130. PROFILE ON PRODUCTION OF CORRUGATED PAPER BOX

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I. SUMMARY

This profile envisages the establishment of a plant for the production of corrugated paper box with a capacity of 40 tonnes per annum.

The present demand for the proposed product is estimated at 31.7 tonnes per annum. The demand is expected to reach at 73 tonnes by the year 2017.

The plant will create employment opportunities for 31 persons.

The total investment requirement is estimated at about Birr 2.81 million, out of which Birr 857,000 is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 14 % and a net present value (NPV) of Birr 425,630 discounted at 8.5%.

II. PRODUCT DESCRIPTION

Corrugated paperboard box is a paper box having different sizes used for packing industrial products. Demand for the product has been met both through import and domestic supply.

The major raw materials used to manufacture corrugated paper box are liners, glue, ink and other auxiliary materials.

Manufacturing process involved include corrugation, slitting, printing, slotting, folding and packing.

The out-put of the plant will serve as a packing material for the outputs of many industries. The linkage effect of the plant is, therefore, forward.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Corrugated paper boards are used for carrying products , protect it from banging around and keeping it from spilling. They are made with important information printed on them about the product inside, how to lift or move it.

The supply of corrugated paper boards are met through import and domestic production. The supply of imported corrugated paper board is presented in Table 3.1. Imported products volume is decreasing while agricultural and industrial production is increasing indicating the domestic supply being satisfying the demand for packaging increasingly.

Imported supply of corrugated paper board for the last ten years was on average 73.8 tons. Nevertheless the first two years average supply was 289.9 tons while the remaining eight years annual average was 19.7 tons. The decline of paper board is simply explained by the effective substitutions by domestic products.

Table 3.1

IMPORTED CORRUGATED PAPER BOARD

Year	Tons
1997	467.3
1998	112.5
1999	46.3
2000	8.8
2001	3.5
2002	4.4
2003	0.2
2004	54.0
2005	40.2
2006	0.7

Source: *Customs Authority*

Therefore imported supply of corrugated paper board is assumed to measure the unsatisfied demand for the product. Accordingly, the current unsatisfied demand for corrugated paper board is taken to be the average import of the latest three years 2004-2006 or 31.7 tons.

2. Demand Projection

The unsatisfied demand for corrugated paper board is assumed to grow with the growth in demand for packaging materials by the agro-industrial, manufacturing and service sectors of the economy. In addition to this, the demand for the product will outgrow the domestic capacity unless met through expansion and new projects.

For the purpose of this study the annual GDP growth rate of 8.7% is considered to project the demand for corrugated paper board. Projected demand is presented in Table 3.2.

Table 3.2
PROJECTED DEMAND FOR
CORRUGATED PAPER BOARD

Year	Tons
2008	34.5
2009	37.5
2010	40.7
2011	44.3
2012	48.1
2013	52.3
2014	56.8
2015	61.8
2016	67.2
2017	73.0

3. Pricing and Distribution

The retail price for a standard paper board is Birr five per piece. The proposed price for the same item of the new project is Birr 4.00.

Packaging materials are mainly produced according to the specific orders of customers. Hence the project will target on selected enterprises and develop its marketing strategy according to the needs of those potential user enterprises.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

The market study for the product in the Administration indicates that the demand of corrugated paper box in 2008 is 34.5 tonnes, and this figure will grow to 73 tonnes by the year 2017.

Based on the this information, the proposed plant will have a capacity of 40 tonnes of corrugated paper box per annum having different sizes. The plant will operate single shift, 8 hours a day, and for 300 days a year.

2. Production Programme

The plant will initially be operated at 70% of its installed capacity and gradually increase its annual output to 85%, and finally to 100% in the succeeding years.

This gradual development of annual output is very important in order to get used to the technology and penetrate the local and national market. Table 3.3 below depicts the proposed production programme.

Table 3.3

PRODUCTION PROGRAMME

YEAR	1	2	3-10
Capacity utilization (%)	70	85	100
Production (tonne)	42	51	60

IV. MATERIALS AND INPUTS

A. RAW AND AUXILIARY MATERIALS

The major raw materials used in making corrugated paperboard are Kraft paper of different grades, adhesive or glue and printing inks.

For a double-faced corrugated board, which is the proposed type for most packing uses, three grades of kraft paper raw materials are required. These are:-

- Kraft liner – The outermost flat layer with a specific weight of 170-180 g/m^2
- Test liner - The inner most flat layer with a specific weight of 160-180 g/m^2.
- Fluting Medium - The middle corrugated layer having a specific weight of 112-127 g/m^2 and higher stiffness.

The adhesive material commonly used in the paper packaging industry is either silicate adhesive (water glass) or starch adhesive. All the three types of paper raw materials are imported. Adhesive and printing inks are locally available.

Table 4.1

ANNUAL MATERIALS REQUIREMENTS AND COSTS

Sr. No.	Description	Qty . (Tonnes)	Unit cost (Birr)	Cost in Birr ('000)		
				FC	LC	TC
1	Kraft liner	22	5500	-	121.00	121.00
2	Fluting Medium	25	6000	-	150.00	150.00
3	Test Liner	21	5000	-	105.00	105.00
	Total	**-**	**-**		**376.00**	**376.00**

Among potential suppliers of kraft paper to the world market, the following can be cited:-

(i) Yashi paper Limited
Darshan Nagar, Faziabd – 224135, U.P, India

(ii) Sappi Cape Kraft (PTY) Ltd
Fax = + 27 21 5522152
South Africa

Auxiliary raw materials for the production of corrugated board include: adhesives, inks and finishing chemicals. Table 4.2 below shows the annual requirements of auxiliary materials for the production of corrugated paper board.

Table 4.2

ANNUAL AUXILIARY MATERIALS AND COSTS

Sr. No	Description	Qty (Kg)	Unit cost (Birr)	Cost in Birr ('000)		
				LC	FC	TC
1.	Adhesive (starch)	1600.00	**4.00**	6.40	-	6.40
2.	Inks and other finishing Chemicals	200.00	**115.00**	23.00	-	23.00
	Total	-	-	29.40	-	29.40

B. UTILITIES

Electricity, fuel oil and water are inputs required for the envisaged plant. Annual requirements and costs of utilities are shown in Table 4.3.

Table 4.3

UTILITY REQUIREMENT & COSTS

Sr. No.	Description	Annual Consumption	Unit Cost (Birr)	Total Cost (Birr)
1	Electricity (120 KW)	57,600 kWh	0.474	37,303
2	Water (at the rate of 1.5 liters/min)	14,000 m^3	3.10	43,400
3	Fuel oil (at the rate of 1.5 liters/min)	9800 Lit	3.34	32,732
Total		**-**	**-**	**103,435**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The conventional technology of corrugated board box production is a batch process where four major operations are involved, namely:-

- Corrugator
- Slitter scorer
- Printer slotter, and
- Folder gluer.

The fluting medium leaves its winding reel, passes over heated rolls and goes through steam showers; and then passes between two corrugated rolls to get 'U' shape of a flute. The kraft liner rolls are unwounded and continuously drawn over heated drum that comes in contact with the glued flute tips. The adhesive applied at this point with applicator roll is used to form a bond between the corrugated medium and the single face liner.

The web is then guided to the double facer unit where the test liner is glued to the other face of the flute medium and this completes the process of single-walled corrugated board. The single –walled board (3 - ply) board produced in such a way is directed to the slitter – scorer for sizing and finally to the printer – slotter for specific box (carton) designs and necessary printing patterns.

2. Source of Technology

The technology of corrugated paper board manufacturing is available from the following sources:-

a) New Long Machine Works, Ltd.
   4-14 Higashi UENO – 6 CHOME
   Taito – Ku Tokyo 110 – 0015
   Japan

b) Daewoo Corporation
C.P.O. Box 2924
541,Ga,Namdaemun – ro,
Jung – gu, seoul, Korea

B. ENGINEERING

1. Machinery and Equipment

The basic machinery and equipment required for the envisaged plant are listed in Table 5.1. The total cost estimate is Birr 857,000 thousands, of which Birr 775,270 thousands is in foreign currency and the balance is in local currency.

Table 5.1

LIST OF REQUIRED MACHINERY AND EQUIPMENT AND COST

Sr. No	Description	Qty.	Unit Pice (Birr)	Total cost ('000 Birr)		
				FC	LC	TC
1	Corrugator	1	134	134	-	134
2	Slitter Scorer	1	63	63	-	63
3	Printer	1	86	86	-	86
4	Rotary Slotter	1	71	71	-	71
5	Folder Gluer	1	52	52	-	52
6	Boiler	1	134	134	-	134
7	Fork lift(5-10 ton)	1	250	250	-	250
	Total FOB	-	-	**790**	**-**	**790**
	Freigh, Insurance, Bank charges, handling charges, etc…	-	-	**1**	**66**	**67**
	Total CIF	**-**	**-**	**-**	**-**	**857**

2. Land, Building and Civil Works

Built-up area of the plant is comprised of main factory building, warehouses, offices and guardhouses. These are considered to cover an area of about 500 m^2. Taking into account reserve area for future expansion, accommodation of vehicles and trucks, and space for grinding, the total site area is estimated to be 1,000 m^2. Land acquisition by means of lease for 70 years is estimated at Birr 7,000.

Taking into consideration the average building construction cost of Birr 1,500 per m^2, the total cost of building is estimated at Birr 750,000. The aggregate expenditure on plant building and land lease value will be Birr 757,000.

3. Proposed Location

Meant Sasha Woreda, Jemu town is taken as a proposed location of the envisaged plant.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The Plant requires technical, production and administrative manpower. A total of 31 persons are required, and Table 6.1 below indicates the details of manpower requirement, together with annual expenditure.

Table 6.1

MANPOWER REQUIREMENT AND LABOUR COST

Sr. No	Job Position	Qty.	Monthly Salary (Birr)	Annual Salary (Birr)
1	General Manager	1	2,000	24,000
2	Production Supervisor	1	1,200	14,400
3	Accountant	1	700	8,400
4	Maintenance Head	1	800	9,600
5	Personnel	1	600	7,200
6	Clerk	2	400	9,600
7	Secretary	3	500	18,000
8	Stores Head	1	500	6,000
9	Cashier	1	400	4,800
10	General Services	3	200	7,200
11	Guard	3	200	7,200
12	Operators	6	600	43,200
13	Assistant Operators	3	300	10,800
14	Technicians	4	500	24,000
Sub Total		**31**		**194,400**
Employees Benefit (25% BS)				48,600
Total				**243,000**

B. TRAINING REQUIREMENT

Training is required for technical staff and operators. It is proposed that appropriate training programme will have to be executed at the workshop of the machinery supplier(s) for a period of one month. The training programme shall be incorporated in the main contractual agreement of technology supply and procurement. The training cost will, thus, be covered by the technology supplier.

VII. FINANCIAL ANALYSIS

The financial analysis of the corrugated paper box 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	2 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 Birr 2.81 million, of which 29 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	490.0
2	Building and Civil Work	750.0
3	Plant Machinery and Equipment	857.0
4	Office Furniture and Equipment	125.0
5	Vehicle	200.0
6	Pre-production Expenditure*	312.0
7	Working Capital	83.5
	Total Investment cost	**2,817.4**
	Foreign Share	29

** N.B Pre-production expenditure includes interest during construction (Birr 161.96 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 1.09 million (see Table 7.2). The material and utility cost accounts for 46.38 per cent, while repair and maintenance take 1.82 per cent of the production cost.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	405.40	36.95
Utilities	103.44	9.43
Maintenance and repair	20	1.82
Labour direct	116.64	10.63
Factory overheads	38.88	3.54
Administration Costs	77.76	7.09
Total Operating Costs	762.12	69.47
Depreciation	205.7	18.75
Cost of Finance	129.21	11.78
Total Production Cost	**1,097.03**	**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.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 27\ \%$$

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 6 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 14% and the net present value at 8.5% discount rate is Birr 425,630.

D. ECONOMIC BENEFITS

The project can create employment for 31 persons. In addition to supply of the domestic needs, the project will generate Birr 624,900 terms of tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports.