**PROFILE ON THE PRODUCTION OF COMPRESSORS**

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# I. SUMMARY

This profile envisages the establishment of a plant for the production of compressors with a capacity of 300 units per annum. Compressors are used in many industrial processes, from construction, through manufacturing, to drilling oil wells.

The demand for compressors is entirely met through import. The present (2012) demand for compressors is estimated at 14295 pieces. The demand for compressors is projected to reach 21,005 pieces and 30,863 pieces by the year 2017 and 2022, respectively.

The principal raw materials required are C.I. castings, M.S plate, expanded mesh, and M.S. sheets. All the raw materials have to be imported.

The total investment cost of the project including working capital is estimated at Birr 6.27 million. From the total investment cost the highest share (Birr 4.54 million or 72.42%) is accounted by fixed investment cost followed by initial working capital (Birr 895.78 thousand or 14.28%) and pre operation cost (Birr 834.84 thousand or 13.31%). From the total investment cost Birr 2.09 million or 33.31% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 26.23% and a net present value (NPV) of Birr 5.24 thousand discounted at 10%.

The project can create employment for 31persons. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports. The project will also create forward linkage with the manufacturing and construction sub sectors and also generates income for the Government in terms of tax revenue and payroll tax.

# II. PRODUCT DESCRIPTION AND APPLICATION

Compressed air is used in many industrial processes, from construction, through manufacturing, to drilling oil wells. It may be produced in low volume (up to 150 CFM-cubic feet per minute) at low pressure (up to 120 psi). Or it may be required at high volumes (2000CFM) and at high pressure (3300 psi). Very high pressures (22,000psi) are some times required for testing lines used in specialists’ applications.

This profile will consider only low pressure applications. Most applications in the developing Ethiopian industrial bases will require lower volumes, but the profile will allow for production of large compressors.

Compressors come in two generic forms: piston type (Reciprocating) and screw type (Rotary and Hydro Vane). Screw types are more efficient for certain applications but have reputations for being susceptible to failure in their electronic control systems. They are acceptable in a maintained environment such as a factory but are less practical for ‘site uses’. The screw compressor is a relatively recent innovation.

Reciprocating compressors, on the other hand, have been around for very much longer. They are more rugged than screw types. The principle of operation is similar to that of the internal combustion engine: a piston moves in a cylinder, driven through a crankshaft by a connecting rod. It has moving parts which have to be serviced, is noisy, and is more expensive to maintain. But it is reliable. Also it is easy to assemble. It lends itself for portability and may be driven by diesel, petrol or electricity. It is readily understood, requires no sophisticated solid state control, and is repairable ‘on site’. This profile will assume production of reciprocating compressors.

# III. MARKET STUDY AND PLANT CAPACITY

**A. MARKET STUDY**

**1. Past Supply and Present Demand**

Since there is no plant in the country that produces compressor in Ethiopia, the requirement of the country is entirely met through import. Compressors are devices, as one of the utilities for industries, which commonly used to generate kinetic energy by compressing air above atmospheric pressure that can be quickly burst on demand. Despite the existence of numerous types of compressors with varying compression capacity, the Ethiopian Customs Authority categorized them into two based on their purpose (end-use); these are “Compressors of a kind used in refrigerating equipment and [All purpose] Air Compressors mounted on a wheeled chassis”.

As there is no data reporting the magnitude of effective demand, the import data of compressors are used as closer estimators of present demand for the product. Table 3.1, thus, portrays the volume of imported compressors during the period 2001 to 2011.

**Table 3.1**

**IMPORT OF COMPRESSORS (NUMBER)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Compressors of a kind used in Refrigerating Equipment** | **Compressors Mounted on a Wheeled Chassis** | **Total** |
| 2001 | 3,096 | 190 | 3,286 |
| 2002 | 4,819 | 189 | 5,008 |
| 2003 | 3,526 | 719 | 4,245 |
| 2004 | 5,104 | 3,379 | 8,483 |
| 2005 | 5,194 | 4,261 | 9,455 |
| 2006 | 5,285 | 5,142 | 10,427 |
| 2007 | 5,998 | 10,968 | 16,966 |
| 2008 | 4,915 | 3,261 | 8,176 |
| 2009 | 1,881 | 1,234 | 3,115 |
| 2010 | 9,260 | 4,869 | 14,129 |
| 2011 | 9,521 | 4,941 | 14,462 |

***Source****: Ethiopian Revenue & Customs Authority.*

Import of compressor during the ten years has shown a general increasing trend although it exceptionally declined in 2008 and 2009. During the period 2001-2007, a yearly average growth of 15% and 135% was registered for compressors used for refrigerant and multi-purpose compressor respectively. However, in the subsequent two years, the volume of import of both types of compressors declined sharply at an average rate of 39% and 66% respectively. In the interview conducted with randomly selected end-users, the abrupt decline in import was not a response to lack of demand rather it was a supply reaction to the momentary confusion upon introduction of new tax (VAT). In 2010 and 2011, non-the-less, aggregate import had remarkably upturned to register a volume that was closer to that of the year 2007, a period that was a record high.

Considering the nature of the supply data it is assumed that the recent two years (2010-2011) average approximates the present demand. Accordingly, current (2012) demand for compressors used for refrigerating equipment and all purpose compressors is estimated at 9,390 pieces and 4,905 pieces respectively.

**2. Projected Demand**

Compressors are widely used in industrial, construction and other operations as a power supply utility and refrigerating equipment used for commercial and household purposes,. Hence, the demand for the product is expected to grow parallel with the development of these sectors. The industrial sectors in the past few years has been growing by 8 to 10% per annum and are planned to grow in the future from 7-12% per annum. Considering this a conservative estimate of 8% annual average growth of demand for the product is taken to forecast the future demand (see Table 3.2).

**Table 1.2**

**PROJECTED DEMAND FOR COMPRESSOR ( NUMBER)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Compressors of a kind used in Refrigerating Equipment** | **Compressors Mounted on a Wheeled Chassis** | **Total Projected Demand for Compressor** |
| 2013 | 10,142 | 5,297 | 15,439 |
| 2014 | 10,953 | 5,721 | 16,674 |
| 2015 | 11,829 | 6,179 | 18,008 |
| 2016 | 12,775 | 6,673 | 19,449 |
| 2017 | 13,798 | 7,207 | 21,005 |
| 2018 | 14,901 | 7,784 | 22,685 |
| 2019 | 16,093 | 8,406 | 24,500 |
| 2020 | 17,381 | 9,079 | 26,460 |
| 2021 | 18,771 | 9,805 | 28,577 |
| 2022 | 20,273 | 10,590 | 30,863 |
|  |  |  |  |

**3. Pricing and Distribution**

Based on the 2011 CIF price of the products and allowing for duty and other import related costs the recommended factory gate price is Birr 23,908 and Birr 94,293 for compressors used for refrigerating equipment and compressors mounted on a wheeled chassis, respectively.

The product will find its market outlet through the existing industrial, electrical and related materials and equipments distributing enterprises.

**B. PLANT CAPACITY AND PRODUCTION PROGRAM**

**1. Plant Capacity**

The suggested plant capacity based on the indications of the market study is 300 units per annum. The plant will operate on a single shift (8 hours) per days per year. Production can be doubled or tripled by increasing the number of shifts at later stages.

**2. Production Programme**

Considering the time required for the development of skill in plant operation, the plant will commence at 75% and 85% of the installed capacity during the first and the second year, respectively. Full capacity production will be achieved from third year on wards. The production program is set by deducting Sundays and public holidays in a year and assuming that repair and maintenance works will be carried out during off-production hours.

# IV. MATERIALS AND INPUTS

**A. RAW MATERIALS**

The major raw materials required for the manufacture of air compressor are C.I. castings, M.S plate, expanded mesh and M.S. sheets, etc. Other bought out components like pressure gauges, V-belts, electric motors, switches, pressure valves, piston and rings, safety valves, etc. are also required for the manufacturing process. All the raw materials have to be imported.

The breakdown of the annual raw material requirement and the total estimated cost at full capacity operation are shown in Table 4.1.

**Table 4.1**

**SUMMARY OF ANNUAL CONSUMPTION FOR RAW AND AUXILIARY MATERIALS AND COST**

| **Sr.**  **No.** | **Description** | **Qty. Ton** | **Cost in '000 Birr** | | |
| --- | --- | --- | --- | --- | --- |
| **FC** | **LC** | **TC** |
| 1. | C.I casting for pulleys, fly wheel, cylinder head | 24 | 319.708 | 111.898 | 431.606 |
| 2. | M.S plate 3 mm. to 6 mm. thickness | 9 | 81.808 | 28.632 | 110.440 |
| 3. | Expanded mesh and M.S. sheet 18-20 SWG for belt guards | 0.5 | 9.404 | 3.292 | 12.696 |
| 4. | Other bought out components like pressure gauges, v-belts, electric motors, switches, pressure valves, piston and rings, paints, safety valves, cooler pipes and dishes for air receiver tank | Ls | 2,194.08 | 767.928 | 2,962.01 |
|  | **Total** |  | **2,605.00** | **911.75** | **3,516.75** |

## B. UTILITIES

The major utilities required for the plant are electricity and water. Total installed electric power is 40 kw. Annual electric consumption required for 300 days in single shift operation of the plant amount to 96,000 kwh. Annual cost of electricity is estimated to be Birr 55,468. Water consumption of the plant is 240 cubic meters per annum. Total cost of water is estimated at Birr 2,400.

# V. TECHNOLOGY AND ENGINEERING

## A. TECHNOLOGY

**1. Production Process**

The manufacturing process of air compressor involves the following production operation:

Casting of standard grades would be procured from outside and machining of the components would be done inside the factory. The important parts in the machining would be cylinder block and cylinder head. Apart from this, the machining of tools etc. will be undertaken in the unit itself.

M.S. sheet from varying 3mm. to 6mm. thickness would be procured and rolled in the unit to produce the storage tank body. The two end parts of the storage tank would be made in the factory and finally be welded. The storage tank is subjected to a pressure test keeping in safety factor where it would then be passed on the assembly section.

The piston, piston rings, etc. will be procured from outside and will be well lapped before they are made ready for the final assembly. The air compressor will then be finally assembled.

The pressure controlling and measuring devices will be fitted and the compressor will be put to test in accordance with the standard norms. After testing, the oil would be drained out and necessary cleaning would be done before it is finally painted and packed for dispatch. Strict inspection and quality control measures are to be adopted while machining the components.

**2. Environmental Impact**

The project does not have any negative impact on the environment.

**B. ENGINEERING**

**1. Machinery and Equipment**

The total cost of plant machinery and equipment is estimated at Birr 2.48 million out of which Birr 2.09 million will be required in foreign currency. The list of machinery and equipment required for the plant is given in Table 5.1.

### Table 5.1

### MACHINERY AND EQUIPMENT REQUIREMENTS

| **No.** | **Description** | **Qty. (pcs.)** |
| --- | --- | --- |
| 1. | Center lathe machine bed length-6ft (0.3048mt) | 5 |
| 2. | Universal milling machine | 1 |
| 3. | Shaper (Stroke:24”) | 1 |
| 4. | Vertical boring machine, Honing (sharpening) | 1 |
| 5. | Housing (Sharpening) machine (manually operated) | 1 |
| 6. | Hand press | 1 |
| 7. | Sheet rolling machine | 1 |
| 8. | Bench drilling machine | 1 |
| 9. | Double ended bench grinder | 1 |
| 10. | Welded transformer, 5KVA, | 1 |
| 11 | Portable grinder, portable drill | 1 each |

**2. Land, Building and Civil Works**

The entire space requirement of the plant is 500 meter square. Total built-up area of the land is suggested to be 200 square meters. Total cost of building at the rate of Birr 4500/sq. meter amounts to Birr 900,000.

According to the Federal Legislation on the Lease Holding of Urban Land (Proclamation No 721/2004) in principle, urban land permit by lease is on auction or negotiation basis, however, the time and condition of applying the proclamation shall be determined by the concerned regional or city government depending on the level of development.

The legislation has also set the maximum on lease period and the payment of lease prices. The lease period ranges from 99 years for education, cultural research health, sport, NGO , religious and residential area to 80 years for industry and 70 years for trade while the lease payment period ranges from 10 years to 60 years based on the towns grade and type of investment.

Moreover, advance payment of lease based on the type of investment ranges from 5% to 10%.The lease price is payable after the grace period annually. For those that pay the entire amount of the lease will receive 0.5% discount from the total lease value and those that pay in installments will be charged interest based on the prevailing interest rate of banks. Moreover, based on the type of investment, two to seven years grace period shall also be provided.

However, the Federal Legislation on the Lease Holding of Urban Land apart from setting the maximum has conferred on regional and city governments the power to issue regulations on the exact terms based on the development level of each region.

In Addis Ababa, the City’s Land Administration and Development Authority is directly responsible in dealing with matters concerning land. However, regarding the manufacturing sector, industrial zone preparation is one of the strategic intervention measures adopted by the City Administration for the promotion of the sector and all manufacturing projects are assumed to be located in the developed industrial zones.

Regarding land allocation of industrial zones if the land requirement of the project is below 5,000 m2,the land lease request is evaluated and decided upon by the Industrial Zone Development and Coordination Committee of the City’s Investment Authority. However, if the land request is above 5,000 m2, the request is evaluated by the City’s Investment Authority and passed with recommendation to the Land Development and Administration Authority for decision, while the lease price is the same for both cases.

Moreover, the Addis Ababa City Administration has recently adopted a new land lease floor price for plots in the city. The new prices will be used as a benchmark for plots that are going to be auctioned by the city government or transferred under the new “Urban Lands Lease Holding Proclamation.”

The new regulation classified the city into three zones. The first Zone is Central Market District Zone, which is classified in five levels and the floor land lease price ranges from Birr 1,686 to Birr 894 per m2. The rate for Central Market District Zone will be applicable in most areas of the city that are considered to be main business areas that entertain high level of business activities.

The second zone, Transitional Zone, will also have five levels and the floor land lease price ranges from Birr 1,035 to Birr 555 per m2 .This zone includes places that are surrounding the city and are occupied by mainly residential units and industries.

The last and the third zone, Expansion Zone, is classified into four levels and covers areas that are considered to be in the outskirts of the city, where the city is expected to expand in the future. The floor land lease price in the Expansion Zone ranges from Birr 355 to Birr 191 per m2 (see Table 5.2).

**Table 5.2**

**NEW LAND LEASE FLOOR PRICE FOR PLOTS IN ADDIS ABABA**

|  |  |  |
| --- | --- | --- |
| **Zone** | **Level** | **Floor price/m2** |
| Central Market District | 1st | 1686 |
| 2nd | 1535 |
| 3rd | 1323 |
| 4th | 1085 |
| 5th | 894 |
| Transitional zone | 1st | 1035 |
| 2nd | 935 |
| 3rd | 809 |
| 4th | 685 |
| 5th | 555 |
| Expansion zone | 1st | 355 |
| 2nd | 299 |
| 3rd | 217 |
| 4th | 191 |

Accordingly, in order to estimate the land lease cost of the project profiles it is assumed that all new manufacturing projects will be located in industrial zones located in expansion zones. Therefore, for the profile a land lease rate of Birr 266 per m2 which is equivalent to the average floor price of plots located in expansion zone is adopted.

On the other hand, some of the investment incentives arranged by the Addis Ababa City Administration on lease payment for industrial projects are granting longer grace period and extending the lease payment period. The criterions are creation of job opportunity, foreign exchange saving, investment capital and land utilization tendency etc. Accordingly, Table 5.3 shows incentives for lease payment.

**Table 5.3**

**INCENTIVES FOR LEASE PAYMENT OF INDUSTRIAL PROJECTS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Scored point** | **Grace period** | **Payment Completion  Period** | **Down  ayment** |
| Above 75% | 5 Years | 30 Years | 10% |
| From 50 - 75% | 5 Years | 28 Years | 10% |
| From 25 - 49% | 4 Years | 25 Years | 10% |

For the purpose of this project profile the average i.e. five years grace period, 28 years payment completion period and 10% down payment is used. The land lease period for industry is 60 years.

Accordingly, the total land lease cost at a rate of Birr 266 per m2 is estimated at Birr 133,000 of which 10% or Birr 13,300 will be paid in advance. The remaining Birr 119,700 will be paid in equal installments with in 28 years i.e. Birr 4,275 annually.

**NB**: The land issue in the above statement narrates or shows only Addis Ababa’s city administration land lease price, policy and regulations.

Accordingly the project profile prepared based on the land lease price of Addis Ababa region.

To know land lease price, police and regulation of other regional state of the country updated information is available at Ethiopian Investment Agency’s website www.eia.gov.et on the factor cost.

# VI. HUMAN RESOURCE AND TRAINING REQUIREMENTS

**A. HUMAN RESOURCE REQUIREMENT**

Total human resource requirement of the plant is 31 persons. Annual cost of labor, including employees benefit, is Birr 610,500. Detail of human resource requirement and the estimated annual labor cost are given in Table 6.1.

### Table 6.1

**HUMAN RESOURCE REQUIREMENT & LABOUR COST**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr.**  **No.** | **Job Position** | **Req.**  **No.** | **Salary per Month** | **Salary per Year** |
| 1.  2.  3.  4.  5.  6.  7.  8.  9.  10.  11. | Manger  Accountant  Clerk/Typist  Sales Clerk  Store keeper  Driver  Watchperson  Foreman/Forewoman  Machine operator  Fitter Technicians  Helpers & Factory cleaning workers | 1  1  1  1  1  1  2  1  9  6  7 | 6,000  2,500  1,500  1,500  1,500  1,500  1,500  2,500  10,800  7,200  4,200 | 72,000  30,000  18,000  18,000  18,000  18,000  18,000  30,000  129,600  86,400  50,400 |
|  | **Sub Total** |  | **40,700** | **488,400** |
|  | Employees’’ Benefit (25% of Basic Salary) |  | 10,175 | 122,100 |
|  | **Total** | **31** | **50,875** | **610,500** |

**B. TRAINING REQUIREMENT**

All operators need basic training so that they can be acquainted to the operation. This can be done during the commissioning period of the plant. The cost of such training is estimated at Birr 50,000.

# VII. FINANCIAL ANALYSIS

The financial analysis of the compressors 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 10%

Discount cash flow 10%

Accounts receivable 30 days

Raw material local 30 days

Raw material imported 120 days

Work in progress 1 day

Finished products 30 days

Cash in hand 5 days

Accounts payable 30 days

Repair and maintenance 5% of machinery cost

**A. TOTAL INITIAL INVESTMENT COST**

The total investment cost of the project including working capital is estimated at Birr 6.27 million (See Table 7.1). From the total investment cost the highest share (Birr 4.54 million or 72.42%) is accounted by fixed investment cost followed by initial working capital (Birr 895.78 thousand or 14.28%) and pre operation cost (Birr 834.84 thousand or 13.31%). From the total investment cost Birr 2.09 million or 33.31% is required in foreign currency.

**Table 7.1**

**INITIAL INVESTMENT COST (000 Birr)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sr.  No | **Cost Items** | **Local  Cost** | **Foreign  Cost** | **Total  Cost** | **%  Share** |
| **1** | **Fixed investment** |  |  |  |  |
| 1.1 | Land Lease | 13.30 |  | 13.30 | 0.21 |
| 1.2 | Building and civil work | 900.00 |  | 900.00 | 14.35 |
| 1.3 | Machinery and equipment | 390.00 | 2,090.00 | 2,480.00 | 39.53 |
| 1.4 | Vehicles | 900.00 |  | 900.00 | 14.35 |
| 1.5 | Office furniture and equipment | 250.00 |  | 250.00 | 3.98 |
|  | **Sub total** | **2,453.30** | **2,090.00** | **4,543.30** | **72.42** |
| **2** | **Pre operating cost \*** |  |  |  |  |
| 2.1 | Pre operating cost | 424.40 |  | 424.40 | 6.76 |
| 2.2 | Interest during construction | 410.44 |  | 410.44 | 6.54 |
|  | **Sub total** | **834.84** |  | **834.84** | **13.31** |
| **3** | **Working capital \*\*** | **895.78** |  | **895.78** | **14.28** |
|  | **Grand Total** | **4,183.93** | **2,090.00** | **6,273.93** | **100** |

*\* N.B Pre operating cost include project implementation cost such as installation, startup, commissioning, project engineering, project management etc and capitalized interest during construction.*

*\*\* The total working capital required at full capacity operation is Birr 1.28 million. However, only the initial working capital of Birr 895.73 thousand during the first year of production is assumed to be funded through external sources. During the remaining years the working capital requirement will be financed by funds to be generated internally (for detail working capital requirement see Appendix 7.A.1).*

##### B. PRODUCTION COST

The annual production cost at full operation capacity is estimated at Birr 6.22 million (see Table 7.2). The cost of raw material account for 56.58% of the production cost. The other major components of the production cost are financial cost, depreciation, labor, and cost of marketing and distribution which account for 6.36%, 13.22%, 7.85% and 8.04% respectively. The remaining 7.89% is the share of utility, repair and maintenance, labor overhead and administration cost. For detail production cost see Appendix 7.A.2.

**Table 7.2**

**ANNUAL PRODUCTION COST AT FULL CAPACITY (year three)**

|  |  |  |
| --- | --- | --- |
| **Items** | **Cost**  **( 000 Birr)** | **%** |
| Raw Material and Inputs | 3,517 | 56.58 |
| Utilities | 58 | 0.93 |
| Maintenance and repair | 74 | 1.19 |
| Labor direct | 488 | 7.85 |
| Labor overheads | 112 | 1.80 |
| Administration Costs | 250 | 4.02 |
| Land lease cost | 0 | 0.00 |
| Cost of marketing and distribution | 500 | 8.04 |
| **Total Operating Costs** | **4,999** | **80.42** |
| Depreciation | 822 | 13.22 |
| Cost of Finance | 395 | 6.36 |
| **Total Production Cost** | **6,216** | **100.00** |

### C. FINANCIAL EVALUATION

**1. Profitability**

Based on the projected profit and loss statement, the project will generate a profit throughout its operation life. Annual net profit after tax will grow from Birr 707 thousand to Birr 1.47 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 12.32 million. For profit and loss statement and cash flow projection see Appendix 7.A.3 and 7.A.4, respectively.

**2. Ratios**

In financial analysis financial ratios and efficiency ratios are used as an index or yardstick for evaluating the financial position of a firm. It is also an indicator for the strength and weakness of the firm or a project. Using the year-end balance sheet figures and other relevant data, the most important ratios such as return on sales which is computed by dividing net income by revenue, return on assets (operating income divided by assets), return on equity (net profit divided by equity) and return on total investment (net profit plus interest divided by total investment) has been carried out over the period of the project life and all the results are found to be satisfactory.

**3. Break-even Analysis**

The break-even analysis establishes a relationship between operation costs and revenues. It indicates the level at which costs and revenue are in equilibrium. To this end, the break-even point for capacity utilization and sales value estimated by using income statement projection are computed as followed.

Break Even Sales Value = Fixed Cost + Financial Cost = Birr 3,011,400

Variable Margin ratio (%)

Break Even Capacity utilization = Break even Sales Value X 100 = 49.49%

Sales revenue

**4. Pay-back Period**

The payback period, also called pay-off period is defined as the period required for recovering the original investment outlay through the accumulated net cash flows earned by the project. Accordingly, based on the projected cash flow it is estimated that the project’s initial investment will be fully recovered within 4 years.

**5. Internal Rate of Return**

The internal rate of return (IRR) is the annualized effective compounded return rate that can be earned on the invested capital, i.e., the yield on the investment. Put another way, the internal rate of return for an investment is the discount rate that makes the net present value of the investment's income stream total to zero. It is an indicator of the efficiency or quality of an investment. A project is a good investment proposition if its IRR is greater than the rate of return that could be earned by alternate investments or putting the money in a bank account. Accordingly, the IRR of this project is computed to be 26.23% indicating the viability of the project.

**6. Net Present Value**

Net present value (NPV) is defined as the total present (discounted) value of a time series of cash flows. NPV aggregates cash flows that occur during different periods of time during the life of a project in to a common measuring unit i.e. present value. It is a standard method for using the time value of money to appraise long-term projects. NPV is an indicator of how much value an investment or project adds to the capital invested. In principal a project is accepted if the NPV is non-negative.

Accordingly, the net present value of the project at 10% discount rate is found to be Birr 5.24 million which is acceptable. For detail discounted cash flow see Appendix 7.A.5.

**D. ECONOMIC AND SOCIAL BENEFITS**

The project can create employment for 31persons. The project will generate Birr 3.61 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. The project will also create forward linkage with the manufacturing and construction sub sectors and also generates other income for the Government.

**Appendix 7.A**

# FINANCIAL ANALYSES SUPPORTING TABLES

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Appendix 7.A.1** | | | | | | | | | | |
| **NET WORKING CAPITAL ( in 000 Birr)** | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |
| **Items** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** | **Year 7** | **Year 8** | **Year 9** | **Year 10** | **Year 11** |
| Total inventory | 615.48 | 791.33 | 879.25 | 879.25 | 879.25 | 879.25 | 879.25 | 879.25 | 879.25 | 879.25 |
| Accounts receivable | 304.11 | 379.09 | 416.58 | 416.58 | 416.94 | 416.94 | 416.94 | 416.94 | 416.94 | 416.94 |
| Cash-in-hand | 8.98 | 11.55 | 12.83 | 12.83 | 12.89 | 12.89 | 12.89 | 12.89 | 12.89 | 12.89 |
| **CURRENT ASSETS** | **928.57** | **1,181.97** | **1,308.67** | **1,308.67** | **1,309.08** | **1,309.08** | **1,309.08** | **1,309.08** | **1,309.08** | **1,309.08** |
| Accounts payable | 32.78 | 42.15 | 46.83 | 46.83 | 46.83 | 46.83 | 46.83 | 46.83 | 46.83 | 46.83 |
| **CURRENT LIABILITIES** | **32.78** | **42.15** | **46.83** | **46.83** | **46.83** | **46.83** | **46.83** | **46.83** | **46.83** | **46.83** |
| **TOTAL WORKING CAPITAL** | **895.78** | **1,139.82** | **1,261.83** | **1,261.83** | **1,262.25** | **1,262.25** | **1,262.25** | **1,262.25** | **1,262.25** | **1,262.25** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Appendix 7.A.2** | | | | | | | | | | |
| **PRODUCTION COST ( in 000 Birr)** | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |
| **Item** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** | **Year 7** | **Year 8** | **Year 9** | **Year 10** | **Year 11** |
| Raw Material and Inputs | 2,462 | 3,165 | 3,517 | 3,517 | 3,517 | 3,517 | 3,517 | 3,517 | 3,517 | 3,517 |
| Utilities | 41 | 52 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 |
| Maintenance and repair | 52 | 67 | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 |
| Labour direct | 342 | 439 | 488 | 488 | 488 | 488 | 488 | 488 | 488 | 488 |
| Labour overheads | 78 | 101 | 112 | 112 | 112 | 112 | 112 | 112 | 112 | 112 |
| Administration Costs | 175 | 225 | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| Land lease cost | 0 | 0 | 0 | 0 | 4 | 4 | 4 | 4 | 4 | 4 |
| Cost of marketing  and distribution | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| **Total Operating Costs** | **3,649** | **4,549** | **4,999** | **4,999** | **5,003** | **5,003** | **5,003** | **5,003** | **5,003** | **5,003** |
| Depreciation | 822 | 822 | 822 | 822 | 822 | 61 | 61 | 61 | 61 | 61 |
| Cost of Finance | 0 | 451 | 395 | 339 | 282 | 226 | 169 | 113 | 56 | 0 |
| **Total Production Cost** | **4,471** | **5,822** | **6,216** | **6,159** | **6,107** | **5,290** | **5,234** | **5,177** | **5,121** | **5,064** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Appendix 7.A.3** | | | | | | | | | | |
| **INCOME STATEMENT ( in 000 Birr)** | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |
| **Item** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** | **Year 7** | **Year 8** | **Year 9** | **Year 10** | **Year 11** |
| Sales revenue | 5,019 | 6,453 | 7,170 | 7,170 | 7,170 | 7,170 | 7,170 | 7,170 | 7,170 | 7,170 |
| Less variable costs | 3,149 | 4,049 | 4,499 | 4,499 | 4,499 | 4,499 | 4,499 | 4,499 | 4,499 | 4,499 |
| **VARIABLE MARGIN** | **1,870** | **2,404** | **2,671** | **2,671** | **2,671** | **2,671** | **2,671** | **2,671** | **2,671** | **2,671** |
| in % of sales revenue | 37.25 | 37.25 | 37.25 | 37.25 | 37.25 | 37.25 | 37.25 | 37.25 | 37.25 | 37.25 |
| Less fixed costs | 1,322 | 1,322 | 1,322 | 1,322 | 1,326 | 565 | 565 | 565 | 565 | 565 |
| **OPERATIONAL MARGIN** | **548** | **1,082** | **1,349** | **1,349** | **1,345** | **2,106** | **2,106** | **2,106** | **2,106** | **2,106** |
| in % of sales revenue | 10.91 | 16.77 | 18.82 | 18.82 | 18.76 | 29.37 | 29.37 | 29.37 | 29.37 | 29.37 |
| Financial costs |  | 451 | 395 | 339 | 282 | 226 | 169 | 113 | 56 | 0 |
| **GROSS PROFIT** | **548** | **631** | **954** | **1,011** | **1,063** | **1,880** | **1,936** | **1,993** | **2,049** | **2,106** |
| in % of sales revenue | 10.91 | 9.77 | 13.31 | 14.09 | 14.82 | 26.22 | 27.01 | 27.79 | 28.58 | 29.37 |
| Income (corporate) tax | 0 | 0 | 0 | 303 | 319 | 564 | 581 | 598 | 615 | 632 |
| **NET PROFIT** | **548** | **631** | **954** | **707** | **744** | **1,316** | **1,355** | **1,395** | **1,435** | **1,474** |
| in % of sales revenue | 10.91 | 9.77 | 13.31 | 9.87 | 10.37 | 18.35 | 18.91 | 19.46 | 20.01 | 20.56 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Appendix 7.A.4** | | | | | | | | | | | | |
| **CASH FLOW FOR FINANCIAL MANAGEMENT ( in 000 Birr)** | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Item** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** | **Year 7** | **Year 8** | **Year 9** | **Year 10** | **Year 11** | **Scrap** |
| **TOTAL CASH INFLOW** | **4,968** | **6,358** | **6,462** | **7,175** | **7,170** | **7,170** | **7,170** | **7,170** | **7,170** | **7,170** | **7,170** | **2,226** |
| Inflow funds | 4,968 | 1,339 | 9 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inflow operation | 0 | 5,019 | 6,453 | 7,170 | 7,170 | 7,170 | 7,170 | 7,170 | 7,170 | 7,170 | 7,170 | 0 |
| Other income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,226 |
| **TOTAL CASH OUTFLOW** | **4,968** | **4,988** | **5,818** | **6,085** | **6,205** | **6,169** | **6,357** | **6,318** | **6,278** | **6,239** | **5,635** | **0** |
| Increase in fixed assets | 4,968 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Increase in current assets | 0 | 929 | 253 | 127 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Operating costs | 0 | 3,149 | 4,049 | 4,499 | 4,499 | 4,503 | 4,503 | 4,503 | 4,503 | 4,503 | 4,503 | 0 |
| Marketing and  Distribution cost | 0 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 0 |
| Income tax | 0 | 0 | 0 | 0 | 303 | 319 | 564 | 581 | 598 | 615 | 632 | 0 |
| Financial costs | 0 | 410 | 451 | 395 | 339 | 282 | 226 | 169 | 113 | 56 | 0 | 0 |
| Loan repayment | 0 | 0 | 564 | 564 | 564 | 564 | 564 | 564 | 564 | 564 | 0 | 0 |
| **SURPLUS (DEFICIT)** | **0** | **1,370** | **644** | **1,090** | **965** | **1,001** | **813** | **852** | **892** | **931** | **1,535** | **2,226** |
| **CUMULATIVE CASH  BALANCE** | **0** | **1,370** | **2,014** | **3,103** | **4,068** | **5,069** | **5,882** | **6,734** | **7,626** | **8,557** | **10,092** | **12,318** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Appendix 7.A.5** | | | | | | | | | | | | |
| **DISCOUNTED CASH FLOW ( in 000 Birr)** | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Item** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** | **Year 7** | **Year 8** | **Year 9** | **Year 10** | **Year 11** | **Scrap** |
| **TOTAL CASH INFLOW** | **0** | **5,019** | **6,453** | **7,170** | **7,170** | **7,170** | **7,170** | **7,170** | **7,170** | **7,170** | **7,170** | **2,226** |
| Inflow operation | 0 | 5,019 | 6,453 | 7,170 | 7,170 | 7,170 | 7,170 | 7,170 | 7,170 | 7,170 | 7,170 | 0 |
| Other income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,226 |
| **TOTAL CASH OUTFLOW** | **5,863** | **3,893** | **4,671** | **4,999** | **5,303** | **5,322** | **5,567** | **5,584** | **5,601** | **5,618** | **5,635** | **0** |
| Increase in fixed assets | 4,968 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Increase in net working capital | 896 | 244 | 122 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Operating costs | 0 | 3,149 | 4,049 | 4,499 | 4,499 | 4,503 | 4,503 | 4,503 | 4,503 | 4,503 | 4,503 | 0 |
| Marketing and Distribution cost | 0 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 0 |
| Income (corporate) tax |  | 0 | 0 | 0 | 303 | 319 | 564 | 581 | 598 | 615 | 632 | 0 |
| **NET CASH FLOW** | **-5,863** | **1,126** | **1,782** | **2,171** | **1,867** | **1,848** | **1,603** | **1,586** | **1,569** | **1,552** | **1,535** | **2,226** |
| **CUMULATIVE NET CASH FLOW** | **-5,863** | **-4,738** | **-2,956** | **-785** | **1,082** | **2,930** | **4,533** | **6,119** | **7,688** | **9,240** | **10,775** | **13,001** |
| Net present value | -5,863 | 1,023 | 1,473 | 1,631 | 1,275 | 1,147 | 905 | 814 | 732 | 658 | 592 | 858 |
| Cumulative net present value | -5,863 | -4,840 | -3,368 | -1,736 | -461 | 686 | 1,591 | 2,405 | 3,137 | 3,795 | 4,387 | 5,245 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| NET PRESENT VALUE | 5,245 |  |  |  |  |  |  |  |  |  |  |  |
| INTERNAL RATE OF RETURN | 26.23% |  |  |  |  |  |  |  |  |  |  |  |
| NORMAL PAYBACK | 4 years |  |  |  |  |  |  |  |  |  |  |  |