79. PROFILE ON PRODUCTION OF DEXTRIN

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I. SUMMARY

This profile envisages the establishment of a plant for the production of dextrin with a capacity of 600 tonnes per annum.

The present demand for the proposed product is estimated at 700 tonnes per annum. The demand is expected to reach at 1,086 tonnes by the year 2016.

The plant will create employment opportunities for 15 persons.

The total investment requirement is estimated at Birr 2.92 million, out of which Birr 735,000 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 22% and a net present value (NPV) of Birr 1.58 million discounted at 8.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Dextrin consists of degradation products obtained by treating starch in a number of ways. They may be prepared by acting on a suspension of starch in water by acids or by enzymes under carefully controlled conditions.

Dextrin may be considered as semi-synthetic materials derived from starch. A tremendous number of variations are possible. In practice, however, each manufacturer makes limited a number of grades and sets standards to which each grade must conform. As these standards are partly conditioned by the design and operating conditions of the plant concerned, dextrin from different manufacturers may be similar in some characteristics while differing widely in others. Users order the dextrin, they require according to the code number of their supplier, and if they wish to change their supplier, they normally submit a sample of the required dextrin to the proposed new supplier for matching purposes.

Three broad differentiations are recognized throughout the industry. These are white dextrin,

yellow or canary dextrin and British gum, but even these broad classifications are arbitrary and sometimes it is difficult to determine to which class a given dextrin belongs.

Dextrin is mainly available in three categories which are used in adhesive industry, and in textile industry. However, when it is manufactured form tapioca starch it has adhesive quality only. But then, it can be blended with some other materials for the use of foundry and textile industry. These formulations are mostly made in house according to the particular industry need.

II. MARKET AND PLANT CAPACITY STUDY

A. MARKET STUDY

1. Past Supply and Present Demand

Vegetables adhesives include starches and dextrins derived from wheat, potatoes, and rice, used for bonding paper, wood, textiles etc. Due to their wide application in the manufacturing sector, the demand is very high.

The present supply for dextrin adhesives is mainly met through import. The import statistics on dexterins is presented in Table 3.1.

Table 3.1

IMPORT OF DEXTRIN ADHESIVES

Year	Quantity (Tonnes)
2001	108.6
2002	155.6
2003	183.7
204	455.5
2005	658.5
2006	743.0

As could be observed from Table 3.1 the import volume has been consistently increasing from year to year. Import volume, which was 108.6 tonnes during the year 2001, has increased to a level of 183.7 tonnes by the year 2003. Similarly import volume has increased to a level of 455.5 tonnes and 658.5 tonnes by the years to 2004 and 2005, respectively. By the year 2006 the supply from import has reached to a level of 743 tonnes.

In the estimation of the current demand, the 2005 - 2006 average level of import is considered. Accordingly current effective demand is estimated at 700 tonnes.

2. Projected Demand

Since dextrin adhesive is used in various manufacturing processes the demand is related with the growth of the manufacturing sector. Therefore the demand projection is made on a conservative estimate of 5%, which is less than the predicted growth rate of the manufacturing sector. The projected demand on dextrin adhesive is presented in Table 3.2.

Table 3.2

PROJECTED DEMAND FOR DEXTRIN ADHESIVE

Year	Quantity (Tonne)
2007	700
2008	735
2009	772
2010	810
2011	851
2012	893
2013	938
2014	985
2015	1034
2016	1086

3. Pricing and Distribution

Based on the average CIF value of imported dextrin and other costs (duty, port handling, inland transport and bank charges), the ex factory price is proposed to be Birr 5,000 per tonne.

Since dextrin adhesive is an intermediate product, the distribution of the product is more convenient if it is direct. Penetration of domestic market will be facilitated through advertisement by creating awareness as well as sales promotional measures.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

The daily production capacity of the plant is 2 tones. Annual capacity is 600 tonnes based on

single shift operation and 300 working days. The working days are set by deducting Sundays and public holidays in a year and assuming that maintenance works will be carried out during off-production.

2. Production Programme

Assuming the difficulty of market entry and gradual growth of sales the plant will produce at 75% of its designed capacity in the first year, 85% in the second year attaining full capacity on the third year and thereafter.

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

The raw material requirements and costs are shown in Table 4.1.

Table 4.1

RAW MATERIAL REQUIREMENT AND COST

Sr. No.	Description	Annual Qty. (tonnes)	Annual Cost ('000 Birr)		
			FC	LC	Total
1	Tapioca Starch	660	1603	161	1764
2	Hydrochloric Acid	120	136	14	150
3	Catalyst	6	29	4	33
	Total		**1768**	**179**	**1947**

B. UTILITIES

The utilities required include electricity and water. The installed power is estimated to be 460 kWh. Annual electricity consumption will be 1104 MWH, costing Birr 523,382. Annual water consumption will be 1,000 cubic meters, with an annual cost of Birr 5,500.

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

A pre-determined quantity of acid is sprayed on the air dried starch by means of an atomizer jet to give the required PH. The starch is suitably agitated during the addition. Additional catalysts such as inorganic salts may be added at this stage. It is then allowed to mature to facilitate even distribution of the acid throughout the starch. Drying is then carried out in a well designed roaster by continuous heating and agitator. Roasting is carried out thereafter with continuous stirring of starch in a vertical agitator.

To prevent conversion of the dextrin proceeding further than desired, it is immediately discharged from the roaster and cooled. In order to avoid foaming or lump formation, dextrin is humidified before packing. To achieve exact standards of various types of dextrin, it is required to be blended.

2. Source of Technology

Machinery and know how is readily available in China and India.

B. ENGINEERING

1. Machinery and Equipment

The list of machinery and equipment required is shown in Table 5.1. The total cost of machinery and equipment is estimated at Birr 735,000 out of which Birr 661,000 is in foreign currency.

Table 5.1

LIST OF MACHINERY AND EQUIPMENT

Description	Quantity Required
Blender mixer (100 liters capacity)	1
Acidification Tank(100 liters capacity)	1
Centrifuge	1
Vacuum dryer	1
Cooling tower	1
Ball mill	1
small boiler	1
Roasting vessel	1
Auxiliary Equipment (compressor, pipes, fillings, etc)	set

2. Land, Building and Civil Works

The total built-up area of the plant is estimated to be 400 square meters. The total land requirement is 1000 square meters. The cost of the land will be Birr 100 per annum. The cost of civil works is estimated at Birr 1,000,000 of which about 30% will be in foreign currency.

3. Proposed Location

The proposed site for the envisaged dextrin plant is in Areka town of Bolososere Woreda.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The total manpower requirement of the plant is estimated to be 15. The manpower list and salary costs are shown in Table 6.1.

Table 6.1

MANPOWER REQUIREMENT AND LABOUR COST

No.	Description	No.	Monthly salary (Birr)	Annual Salary (Birr)
A.	Administration			
1	Manager	1	1500	18,000
2	Secretary	1	800	9,600
3	Accountant	1	800	9,600
4	Guard	2	400	4,800
	Sub-total	**5**	**3500**	**42,000**
B.	Production			
1	Supervisors	1	800	9,600
2	Skilled workers (Operators and	4	2000	24,000
3	technicians)	5	1000	12,000
	Unskilled workers (Laborers)			
	Sub-total	**10**	**3,800**	**45,600**
	Total	**15**	**7,300**	**87,600**

B. TRAINING REQUIREMENT

The process requires no special training except for basic orientation during plant erection.

VII. FINANCIAL ANALYSIS

The financial analysis of the dextrin project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 year
Source of finance	30 % equity
	70 % loan
Tax holidays	3 years
Bank interest	8 %
Discount cash flow	8.5%
Accounts receivable	30 days
Raw material local	30 days
Raw material, import	90 days
Work in progress	5 days
Finished products	30 days
Cash in hand	5 days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at 2.93 million, of which 11 per cent will be required in foreign currency.

The major breakdown of the total initial investment cost is shown in Table 7.1.

Table 7.1

INITIAL INVESTMENT COST

Sr. No.	Cost Items	Total Cost ('000 Birr)
1	Land lease value	8.0
2	Building and Civil Work	1,000.0
3	Plant Machinery and Equipment	735.0
4	Office Furniture and Equipment	75.0
5	Vehicle	450.0
6	Pre-production Expenditure*	296.8
7	Working Capital	360.6
	Total Investment cost	**2,925.4**
	Foreign Share	11

* *N.B Pre-production expenditure includes interest during construction (Birr 146.75 thousand) and Birr 150 thousand costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

B. PRODUCTION COST

The annual production cost at full operation capacity is estimated at Birr 2.56 million (see Table 7.2). The material and utility cost accounts for 76.52 per cent, while repair and maintenance take 3.89 per cent of the production cost.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	1,947.00	75.84
Utilities	17.52	0.68
Maintenance and repair	100	3.89
Labour direct	52.56	2.05
Factory overheads	47.2	1.84
Administration Costs	35.04	1.36
Total Operating Costs	2,199.32	85.66
Depreciation	251	9.78
Cost of Finance	117.08	4.56
Total Production Cost	**2,567.40**	**100**

C. FINANCIAL EVALUATION

1. Profitability

According to the projected income statement, the project will start generating profit in the first year of operation. Important ratios such as profit to total sales, net profit to equity (Return on equity) and net profit plus interest on total investment (return on total investment) show an increasing trend during the life-time of the project.

The income statement and the other indicators of profitability show that the project is viable.

2. Break-even Analysis

The break-even point of the project including cost of finance when it starts to operate at full capacity (year 3) is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 21\%$$

3. Pay Back Period

The investment cost and income statement projection are used to project the pay-back period. The project's initial investment will be fully recovered within 5 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 22 % and the net present value at 8.5% discount rate is Birr 1.58 million.

D. ECONOMIC BENEFITS

The project can create employment for 15 persons. In addition to supply of the domestic needs, the project will generate Birr 1.21 million in terms of tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports.