**PROFILE ON THE PRODUCTION OF HAND PUMPS AND SUBMERSIBLE PUMPS**

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# I. SUMMARY

This profile envisages the establishment of a plant for the production of 12,000 pieces of hand pumps and 3,000 pieces of submersible pumps per annum. Hand pumps are devices that are used to pull out water from deep or shallow wells to the surface of the earth; and submersible pumps are pumps operated by electric power to lift water from deep wells to the surface point for the user

The demand for hand pumps and submersible pumps is met through import. The present (2012) demand is estimated at 29,015 pieces for hand pumps and 20,437 pieces for submersible pumps. The demand for hand pumps and submersible pumps is projected to reach 40,695 pieces and 28,664 pieces units by the year 2017, respectively and 57,077 units and 40,202 units by the year 2022, respectively.

The principal raw materials required are various sizes of metal sections and rubber seals which have to be imported.

The total investment cost of the project including working capital is estimated at Birr 13.40 million. From the total investment cost the highest share (Birr 9.50 million or 70.93%) is accounted by fixed investment cost followed by initial working capital (Birr 2.53 million or 18.89%) and pre operation cost (Birr 1.36 million or 10.18%). From the total investment cost Birr 3.56 million or 26.56% is required in foreign currency

The project is financially viable with an internal rate of return (IRR) of 25.51% and a net present value (NPV) of Birr 10.63 million discounted at 10%.

The project can create employment for 53 persons. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports and also generates income for the Government in terms of tax revenue and payroll tax.

#  II. PRODUCT DESCRIPTIONS AND APPLICATIONS

This project envisages the production of hand pumps and submersible pumps for lifting water

to desired points by using manual, electric or engine power.

**Hand pumps** are devices that are used to pull out water from deep or shallow wells to the surface of the earth. They are operated by the manual reciprocating motion of the handle. It is also possible to operate the pump by the pedal motion of the leg to move the handle. The hand pump is used in rural areas to extract water from wells while the well is still closed from the surface contamination of dirt. Hand pumps are easy to repair and require no fuel or electricity to operate they are thus very popular particularly in rural areas.

**Submersible pumps** are pumps operated by electric power to lift water from deep wells to the surface point for the user. They operate fully submerged in the bottom of the well serving for along time with out the need for servicing.

# III. MARKET STUDY AND PLANT CAPACITY

 **A. MARKET STUDY**

 **1. Past Supply and Present Demand**

Ethiopia imports various types of pumps for liquids. The major types of pumps imported to the country are hand pumps and submersible pumps. Due to inadequate water facilities, especially in remote rural areas, supply with the help of hand pumps is gaining popularity. Hand pumps are preferred in rural areas where there is no electricity and for easy operation and maintenances. Except some efforts made in some workshops to manufacture hand and submersible pumps the products supply is mainly from import. Import of hand pumps for the past ten years is indicated in Table 3.1.

**Table 3.1**

**IMPORT OF HAND AND SUBMERSIBLE PUMPS (PIECES)**

|  |  |  |
| --- | --- | --- |
| **Year** | **HandPumps** | **Submersible Pumps** |
|
|
| 2002 | 62,958 | 11,274 |
| 2003 | 36,978 | 22,368 |
| 2004 | 30,111 | 22,270 |
| 2005 | 76,467 | 20,227 |
| 2006 | 10,371 | 12,424 |
| 2007 | 5,883 | 24,962 |
| 2008 | 28,166 | 47,148 |
| 2009 | 12,214 | 14,718 |
| 2010 | 52,137 | 5,921 |
| 2011 | 23,543 | 13,961 |

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

Scrutiny of Table 3.1 reveals that imports of hand pumps during the period under consideration (2002-2011) ranged from 5,883 pieces (2007) to 76,467 pieces (2009) with a mean import of 33,883 pieces. Similarly, during the same period import of submersible pumps ranges from 5,921 pieces in 2010 to 47,148 pieces in 2008 averaging at 19,527 pieces.

Accordingly considering the trend in import of the products the recent four years (2008-2011) average import i.e., 29,015 pieces for hand pumps and 20,437 pieces for submersible pumps is considered to approximate current (2012) demand for the products.

**2. Demand Projection**

The demand for the products is expected to increase with the plan of expanding water supply coverage in the rural areas of the country in general and also with the expansion of irrigation activities. Moreover, hand pumps are preferred in rural areas compared to other types of pumps because of their low running and maintenance costs. Hence, by taking the estimated current effective demand as a base annual average growth rate of 7% is employed to project the future demand (See Table 3.2.)

**Table 3.2**

**PROJECTED DEMAND (PIECES)**

|  |  |  |
| --- | --- | --- |
| **Year** | **HandPumps** | **Submersible Pumps** |
|
|
| 2013 | 31,046 | 21,867 |
| 2014 | 33,219 | 23,398 |
| 2015 | 35,545 | 25,036 |
| 2016 | 38,033 | 26,788 |
| 2017 | 40,695 | 28,664 |
| 2018 | 43,544 | 30,670 |
| 2019 | 46,592 | 32,817 |
| 2020 | 49,853 | 35,114 |
| 2021 | 53,343 | 37,572 |
| 2022 | 57,077 | 40,202 |
| 2023 | 61,072 | 43,016 |
| 2024 | 65,347 | 46,027 |
| 2025 | 69,922 | 49,249 |

**3. Pricing and Distribution**

The price of hand and submersible pumps varies depending on the capacity of the pumps. An average price of Birr 900 and Birr 2,000 for hand and submersible pumps respectively is taken for sales revenue projection.

The plant can sell its product either directly to government agencies or NGOs involved in water supply projects or through agents that distribute similar products throughout the country.

**B. PLANT CAPACITY AND PRODUCTION PROGRAM**

**1. Plant Capacity**

From the market study and taking into consideration the complexity of the manufacturing process, the manufacturing capacity of the plant is taken as12,000 pieces of hand pumps and 3,000 pieces of submersible pumps annually during the start up period of three years.

 **2. Production Program**

Considering the production process involved i.e. the time required for mastering the skill of production and maintenance work, the plant will operate at 75% of its installed capacity during the first year of operation. Then, it is planned to increase to 85% and 100% during the second year and third year and then after respectively. The detail production program is shown in Table 3.3.

**Table 3.1**

**ANNUAL PRODUCTION PROGRAM**

|  |  |  |  |
| --- | --- | --- | --- |
| **Type of product** | **Year 1** | **Year 2** | **Year 3** |
| Hand pump (units ) | 7,500 | 10,200 | 12,000 |
| Submersible pump (units )  |  2,250 |  2,950 |  3,000 |
| Capacity % | 75 | 85 | 100 |

# IV. RAW MATERIAL AND INPUTS

#

1. **RAW AND AUXILIARY MATERIALS**

The selected product requires various sizes of metal sections and rubber seals that are bought out. The total cost raw and auxiliary raw materials is Birr 19.52 million in foreign currency and Birr 3.9 million in local currency. The required raw materials and their cost at full capacity production are shown in Table 4.1.

**Table 4.1**

**RAW MATERIALS REQUIRED AND ANNUAL COST**

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Raw Materials** | **Annual Requirement** |  **Cost (000 Birr)** |
| Units | Quantity | F.C | L.C | Total |
| 1 | Galvanized pipe  | Ton | 50 | 1,900 | 380 | 2,280 |
| 3 | Foot valve | Pcs. | 12,000 | 900 | 180 | 1,080 |
| 4 | Brass road | Ton | 30 | 1,350 | 270 | 1,620 |
| 5 | Flat Bar | “ | 36 | 648 | 130 | 778 |
| 6 | Rubber ring gaskets | Pcs. | 15,000 | 225 | 45 | 270 |
| 7 | Pig iron | Ton | 20 | 560 | 112 | 672 |
| 8 | Cast iron Scrap | Ton | 15 | 180 | 36 | 216 |
| 9 | Brass scrap | Ton | 5 | 150 | 30 | 180 |
| 10 | Casting Sand | Mt.cube | 150 | 75 | 15 | 90 |
| 11 | Molasses | Mt.cube | 1.5 | 54 | 11 | 65 |
| 12 | Furnace oil | Mt.cube | 20 | 200 | 40 | 240 |
| 13 | Body cover with seals | Pcs | 15,000 | 525 | 105 | 630 |
| 14 | Valves, glands, Handles Bushings, Shaft | sets | 15,000 | 600 | 120 | 720 |
| 15 | Axial motor/rotor and stator with cable | Pcs. | 3,000 | 1,350 | 270 | 1,620 |
|  | **Total** |  |  | **8,717** | **1,743** | **10,460** |

**B. UTILITIES**

Utilities required by the plant are electric power and water. Annual cost of utilities is Birr 47,616. The utility requirement of the plant at full capacity operation is indicated in Table 4.2

**Table 4.2**

**ANNUAL UTILITIES REQUIREMENTS AND COST**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No** | **Utility**  | **Unit** | **Quantity**  | **Cost(Birr)** |
| 1 | Electricity | KWh | 65,000 | 37,616 |
| 2 | Water | Meter cube | 1,000 | 10,000 |
|  | **Total** |  |  | **47,616** |

# V. TECHNOLOGY AND ENGINEERING

#

**A. TECHNOLOGY**

**1. Process Description**

Hand pump is made by the process of fabrication of the different parts of the pump, mostly from galvanized pipes and assembling the parts together by various techniques like welding. The main part of the hand pump is the cylinder; it is made by cutting, boring, threading and welding of a 4” gal pipe.

The piston is made by cutting, turning and assembling of the brass road and fitting to the piston road. The intake pipe is made from galvanized pipe of ¾”.The pipe will be made to have the same length as the depth of the well. The bottom end of the pipe which is submerged in the water has a foot valve fitted at the tip.

The rest of the parts like the handle, the support and the anchor base are made by cutting and welding of different metal sections of the metal.

The submersible pump is made mostly from imported parts like the body cover, the axial electric motor, the valve and shaft. The other parts are made on the shop with the final electroplating work to be done on the exposed external parts.

**2. Environmental Impact**

The Production activity of the plant mainly involves cutting and drilling of metal parts; it does not have any negative impact on the environment. The melting process has a smoke which can be controlled by efficient burners and chimney. Thus the plant has no negative impact on the environment

 **B. ENGINEERING**

 **1. Machinery and Equipment**

The production process of the plant requires manual and machine operations including electroplating work. The total cost of machinery and equipment is Birr 4.58 million out of which Birr 3.56 million would be in foreign currency. For the production of the envisaged hand and submersible pump machine, the list of the necessary machinery and equipment are listed in Table 5.1.

**Table 5.1**

**LIST OF MACHINERY AND EQUIPMENT AND COST**

| **Sr. No.** | **Machine** | **Unit** | **Qty.** |
| --- | --- | --- | --- |
|
|  |
| 1 | Power Hacksaw | Nos | 1 |
| 2 | Abrasive circular saw | “ | 3 |
| 3 | Lathe machine | ‘ | 2 |
| 4 | Treadle shearing machine | ‘ | 1 |
| 5 | Arc welding Machine | “ | 15 |
| 6 | Pedestal Grinding Machine | ‘ | 5 |
| 7 | Portable grinding Machine | “ | 15 |
| 8 | Portable Electric drill | “ | 10 |
| 9 | Pillar drilling machine | Set | 3 |
| 10 | Tool Sets | Set | 3 |
| 11 | Material Handling Equipment | set | 3 |
| 12 | Painting and compressor set | Set | 1 |
| 13 | Polishing Buffing Machine | Nos | 2 |
| 14 | Capstan Lathe | “ | 2 |
| 15 | Pipe threading Machine | ‘ | 2 |
| 16 | Polishing tumbling Barrel | ‘ | 1 |
| 17 | Electroplating Plant | “ | 1 |
| 18 | Turning Lathe. | ‘ | 1 |
| 19 | Fly wheel press | ‘ | 2 |
| 20 | Dies for washer gasket Cutting | set | 5 |
| 21 | Moulds for taps models | set | 5 |

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

The envisaged plant requires a total land area of 1,000 m2, of which 750 m2 would be built-up area. Building construction cost at a rate of Birr 5000/m2 is estimated to be Birr 3.75 million.

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 Payment** |
| 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 266,000 of which 10% or Birr 26,600 will be paid in advance. The remaining Birr 239,400 will be paid in equal installments with in 28 years i.e. Birr 8,550 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 REQUIREMENT

**A. HUMAN RESOURCE REQUIREMENT**

The plant employs a total of 53 workers of whom 44 are technical workers; the total annual salary amounts to 1.44million. The human resource requirement by type of job and monthly and annual salary is indicated in Table 6.1.

**B. TRAINING REQUIREMENT**

On the job training and demonstration of the operators at the start up and at intermediate periods would be enough for workers with technical back ground. For two such sessions it costs an amount of 30,000 Birr.

**Table 6.1**

**HUMAN RESOURCE REQUIREMENT AND ANNUAL SALARY**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Description** | **No.** | **Salary (Birr)** |
| **Monthly** | **Annual** |
| A. Administration |
| 1 | Plant Manager | 1 | 5,000 | 60,000 |
| 2 | Secretary | 1 | 2,500 | 30,000 |
| 3 | Accountant | 1 | 2,500 | 30,000 |
| 4 | Salesman/purchaser | 1 | 2,500 | 30,000 |
| 5 | Clerk | 1 | 1,500 | 18,000 |
| 6 | Cashier | 1 | 2,000 | 24,000 |
| 7 | General Service | 3 | 800 | 28,800 |
|  **Sub- Total** | **9** |  | **220,800** |
| B. Production |
| 8 | Foreman/ | 1 | 2,500 | 30,000 |
| 9 | Machinery Operators | 17 | 2,000 | 408,000 |
| 10 | Assistant Operators | 7 | 1,500 | 126,000 |
| 11 | Welder technicians | 16 | 2,000 | 384,000 |
| 12 | Quality controller | 1 | 1,500 | 18,000 |
| 13 | Laborers | 2 |  800 | 19,200 |
|  | **Sub -Total** | **44** | **-** | **985,200** |
|  | **Total Basic Salary**  |  |  | **1,206,000** |
|  | Employees’ Benefit 25%0f Basic Salary | - | - | 238,800 |
|  | **Total** | **53** | **-** | **1,444,800** |

# VII. FINANCIAL ANALYSIS

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

Construction period 1 year

Source of finance 30 % equity and 70% loan

Tax holidays 3 years

Bank interest 10%

Discount cash flow 10%

Accounts receivable 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 13.40 million (See Table 7.1). From the total investment cost the highest share (Birr 9.50 million or 70.93%) is accounted by fixed investment cost followed by initial working capital (Birr 2.53 million or 18.89%) and pre operation cost (Birr 1.36 million or 10.18%). From the total investment cost Birr 3.56 million or 26.56% 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 | 26.60 |   | 26.60 | 0.20 |
| 1.2 | Building and civil work | 3,750.00 |   | 3,750.00 | 27.98 |
| 1.3 | Machinery and equipment | 1,020.00 | 3,560.00 | 4,580.00 | 34.17 |
| 1.4 | Vehicles | 900.00 |   | 900.00 | 6.72 |
| 1.5 | Office furniture and equipment | 250.00 |   | 250.00 | 1.87 |
|  | **Sub total** | **5,946.60** | **3,560.00** | **9,506.60** | **70.93** |
| **2** | **Pre operating cost \*** |  |  |  |   |
| 2.1 | Pre operating cost | 487.40 |   | 487.40 | 3.64 |
| 2.2 | Interest during construction  | 876.78 |   | 876.78 | 6.54 |
|  | **Sub total** | **1,364.18** |  | **1,364.18** | **10.18** |
| **3** | **Working capital**  | **2,531.47** |  | **2,531.47** | **18.89** |
|  | **Grand Total** | **9,842.25** | **3,560.00** | **13,402.25** | **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 3.59 million. However, only the initial working capital of Birr 2.53 million 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 14.93 million (see Table 7.2). The cost of raw material account for 70.05% of the production cost. The other major components of the production cost are depreciation, direct labor and financial cost, which account for 9.16%, 8.08% and 4.84% respectively. The remaining 7.86% is the share of utility, repair and maintenance, labor overhead, cost of marketing and distribution 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 | 10,460.00 | 70.05 |
| Utilities  | 48.00 | 0.32 |
| Maintenance and repair | 137.00 | 0.92 |
| Labor direct | 1,206.00 | 8.08 |
| Labor overheads | 239.00 | 1.60 |
| Administration Costs | 250.00 | 1.67 |
| Land lease cost | - | - |
| Cost of marketing and distribution | 500.00 | 3.35 |
| **Total Operating Costs** | **12,840.00** | **85.99** |
| Depreciation | 1,368.48 | 9.16 |
| Cost of Finance | 723.35 | 4.84 |
| **Total Production Cost** | **14,931.83** | **100** |

**C. FINANCIAL EVALUATION**

**1. Profitability**

Based on the projected profit and loss statement, the project will generate a profit through out its operation life. Annual net profit after tax will grow from Birr 1.25 million to Birr 2.64 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 25.46 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 7,038,221

 Variable Margin ratio (%)

Break Even Capacity utilization = Break even Sales Value X 100 = 42%

 Sales revenue

**4. Pay-back Period**

The pay-back 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 25.21% 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 principle, 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 10.63 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 53 persons. The project will generate Birr 6.45 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 generate 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 | 1,830.50 | 2,092.00 | 2,353.50 | 2,615.00 | 2,615.00 | 2,615.00 | 2,615.00 | 2,615.00 | 2,615.00 | 2,615.00 |
| Accounts receivable | 761.50 | 864.33 | 967.17 | 1,070.00 | 1,070.71 | 1,070.71 | 1,070.71 | 1,070.71 | 1,070.71 | 1,070.71 |
| Cash-in-hand | 17.81 | 20.36 | 22.90 | 25.44 | 25.56 | 25.56 | 25.56 | 25.56 | 25.56 | 25.56 |
| **CURRENT ASSETS** | **2,609.81** | **2,976.69** | **3,343.57** | **3,710.44** | **3,711.28** | **3,711.28** | **3,711.28** | **3,711.28** | **3,711.28** | **3,711.28** |
| Accounts payable | 78.34 | 89.53 | 100.73 | 111.92 | 111.92 | 111.92 | 111.92 | 111.92 | 111.92 | 111.92 |
| **CURRENT LIABILITIES** | **78.34** | **89.53** | **100.73** | **111.92** | **111.92** | **111.92** | **111.92** | **111.92** | **111.92** | **111.92** |
| **TOTAL WORKING CAPITAL**  | **2,531.47** | **2,887.16** | **3,242.84** | **3,598.53** | **3,599.36** | **3,599.36** | **3,599.36** | **3,599.36** | **3,599.36** | **3,599.36** |

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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 | 7,322 | 8,368 | 9,414 | 10,460 | 10,460 | 10,460 | 10,460 | 10,460 | 10,460 | 10,460 |
| Utilities  | 34 | 38 | 43 | 48 | 48 | 48 | 48 | 48 | 48 | 48 |
| Maintenance and repair | 96 | 110 | 123 | 137 | 137 | 137 | 137 | 137 | 137 | 137 |
| Labour direct | 844 | 965 | 1,085 | 1,206 | 1,206 | 1,206 | 1,206 | 1,206 | 1,206 | 1,206 |
| Labour overheads | 167 | 191 | 215 | 239 | 239 | 239 | 239 | 239 | 239 | 239 |
| Administration Costs | 175 | 200 | 225 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| Land lease cost | 0 | 0 | 0 | 0 | 9 | 9 | 9 | 9 | 9 | 9 |
| Cost of marketing and distribution  | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| **Total Operating Costs** | **9,138** | **10,372** | **11,606** | **12,840** | **12,849** | **12,849** | **12,849** | **12,849** | **12,849** | **12,849** |
| Depreciation | 1,368 | 1,368 | 1,368 | 1,368 | 1,368 | 175 | 175 | 175 | 175 | 175 |
| Cost of Finance | 0 | 964 | 844 | 723 | 603 | 482 | 362 | 241 | 121 | 0 |
| **Total Production Cost** | **10,506** | **12,705** | **13,818** | **14,932** | **14,820** | **13,506** | **13,385** | **13,265** | **13,144** | **13,024** |

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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 | 11,760 | 15,120 | 16,800 | 16,800 | 16,800 | 16,800 | 16,800 | 16,800 | 16,800 | 16,800 |
| Less variable costs | 8,638 | 9,872 | 11,106 | 12,340 | 12,340 | 12,340 | 12,340 | 12,340 | 12,340 | 12,340 |
| **VARIABLE MARGIN** | **3,122** | **5,248** | **5,694** | **4,460** | **4,460** | **4,460** | **4,460** | **4,460** | **4,460** | **4,460** |
| in % of sales revenue | 26.55 | 34.71 | 33.89 | 26.55 | 26.55 | 26.55 | 26.55 | 26.55 | 26.55 | 26.55 |
| Less fixed costs | 1,868 | 1,868 | 1,868 | 1,868 | 1,877 | 684 | 684 | 684 | 684 | 684 |
| **OPERATIONAL MARGIN** | **1,254** | **3,380** | **3,826** | **2,592** | **2,583** | **3,776** | **3,776** | **3,776** | **3,776** | **3,776** |
| in % of sales revenue | 10.66 | 22.35 | 22.77 | 15.43 | 15.37 | 22.48 | 22.48 | 22.48 | 22.48 | 22.48 |
| Financial costs |   | 964 | 844 | 723 | 603 | 482 | 362 | 241 | 121 | 0 |
| **GROSS PROFIT** | **1,254** | **2,415** | **2,982** | **1,868** | **1,980** | **3,294** | **3,415** | **3,535** | **3,656** | **3,776** |
| in % of sales revenue | 10.66 | 15.97 | 17.75 | 11.12 | 11.79 | 19.61 | 20.33 | 21.04 | 21.76 | 22.48 |
| Income (corporate) tax | 0 | 0 | 0 | 560 | 594 | 988 | 1,024 | 1,061 | 1,097 | 1,133 |
| **NET PROFIT** | **1,254** | **2,415** | **2,982** | **1,308** | **1,386** | **2,306** | **2,390** | **2,475** | **2,559** | **2,644** |
| in % of sales revenue | 10.66 | 15.97 | 17.75 | 7.78 | 8.25 | 13.73 | 14.23 | 14.73 | 15.23 | 15.74 |

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| **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** | **9,994** | **15,247** | **15,131** | **16,811** | **16,800** | **16,800** | **16,800** | **16,800** | **16,800** | **16,800** | **16,800** | **6,753** |
| Inflow funds | 9,994 | 3,487 | 11 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inflow operation | 0 | 11,760 | 15,120 | 16,800 | 16,800 | 16,800 | 16,800 | 16,800 | 16,800 | 16,800 | 16,800 | 0 |
| Other income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6,753 |
| **TOTAL CASH OUTFLOW** | **9,994** | **12,625** | **12,909** | **14,022** | **15,696** | **15,252** | **15,525** | **15,440** | **15,356** | **15,271** | **13,981** | **0** |
| Increase in fixed assets | 9,994 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Increase in current assets | 0 | 2,610 | 367 | 367 | 367 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Operating costs | 0 | 8,638 | 9,872 | 11,106 | 12,340 | 12,349 | 12,349 | 12,349 | 12,349 | 12,349 | 12,349 | 0 |
| Marketing and Distribution cost | 0 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 0 |
| Income tax | 0 | 0 | 0 | 0 | 560 | 594 | 988 | 1,024 | 1,061 | 1,097 | 1,133 | 0 |
| Financial costs | 0 | 877 | 964 | 844 | 723 | 603 | 482 | 362 | 241 | 121 | 0 | 0 |
| Loan repayment | 0 | 0 | 1,206 | 1,206 | 1,206 | 1,206 | 1,206 | 1,206 | 1,206 | 1,206 | 0 | 0 |
| **SURPLUS (DEFICIT)** | **0** | **2,622** | **2,222** | **2,789** | **1,104** | **1,548** | **1,275** | **1,360** | **1,444** | **1,529** | **2,819** | **6,753** |
| **CUMULATIVE CASH BALANCE** | **0** | **2,622** | **4,844** | **7,633** | **8,737** | **10,285** | **11,560** | **12,920** | **14,364** | **15,893** | **18,711** | **25,464** |

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| **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** | **11,760** | **15,120** | **16,800** | **16,800** | **16,800** | **16,800** | **16,800** | **16,800** | **16,800** | **16,800** | **6,753** |
| Inflow operation | 0 | 11,760 | 15,120 | 16,800 | 16,800 | 16,800 | 16,800 | 16,800 | 16,800 | 16,800 | 16,800 | 0 |
| Other income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6,753 |
| **TOTAL CASH OUTFLOW** | **12,525** | **9,494** | **10,728** | **11,962** | **13,401** | **13,443** | **13,837** | **13,873** | **13,909** | **13,945** | **13,981** | **0** |
| Increase in fixed assets | 9,994 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Increase in net working capital | 2,531 | 356 | 356 | 356 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Operating costs | 0 | 8,638 | 9,872 | 11,106 | 12,340 | 12,349 | 12,349 | 12,349 | 12,349 | 12,349 | 12,349 | 0 |
| Marketing and Distribution cost | 0 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 0 |
| Income (corporate) tax |   | 0 | 0 | 0 | 560 | 594 | 988 | 1,024 | 1,061 | 1,097 | 1,133 | 0 |
| **NET CASH FLOW** | **-12,525** | **2,266** | **4,392** | **4,838** | **3,399** | **3,357** | **2,963** | **2,927** | **2,891** | **2,855** | **2,819** | **6,753** |
| **CUMULATIVE NET CASH FLOW** | **-12,525** | **-10,259** | **-5,867** | **-1,029** | **2,370** | **5,728** | **8,691** | **11,618** | **14,509** | **17,363** | **20,182** | **26,935** |
| Net present value | -12,525 | 2,060 | 3,630 | 3,635 | 2,321 | 2,085 | 1,673 | 1,502 | 1,349 | 1,211 | 1,087 | 2,603 |
| Cumulative net present value | -12,525 | -10,465 | -6,835 | -3,200 | -879 | 1,206 | 2,879 | 4,381 | 5,729 | 6,940 | 8,027 | 10,630 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| NET PRESENT VALUE | 10,630 |  |  |  |  |  |  |  |  |  |  |  |
| INTERNAL RATE OF RETURN | 25.51% |  |  |  |  |  |  |  |  |  |  |  |
| NORMAL PAYBACK | 4 years |  |  |  |  |  |  |  |  |  |  |  |