add: Indirect Cost @ 40%	4.8	8.0	12.8	5.3	8.8	14.1	-	12.1	13.4	12.1	14.6
TOTAL PRODUCTION	16.8	28.1	44.9	18.5	30.9	49.4	-	42.4	42.4	46.8	51.1
2. MANAGEMENT											
2.1 General Manager	18.0	-	18.0	19.8	-	19.8	21.8	6.0	27.8	6.6	7.2
2.2 Administration, Accounts, Stores Steno	-	4.8	4.8	-	5.3	5.3	-	7.0	7.0	7.7	8.5
Sub-Total	18.0	4.8	22.8	19.8	5.3	25.1	21.8	13.0	34.8	14.3	15.7
Add: Indirect Cost @ 40%	7.2	1.9	9.1	7.9	2.1	10.0	8.7	5.2	13.9	5.7	6.3
TOTAL MANAGEMENT	25.2	6.7	31.9	27.7	7.4	35.1	30.5	18.2	48.7	20.0	22.0
3. MARKETING											
3.1 Technical Service Manager	12.0	-	12.0	13.2	-	13.2	14.5	3.0	17.5	3.3	3.6
3.2 Sales Engineer	-	1.2	1.2	-	1.3	1.3	-	1.5	1.5	1.6	1.7
3.3 Typist/Clerk	-	0.7	0.7	-	0.8	0.8	-	0.9	0.9	1.0	1.1
Sub-Total	12.0	1.9	13.9	13.2	2.1	15.3	14.5	5.4	19.9	5.9	6.4
Add: Indirect Cost @ 40%	4.8	0.8	5.6	5.3	0.8	6.1	5.8	2.2	8.0	2.4	2.6
TOTAL MARKETING	16.8	2.7	19.5	18.5	2.9	21.4	20.3	7.6	27.9	8.3	9.0
TOTAL MANPOWER COST	58.8	37.5	96.3	64.7	41.2	105.9	50.8	68.2	119.0	75.1	82.1

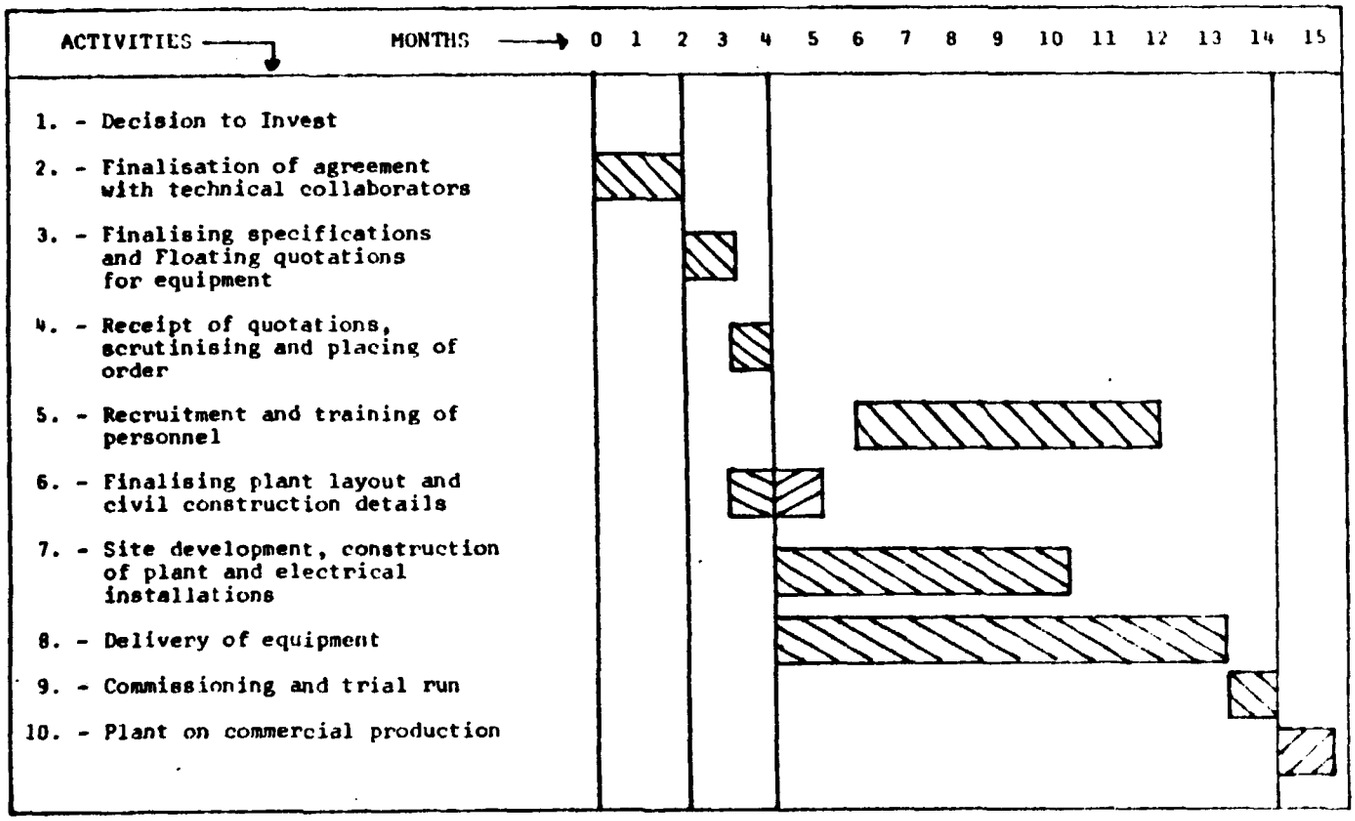
SCHEDULE - 9.3

PROPOSED ORGANISATION CHART



SCHEDULE - 10.1

PROPOSED IMPLEMENTATION SCHEDULE



SCHEDULE - 10.2

ESTIMATES OF COST DURING IMPLEMENTATION

(In '000 US$)

Particulars	Foreign	Local	Total
1. Management of Project Implementation	10	14	24
2. Engineering Services	75	-	75
3. Selection, tendering, supervision, co-ordination, test run and take-over of equipment and plant	25	-	25
4. Pre-operation cost for building of administration, recruitment and training of staff and labour	-	10	10
5. Commissioning of Plant	10	15	25
6. Industrial registration cost	-	24	24
7. Financing Cost	-	20	20
TOTAL :	120	83	203

SCHEDULE - 10.3

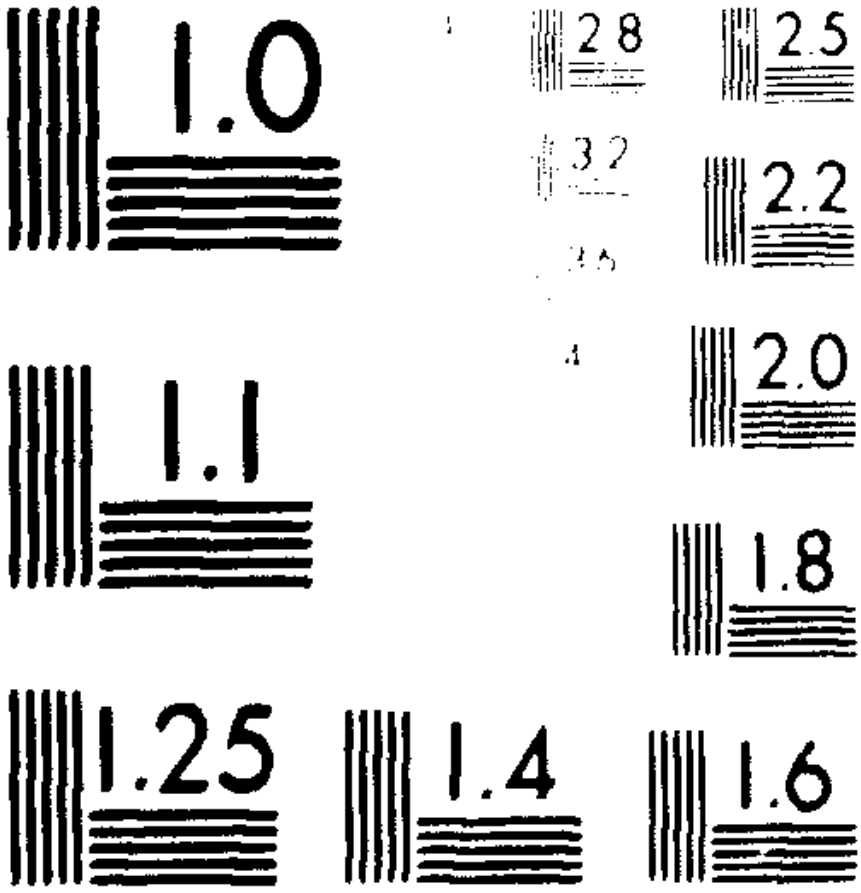
INITIAL FIXED INVESTMENT COST

(In '000 US$)

Item	Investment Category	From Schedule	Foreign	Local	Total
1.	Land	-	-	-	-
2.	Site preparation and development	7.2	-	30	30
3.	Structure and Civil Works	7.2	22	88	110
4.	Incorporated Fixed Assets	10.2	120	83	203
5.	Plant Machinery and Equipment	7.1	276	-	276
6.	Furniture, etc.	7.2	-	10	10
	TOTAL :		418	211	629

NOTE :

1. The above costs are upto start-up period.
2. For one more extruder, an amount of US$ 77,000 will be required during 2nd year of operation.



SCHEDULE - 11.1

TOTAL INVESTMENT COST

Period	Construction			Start-up			Full Prod.			Expansion			Total		
Year	-1			1			2			3 -					
Currency	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt	FC	LC	Tt
1. Fixed Investment Costs															
(a) Initial Fixed Investment Cost	106	91	197	192	37	229	-	-	-	-	-	-	298	128	426
(b) Expansion	-	-	-	-	-	-	-	-	-	77	-	77	77	-	77
2. Preproduction capital expenditure	68	60	128	52	23	75	-	-	-	-	-	-	120	83	203
3. Working capital increases	-	-	-	-	230	230	-	84	84	-	119	119	-	433	433
Total Investment Cost	174	151	325	244	290	534	-	84	84	77	119	196	495	644	1139

NOTES:

1. FC = Foreign Currency
   LC = Local Currency
   Tt = Total
2. In fourth and fifth years of operation, estimated increase in working capital requirement is approx. 31,000 US $ and 3,000 US $ respectively.

SCHEDULE - 11.2

CALCULATION OF WORKING CAPITAL REQUIREMENTS

(in '000 US$)

Particulars	Norms	Start up year	Full Capacity Years			
		1	2	3	4	5
1. CURRENT ASSETS						
1.1. Accounts Receivables	30 days' credit	117	161	220	234	237
1.2. Inventory :						
(a) Raw Materials Imported	3 months' consumption	45	57	79	85	85
(b) Stores & Spares	1 month	1	2	2	2	3
(c) Work-in-progress	15 days of raw material consumption	7	9	13	14	14
(d) Finished Goods	1 month	54	82	116	131	129
1.3 Cash Balance	1 month	21	22	29	26	27
TOTAL CURRENT ASSETS		245	333	459	492	495
2. Less: Accounts Payable						
2.1. Raw Materials *	1 month	15	19	26	28	28
3. WORKING CAPITAL		230	314	433	464	467
4. INCREASE/DECREASE		-	84	119	31	3

..2

SCHEDULE - 11.2
(continued)

A. BASIS FOR COST OF FINISHED GOODS IN ABOVE STATEMENT

	Year I	Year II	Year III	Year IV	Year V
1. Materials & Inputs	439.0	747.0	1,041.0	1,114.0	1,114.0
2. Manpower Cost	53.3	58.6	65.5	48.4	52.9
3. Overhead Cost	217.0	209.0	234.0	213.0	196.0
4. Total Cost	709.3	1,014.6	1,340.5	1,375.4	1,362.9
Total Production	325	571	771	810	810
Cost per tonne	2,182	1,777	1,739	1,698	1,683
Inventory level/MT	25	46	67	77	77

B. BASIS FOR CASH BALANCE

	Year I	Year II	Year III	Year IV	Year V
1. Power and Water	27.0	46.0	62.0	66.0	66.0
2. Manpower Cost	87.9	96.6	117.6	72.0	78.8
3. Overhead Cost (excluding Depreciation)	80.0	125.0	164.0	179.0	175.0
Total	194.9	267.6	343.6	317.0	319.8
Required per month ('000 US$)	21	22	29	26	27

* It is assumed that the proposed unit will negotiate 30 days letter of credit for purchase of raw materials.

SCHEDULE - 11.3

CASH FLOW TABLE

('000 US$)

	Construc-tion	Year I	Year II	Year III	Year IV	Year V
1. CASH INFLOW						
1.1. Equity	125	-	-	-	-	-
1.2. Borrowings	200	534	84	119	31	3
1.3. Sales	-	1,054	1,932	2,636	2,811	2,848
TOTAL	325	1,588	2,016	2,755	2,842	2,851
2. CASH OUTFLOW						
2.1. Assets	325	304	-	77	-	-
2.2. Increase in Current Assets (Net)	-	230	84	119	31	3
2.3. Operating Costs						
(a) Materials & Inputs	-	439	747	1,041	1,114	1,114
(b) Overhead Costs	-	79	124	163	172	174
(c) Manpower Costs	-	96	106	119	75	82
2.4. Statutory Dues	-	24	48	67	72	72
2.5. Dividend @ 16%	-	20	20	20	20	20
TOTAL OUTFLOW	325	1,192	1,129	1,606	1,484	1,465
3. SURPLUS	-	396	887	1,149	1,358	1,386
4. INTEREST COST @ 16%	*	32	45	-	-	-
5. REPAYMENT OF LOAN	-	364	454	119	31	3
6. NET SURPLUS	-	-	388	1,030	1,327	1,383

* Total loan will not be needed for full year and hence 60% of interest considered. This cost is considered in assets cost.

SCHEDULE - 11.4

NET INCOME STATEMENT

('000 US$)

	Year I	Year II	Year III	Year IV	Year V
1. SALES	1,054.0	1,932.0	2,636.0	2,811.0	2,848.0
2. COST OF PRODUCTION					
2.1. Materials & Inputs	439.0	747.0	1,041.0	1,114.0	1,114.0
2.2. Manpower Costs	44.9	49.4	42.4	46.8	51.1
2.3. Overhead Costs	217.0	209.0	234.0	213.0	196.0
TOTAL PRODUCTION COST	700.9	1,005.4	1,317.4	1,373.8	1,361.1
3. CONTRIBUTION	353.1	926.6	1,318.6	1,437.2	1,486.9
4. MANAGEMENT AND MARKETING COST					
4.1. Manpower-Management	31.9	35.1	48.7	20.0	22.0
4.2. Manpower-Marketing	19.5	21.4	27.9	8.3	9.0
4.3. Overhead-Management	3.0	3.0	3.0	3.0	3.0
4.4. Overhead-Marketing	10.0	20.0	26.0	28.0	28.0
TOTAL MANAGEMENT/MARKETING COST	64.4	79.5	105.6	59.3	62.0
5. OPERATING PROFIT	288.7	847.1	1,213.0	1,377.9	1,424.9
6. FINANCING COST	32.0	45.0	-	-	-
7. GROSS PROFIT	256.7	802.1	1,213.0	1,377.9	1,424.9
8. STATUTORY DUES					
8.1. Trade Income Tax	9.2	16.9	23.1	24.6	24.6
8.2. Profits Royalty	2.6	8.0	12.1	13.8	13.9
8.3. Health Tax	12.6	23.2	31.6	33.7	33.7
9. NET PROFIT	232.3	654.0	1,146.2	1,305.8	1,352.7
10. DIVIDENDS (16%)	20.0	20.0	20.0	20.0	20.0
11. UNDISTRIBUTED PROFITS	212.3	734.0	1,126.2	1,285.8	1,332.7
12. ACCUMULATED UNDISTRIBUTED PROFITS	212.3	946.3	2,072.5	3,358.3	4,691.0
RATIOS :					
(a) Gross Profit : Sales (%)	25	42	46	49	50
(b) Net Profit : Sales (%)	23	40	44	47	48
(c) Net Profit : Equity (%)	192	649	918	1,047	1,082

SCHEDULE - 11.5

PROJECTED BALANCE SHEET

('000 US$)

Period	Construc-tion	Start-up	Full Capacity			
Year	- I	I	II	III	IV	V
ASSETS (Total) :						
1. Current Assets	-	245	721	1877	3237	4623
2. Fixed Assets (Net of depreciation)	325	478	370	347	275	221
TOTAL ASSETS	325	723	1091	2224	3512	4844
LIABILITIES (Total) :						
1. Current Liability	-	15	19	26	28	28
2. Loans	200	370	-	-	-	-
3. Equity	125	125	125	125	125	125
4. Retained Profits	-	213	947	2073	3359	4691
TOTAL LIABILITIES	325	723	1091	2224	3512	4844

SCHEDULE - 11.6

CASH FLOW TABLE AND CALCULATION OF NET PRESENT VALUE

Period	Construction	Start up					Salvage Value	Total
	-1	1	2	3	4	5		
A. CASH INFLOWS:								
Sales Revenue	-	1054	1932	2636	2811	2848	-	11281
B. CASH OUTFLOWS:								
1. Fixed Investment	-325	-304	-	- 77	-	-	221*	- 485
2. Current Assets (Net)	-	-230	- 84	-119	- 31	- 3	467**	-
3. Operating and Management Costs	-	-614	-977	-1323	-1361	-1370	-	-5645
4. Financing Cost	-	- 32	- 45	-	-	-	-	- 77
5. Corporate Tax	-	- 24	- 48	- 67	- 72	- 72	-	- 283
6. Dividend	-	- 20	- 20	- 20	- 20	- 20	-	- 100
7. Repayment of Loans	-	-364	-454	-119	- 31	- 3	-	- 971
TOTAL OUTFLOWS	-325	-1588	-1628	-1725	-1515	-1468	688	-7561
C. NET CASH FLOW:	-325	-534	304	911	1296	1380	688	3720
D. PRESENT VALUE (at 16%)	-280	-397	195	503	617	566	247	1451

NOTES: * Salvage value of fixed assets is taken as written down value.

** Salvage value of current assets is at cost.