

**67. PROFILE ON PRODUCTION OF SHEET
GLASS**

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I. SUMMARY

This profile envisages the establishment of a plant for the production of sheet glass with a capacity of 15,000 tonnes per annum.

The present demand for the proposed product is estimated at 14,148 tonnes per annum. The demand is expected to reach at 36,696 tonnes by the year 2017.

The plant will create employment opportunities for 107 persons.

The total investment requirement is estimated at Birr 175.55 million, out of which Birr 155.92 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 30 % and a net present value (NPV) of Birr 157.68 million discounted at 8.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

A sheet glass is a rigid, brittle, transparent material which is produced by fusing it mainly with silica, lime and soda ash. It can be produced in a wide range of sizes with a thickness of 2 to 12 mm.

The profile envisages production of sheet glass of thickness 3mm - 6mm in different proportion. The product is widely applicable in construction, particularly in building construction for doors and windows as well as for furniture, show cases, green houses mirrors and the like.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

The country's requirement of sheet glass is entirely met through import. Ethiopia imports a variety of sheet glass for use in the construction sector and furniture manufacture. The types of sheet glasses imported include cloured throughout the mass (body tinted), non-wired and wired un worked sheets of cast/rolled glass and plain clear sheet glass. The quantity and value of sheet glass imported in the past ten years is given in Table 3.1.

Table 3.1
IMPORT OF SHEET GLASS

Year	Qty(TON)	Value (Birr)
1997	2162.3	10,072,350
1998	3063.3	9,526,367
1999	3431.9	10,786,046
2000	5149.2	24,577,993
2001	6792.8	25,426,036
2002	5361.7	18,348,741
2003	8257.0	22,219,519
2004	10250.5	30,682,606
2005	6704.6	27,415,360
2006	11,789.7	41,213,056

Source:- Compiled from Customs Authority

As could be observed from Table 3.1 import of sheet glass in the past 10 years has shown an increasing trend. During the past 10 years the annual average growth of import was about 20%. The import level, which was 2,162.3 tones in the year 1997, has increased to a level of

5,149.2 tons and 10,250.5 tons by the year 2000 and 2004 respectively. Although the import figure declined to 6,704.6 tons by the year 2005 it did not stay long to increase to about to 11,790 tons by the year 2006. The high growth rate registered during the past eight years is mainly due to the growth of the construction sector and urbanization.

To determine the present effective demand 20 annual average growth rates, which was observed in the past ten years, is applied by taking year 2006 as a base. Accordingly, current effective demand for sheet glass is estimated at 14,148 tons.

2. Demand and Projection

The demand for sheet glass is mainly influenced by the development of the building construction sector and urbanization. The construction sector of developing economies is found to grow at faster rate than their economy in general. With a population of more than 70 million and existing conducive conditions the economy is expected to grow at an accelerated rate. The accompanying growth in-turn will accentuate the demand for sheet glass and other building materials.

In order to forecast the demand for sheet glass the observed values in the past trend and the growth of the construction sector has been considered. Accordingly, import has been growing by about 20 annually in the past 10 years. Since this is found to be very high due to backlog effect it is adjusted to 10 and is considered to be a pessimistic growth rate. The forecast executed on the basis of this assumption is presented in Table 3.2

Table 3.2**PROJECTED DEMAND FOR SHEET GLASS**

Year	Qty (TON)
2008	15,562
2009	17,119
2010	18,831
2011	20,714
2012	22,785
2013	25,064
2014	27,570
2015	30,327
2016	33,360
2017	36,696

2. Pricing and Distribution

The average CIF price of sheet glass imported in the past four years in Birr 3,792 per ton. Assuming 40% for duty, clearance, and other expenses Birr 5,000 per ton is recommended for sales revenue projection.

The product will find its market outlet through the existing building materials distributing enterprises throughout the country.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME**1. Plant Capacity**

The recommended plant capacity is 15, 000 tons operating twenty-four hours per day, working for 300 working days.

The working days have been estimated by subtracting routine maintenance from calendar days of

the year. The process can not be interrupted once started at least for four to five years as stopping and restarting the operation will be extremely expensive.

2. Production Programme

70% of plant capacity during the 1st year

85% of plant capacity during the 2nd year

90 % of plant capacity during the 3rd year

100% of the plant capacity during the 4th year

The gradual increase in production is planned because of the complexity of technology which will require considerable amount of time for the operators to grasp the skill.

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

Even though there are so many different glass compositions, the average composition for sheet glasses is as follows:-

- Sand 64%
- Lime stone 7%
- Soda Ash 14%
- Dolomite 14%
- Other refining, colouring and decolorizing chemicals 1%.

During processing of this product, cullet (broken glass) of similar composition is added in the range of 30 to 50% to facilitate the melting process. The annual consumption of raw materials is summarized in Table 4.1. The major auxiliary materials are packing materials. As the products are rigid and brittle, appropriate packing materials which are usually wooden pallets are required.

Table 4.1**ANNUAL CONSUMPTION OF RAW MATERIALS AND AUXILIARY MATERIALS**

No	Description	Annual Consumption	Cost in '000 Birr		
			F.C	L.C	T.C
1	Sand	L0800 t	-	3,240	3,240
2	Soda Ash	2400 t	-	2,808	2,808
3	Limestone	1200 t	-	481	481
4	Dolomite	2400 t	1200	240	1440
5	Cullet	3300 t	-	990	990
6	Additives	150 t	373.25	74.65	447.9
Total			1573.25	7,353	8,926

B. UTILITIES

Utilities required by the project are:-

- Furnace oil (Heavy fuel oil)
- Electricity
- Compressed air
- Potable and industrial water

The annual requirement of utilities and the corresponding cost are given in Table 4.2

Table 4.2**ANNUAL UTILITIES CONSUMPTION AND COST**

No	Description	Annual Consumption	Cost in '000 Birr		
			F.C	L.C	T.C
1	Furnace oil	825 t	-	883.9	883.9
2	Electric Energy	5250 mwh	-	1345.6	1,345.6
3	Water	7000 m ³	-	11.7	11.7
	Total		-	883.9	883.9

V. TECHNOLOGY AND ENGINEERING**A. TECHNOLOGY****1. Production Process**

The ordinary sheet glass is produced by the vertical drawing method. The procedure is as follows.

The major ingredients, from their storage bins, are proportioned by the adjustable automatic weigher and fed to the batch mixer. The small ingredients are dosed on the belt conveyor which feed the ingredients to the batch mixer. The mixed batch from the storage bin is fed to the furnace via a belt conveyor with the batch distributor so that it can be distributed uniformly in the furnace. There it melts and the molten glass is homogenized as it slowly flows through the regaining vessel, and then its viscosity gradually drops. This molten glass is drawn vertically from the furnace through a so called "debiteuse" by means of a drawing machine.

The glass is continuously drawn upward in ribbon form and its' surface is chilled by adjacent water coils. Then it passes through the annealing chamber. After cooling down completely it is cut to required size and packed in appropriate way.

2. Source of Technology

Information regarding machinery and equipment for processing of the product can be obtained from: www.glassglobal.com.

B. ENGINEERING

1. Machinery and Equipment

The required machinery and corresponding costs are provided in Table 5.1 below.

Table 5.1
LIST OF MACHINERY AND EQUIPMENT

No.	Description	Cost in '000 Birr		
		F.C	L.C	T.C
1	Sand preparation and refining unit	3,620	725	4,345
2	Storage and mix preparation	10,861	2,172	13,033
	2.1 Storage bins			
	2.2 Automatic batch dozer			
	2.3 Batch mixer			
	2.4 Batch feeder			
	2.5 Batch distributor			50,684
3	Melting furnace and utilities	42,236	8,448	14,481
4	Cooling system	12,067	2,414	15,928
5	Finishing line	13,274	2,654	
	5.1 Dibiteuse and draw bar			
	5.2 Drawing machine			
	5.3 Automatic Cutler			
	5.4 Lay down machine			2,896
	5.5 Annealing chamber			21,721
6	Compressor station	2,413	483	20,980
7	Central control panel	18,101	3,620	4,427
8	Handling facilities	17,483	3,497	7,425
9	Transformer station	3,689	738	
10	Erection	5,197	2,228	
		128,941	26,979	155,920

2. Building and Civil Works

For construction of this plant an estimated land area of 20,000 square meters is required of which the building covers a total floor area of 3,000 square meters. Enough open space has been assumed for bulky raw material storage and easy of movement during operation and possible future expansion.

It is estimated that the annual land lease cost will be Birr 2,000 and the total cost of building construction is estimated to be Birr 7,500,000.

3. Proposed Location

The project shall be located in Bachima town, Meanit Goldia Woreda of Bench Maji Zone.

VI. MANPOWER AND TRAINING REQUIREMENTS

A. MANPOWER REQUIREMENT

Manpower requirement for sheet glass processing plant is summarized in Table 7.1.

B. TRAINING REQUIREMENT

Process engineers shall be intensively trained for glass technology.

All other production personnel shall be trained for processing technique and operation of machinery and equipment of their respective work areas during the commissioning period of the plant.

Table 7.1**MANPOWER REQUIREMENT FOR SHEET GLASS PROCESSING PLANT**

Position	No	Salary Per Month	Salary Per Year
A. <u>Plant Management</u>			
1. Plant Manger	1	4,000	48,000
2. Secretary	1	1,000	12,000
B. <u>Production Staff</u>			
1. Production manager	1	3,000	36,000
2. Production clerk	1	650	7,800
3. Process engineer	3	2,000	72,000
4. Shift leader	3	1,300	46,800
5. Control room attendant	6	800	57,600
6. Operators	9	650	70,200
7. Production inspectors	6	800	57,600
8. Packers	6	500	36,000
9. Labourers	24	300	86,400
C. <u>Maintenance & Laboratory</u>			
1. Maintenance & Utility Manager	1	2,500	304,000
2. Quality Manger	1	2,500	30,000
3. Quality Controller	9	1,000	108,000
4. Mechanic	6	1,000	72,000
5. Electrician	6	1,000	72,000
6. Instrument technician	3	800	28,800
D. <u>Others</u>			
1. Head for finance & admin	1	2,500	30,000
2. Marketing Manager	1		30,000
2. Personnel Officer	1	2,500	12,000
3. Accountant	1	1,000	12,000
4. Cashier	1	1,000	9,600
5. Purchaser & transistor	1	800	9,600
6. Sales man	1	800	9,600
7. Stores' clerk	1	800	4,800
8. Time Keeper	3	400	10,800
9. Security guard	6	300	14,400
10. Messenger/cleaner	3	200	7,200
		200	
Benefits (25% of Basic Salary)			296,800

Total	107	1,484,000
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VII. FINANCIAL ANALYSIS

The financial analysis of the sheet glass 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 Birr 175.55 million, of which 19 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	2.0
2	Building and Civil Work	7,500.0
3	Plant Machinery and Equipment	155,920.0
4	Office Furniture and Equipment	125.0
5	Vehicle	200.0
6	Pre-production Expenditure*	10,096.9
7	Working Capital	1,713.4
	Total Investment cost	175,557.3
	Foreign Share	19

* *N.B Pre-production expenditure includes interest during construction (Birr 9.94 million 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 35.85 million (see Table 7.2). The material and utility cost accounts for 27.36 per cent, while repair and maintenance take 0.78 per cent of the production cost.

Table 7.2
ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	8,926.00	24.89
Utilities	883.9	2.47
Maintenance and repair	280	0.78
Labour direct	890.4	2.48
Factory overheads	296.8	0.83
Administration Costs	593.6	1.66
Total Operating Costs	11,870.70	33.11
Depreciation	16049.5	44.76
Cost of Finance	7935.59	22.13
Total Production Cost	35,855.79	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.

$$\text{BE} = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 35 \%$$

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 3 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 30% and the net present value at 8.5% discount rate is Birr 157.68 million.

D. ECONOMIC BENEFITS

The project can create employment for 107 persons. In addition to supply of the domestic needs, the project will generate Birr 90.64 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.