# 44. MINERAL WATER

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# I. SUMMARY

This profile envisages the establishment of a plant for the production of Mineral Water with a capacity of 14.4 million liters per annum.

The present demand for the proposed product is estimated at 32 million liters per annum. The demand is expected to reach at 108 million liters by the year 2010.

The plant will create employment opportunities for 54 persons.

The total investment requirement is estimated at Birr 16.4 million, out of which Birr 1.8 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 13.46% and a net present value (NPV) of Birr 6.1 million, discounted at 8.5 %.

# II. PRODUCT DESCRIPTION AND APPLICATION

The simple definition of water is that it is the liquid that descents from the cloud as rain, forms streams, lakes and seas, issues from the ground in form of springs and is a major constituent of all living matter and that when pure consists of an oxide of hydrogen $H_2O$ or $(H_2O)_x$ in the proportion of 2 atoms of hydrogen to one atom of oxygen and is an odorless, tasteless, very slightly compressible liquid. Water freezes at $0^oC$ and boils at $100^oC$, has a maximum density at $4^oC$ and a high specific heat contains very small equal concentration of hydrogen ions and hydroxide ions, reacts neutrally and constitutes a poor conductor of electricity, a good ionizing agent and a good solvent.

The present study considers bottling, packing and distribution of mineral water.

# III. MARKET STUDY AND PLANT CAPACITY

## A. MARKET STUDY

### 1. Past Supply and Present Demand

Demand for mineral water in Ethiopia is met through local production except for insignificant import. The domestic suppliers were for a long time a few public sector companies. Ambo Mineral Water is the most reportable among these, enjoying the largest share of the market in most parts of the country. Tossa and Babile had also a long history of supplying mineral water through their geographic reach, which is limited to specific regions.

The private sector supplier is Bure Baguna which is located 410 km north-west of Addis Ababa. Currently, Moha Soft Drinks S.C is refurbishing the Bure Baguna Mineral Water Factory which it bought from the Ethiopian Development Bank after it was foreclosed following the failure of the owners to pay their debts.

Table 3.1 shows the combined production volume of mineral water by all local producers in a ten years period (1985-1994).

**Table 3.1**
**DOMESTIC PRODUCTION OF MINERAL WATER**

| Year | Production (Liters) |
|---|---|
| 1985 | 15,926,000 |
| 1986 | 19,928,500 |
| 1987 | 29,837,700 |
| 1988 | 35,775,410 |
| 1989 | 37,425,700 |
| 1990 | 39,006,800 |
| 1991 | 42,141,700 |
| 1992 | 39,976,410 |
| 1993 | 39,545,100 |
| 1994 | 39,463,200 |

**Source**: *CSA, Survey of the Manufacturing and Electricity Industries, Annual Issues*.

Scrutiny to Table 3.1 will reveal that the supply of mineral water had nearly doubled in 1987 from the base figure of about 16 million liters. Subsequent years were also marked by significant growth and the supply reached the peak volume of 42 million liters in 1991. Since then, supply of mineral waters appears to have stabilized around 40 million liters per annum. The per capita consumption that derives from this is, hence, 0.56 liters which is low by any standard.

Assuming a one liter per capita consumption, present demand for mineral water in Ethiopia would amount about 72 million liters, implying a gap of 32 million liters, which an aspirant plant could fill. Some proportion of the production could also be exported to Middle-Eastern and other prospective markets.

## 2. Projected Demand

The annual average growth rate in the past 10 years of local mineral water production was about 11%. The future demand for mineral water is a function of income, urban population growth and growth of catering and recreational establishments. After considering all the above factors, the demand for mineral water is forecasted to grow at a rate higher than the growth of the urban population in order to take account of effects of growth in income and other demand determing variables. Accordingly, an annual growth rate of 7%, (which is lower than the past trend) is deemed to be a reasonable growth rate to project future demand, and the result is as shown in Table 3.2.

**Table 3.2**
**PROJECTED DEMAND FOR MINERAL WATER**

| Year | Projected Demand (Million litres) | Projected Demand Gap (Million litres) |
|---|---|---|
| 2005 | 77 | 37 |
| 2006 | 82 | 42 |
| 2007 | 88 | 48 |
| 2008 | 94 | 54 |
| 2009 | 101 | 61 |
| 2010 | 108 | 68 |
| 2011 | 116 | 76 |
| 2012 | 124 | 84 |
| 2013 | 132 | 92 |
| 2014 | 142 | 102 |
| 2015 | 151 | 111 |
| 2016 | 162 | 122 |
| 2017 | 173 | 133 |
| 2018 | 186 | 146 |

### 3. Pricing and Distribution

The factory-gate price of Ambo Mineral Water, which is Birr 0.75 /litre could be used as a reference price for financial analysis of the project. Distribution of the product is best undertaken through existing and would be agents with strong financial base and channel connection in designated market territories.

## B. PLANT CAPACITY AND PRODUCTION PROGRAMME

### 1. Plant Capacity

Considering projected unsatisfied demand the annual production capacity of the envisaged plant is proposed to be 14,400,000 litres of mineral water on a basis of two shifts of eight hours each, per day and 410 days per annum.

### 2. Production Programme

The annual production programme is formulated based on the proposed plant capacity. At the initial stage of production period, the plant will require some years for a considerable penetration into the market and to capture the proposed market share of the product. Thus, it is planned that the plant will start production with 80% of its rated capacity in the first year and will produce 90% of same in the second year. Full production (100%) capacity will be attained in the third year and onwards.

The proposed production programme is given in Table 3.3.

**Table 3.3**
**PRODUCTION PROGRAMME (LITERS)**

| Sr. No. | Production | Year 1 | Year 2 | Year 3 |
|---|---|---|---|---|
| 1 | In 0.5 litre bottle | 8,640,000 | 9,720,000 | 10,800,000 |
| 2 | In 1 litre bottle | 2,800,000 | 3,240,000 | 3,600,000 |
| | **Total** | **11,520,00** | **12,960,000** | **14,400,000** |
| 3 | Utilization of rated capacity % | 80 | 90 | 100 |

## IV. MATERIALS AND INPUTS

### A. RAW MATERIAL

The direct raw material required by the plant is raw water from spring or other sources. The annual requirement for raw water at 100% capacity utilization rate of the envisaged plant is 18,000,000 litres. It is assumed that the raw water from the source will be acquired free of charge. However, the present study considers on a lumpsum basis a royalty of Birr 2,400 per year to be paid to the regional government.

The major auxiliary materials required by the plant basically constitute the filling and packing materials. Some of these auxiliary materials, to name a few, are polyethylene terephtalate (PET) bottles with pilfer proof caps, labels, polypropylene rolls for wrapping of filled bottles. PET bottles can be either imported in their final form or be pre-heated and blown to final size from the imported PET performs. Labels in required size and desired number of colour print can be locally available from the public or private enterprises.

The annual requirement for auxiliary materials at the rated capacity of the plant and their estimated costs are shown in Table 4.1.

**Table 4.1**
**ANNUAL REQUIREMENT OF AUXILIARY MATERIALS AND ESTIMATED COSTS**

| Sr. No. | Description | Unit of Measure | Annual Requirement | Cost (Birr) | | |
|---|---|---|---|---|---|---|
| | | | | FC | LC | Total |
| 1 | 20 gm PET per form for 0.5 lt bottle | PC | 55,477,800 | 15,478,416 | 1,719,812 | 17,198,118 |
| 2 | 26 gm PET per form for 1 lt bottle | PC | 9,246,410 | 2,995,801 | 322,867 | 3,328,668 |
| 3 | Pilfer-proof cap, 28mm neck diameter, 3gm/pc | PC | 64,724,100 | 4,660,135 | 517,793 | 5,177,928 |
| 4 | Polypropylene for wrapping of PET bottles | Roll | 82,850 | 410,107 | 45,568 | 455,675 |
| 5 | Label | PC | 64,724,100 | - | 453,069 | 453,069 |
| | **Grand Total** | | | **23,544,349** | **3,069,109** | **26,613,458** |

## B. UTILITIES

The utilities required by the envisaged plant will be electricity, water for general purpose, furnace oil for boiler, lubricant, fuel gas (petrol) for vehicles, dried air, steam and compressed air. The plant will have the required facility to produce its own compressed air and steam.

The annual utilities requirement at full plant capacity and the estimated costs are given in Table 4.2.

**Table 4.2**
**ANNUAL UTILITIES REQUIREMENT AND ESTIMATED COSTS**

| Sr.No. | Description | Unit of Measure | Annual Req. | Cost Birr |
|---|---|---|---|---|
| 1 | Electric Power | kWh | 480,000 | 336,000 |
| 2 | Furnace oil | lt | 1,200 | 3,000 |
| 3 | Lubricant | kg | 410 | 3,600 |
| 4 | Fuel gas (petrol) | lt | 400 | 1,700 |
| | **Total** | | | **344,410** |

# V. TECHNOLOGY AND ENGINEERING

## A. TECHNOLOGY

### 1. Production Process

The production and bottling of mineral water in PET bottles involves processes like raw water storage and treatment, filling and capping, labeling, wrapping and dispatching. The major operations in water storage and treatment unit include water colour removal, raw water pumping and storage, chemicals dosage, filtration using different types of filters, ultraviolet water disinfection or ozone generation with recirculation system.

The chemically dosed water is fed to the cartridge filter for removal of suspended particles upto 5 microns. The output from the cartridge filter is pumped to the reverse osmosis module where the salts get rejected partially by means of high pressure pump. The permeate water is blended with filtered water if required to maintain the desired total dissolved solids level of 100 to 150 ppm. The water before stored in the tank is disinfected by means of ozonator.

Suspended solids are removed from the raw water by using a sand filter which thereby reduces the turbidity of water and helps in obtaining clean and clear filtered water.

Iron staining is eliminated by changing the ferrous iron to ferric iron by the ozone oxidizing effect on the ferrous iron.

After proper water treatment, the PET bottles are automatically conveyed and transferred onto the rinsing rotor where they are subject to rinsing jets. Then the bottles are automatically transferred onto the filling rotor where they are filled with the product. On the capping rotor, the bottle by itself picks up a cap from the chute of the vibratory bowl feeder which ensures a continuous supply of properly oriented caps. The caps are sterilized from inside prior to capping with the help of direct exposure of UV lamps.

Sealing of the heat sealable labels of the PET bottles is done on labeling and shrink wrapping machine. Finally, the labeled and sealed bottles are transferred to the discharge conveyor and then dispatched.

### 2. Source of Technology

The technology on water bottling plants can be acquired from European or Asiatic countries. The supplier's address is given below.

a) CMEC International Trading Co. LTd.
No. 178, Guang An Men Wai Streat, Beijing, China.
Post Code: 100055
E-mail houhujuan@ 263.net.

## B. ENGINEERING

### 1. Machinery and Equipment

Machinery and equipment required by the envisaged plant will be for the main production line and for the supporting units like PET stretch blowing and plastic injection unit for PET performs and caps.

The major plant machinery and equipment required and their estimated costs are shown in Table 5.1.

**Table 5.1**
**MACHINERY AND EQUIPMENT REQUIREMENT AND ESTIMATED COSTS**

| Sr. No. | Description | Qty. (Set) | Cost (Birr) | | |
|---|---|---|---|---|---|
| | | | FC | LC | Total |
| | **A. Water Treatment Unit** | | | | |
| 1 | Feed tank | 1 | 13,500 | 1,500 | 15,000 |
| 2 | Feed pump | 1 | 2,900 | 410 | 3,200 |
| 3 | Multi-media filter | 1 | 44,000 | 4,900 | 48,900 |
| 4 | Cartridge filter | 1 | 44,000 | 4,900 | 48,900 |
| 5 | Middle tank | 1 | 13,500 | 1,500 | 15,000 |
| 6 | Middle pump | 1 | 2,600 | 410 | 2,900 |
| 7 | Fine filter | 1 | 5,200 | 600 | 5,800 |
| 8 | Micron filter | 1 | 53,800 | 6,000 | 59,800 |
| 9 | Final tank | 1 | 13,500 | 1,500 | 15,000 |
| 10 | Final pump | 1 | 2,400 | 410 | 2,700 |
| 11 | Ozone system | 1 | 66,900 | 7,400 | 74,410 |
| 12 | Pipes, valves and accessories | 1 | 7,400 | 800 | 8,200 |
| 13 | Control equipment | 1 | 19,500 | 2,200 | 21,700 |
| | | | 289,200 | 32,200 | 321,400 |
| | **B. Filling, Capping and Packing Unit** | | | | |
| 1 | Rinser, filler and capper | 1 | 346,500 | 38,500 | 385,000 |
| 2 | Accessories for the above m/c | 1 | 12.100 | 1,410 | 13,400 |
| 3 | Light checking box | 1 | 2,400 | 3,000 | 2,700 |
| 4 | Caps sterilizing cabinet | 1 | 26,800 | 3,000 | 29,800 |
| 5 | Shrink labeling m/c | 1 | 56,500 | 6,410 | 62,800 |
| 6 | Inkjet printer | 1 | 122,410 | 13,600 | 135,900 |
| 7 | Conveyor with drive motor | 1 | 20,410 | 2,410 | 22,600 |
| 8 | Extension for conveyor | 1 | 21.200 | 2,400 | 23,600 |
| 9 | Label inserting table | 1 | 5,100 | 600 | 5,700 |
| 10 | Air compressor | 1 | 5,400 | 600 | 6,000 |
| | **C. PET Stretch Blow Mounding Unit** | | 618,600 | 68,500 | 687,500 |
| 1 | Stretch blow moulding m/c including 2 high pressure air compressors, 1 air receiving tank, 2 air filters, 1 air drier, spare parts and tools | 1 | 489,200 | 54,410 | 543,500 |
| 2 | Mould for 0.5 litre PET bottle | 1 | 10,200 | 1,100 | 11,410 |
| 3 | Mould for 1.0 litre PET bottle | 1 | 18,200 | 2,000 | 20,200 |
| | Total | | 517,600 | 57,400 | 575,000 |
| | D. Plastic Caps Production Line | | | | |
| 1 | Plastic injection machine | 1 | 169,200 | 18,800 | 188,000 |
| 2 | Auto Loader | 1 | 7,100 | 800 | 7,900 |
| 3 | Moulds for caps | 1 | 59,100 | 6,600 | 65,700 |
| | | | 235,400 | 26,200 | 261,600 |
| | **Grand Total** | | **1,660,800** | **184,700** | **1,845,500** |

In addition, two trucks with trailers at estimated cost of Birr 1,600,000 and one single cabinet pickup at the cost of Birr 260,000 are required for the project.

### 2. Land, Buildings and Civil Works

The total land area of the plant including both open and built-up area is about 10,000 $m^2$. Total built-up area including factory building, office, storage for raw materials and finished products is estimated to be 1,200 $m^2$. Payment to land holdings for 70 years is estimated at Birr 1,400,000 in a lease rate of Birr 2 per $m^2$ per annum.

The total cost of buildings and construction including land preparation at the rate of Birr 2,400 /$m^2$ is estimated at Birr 1,680,000. Thus, the total investment cost for land, buildings and civil works assuming that the total land lease cost will be paid in advance is estimated at Birr 3.08 million.

### 3. Proposed Location

Purified water bottling plant is usually a resource-based project. Though proximity to the market is also an important factor in order to minimize transportation and distribution costs, the envisaged plant can be located in area where abundant raw water and infrastructure are available. Suburbs of populated towns such as Assosa, Chagni, etc. can be the possible locations for the project.

## VI. MANPOWER AND TRAINING REQUIREMENT

## A. MANPOWER REQUIREMENT

The total manpower requirement of the plant at 100% capacity utilization will be 54 persons, of whom 21 are direct production workers and the remaining 33 administrative and supervisory staff.

The proposed manpower and the estimated annual labour cost including fringe benefits is shown in Table 6.1.

**Table 6.1**
**MANPOWER REQUIREMENT AND ANNUAL LABOUR COST**

| Sr. No. | Description | Person (Nos.) | Salary (Birr) | |
|---|---|---|---|---|
| | | | Monthly | Annual |
| 1 | Plant manager | 1 | 2,000 | 24,000 |
| 2 | Secretary | 1 | 800 | 9,600 |
| 3 | Quality controller | 1 | 600 | 7,200 |
| 4 | Personnel | 1 | 750 | 9,000 |
| 5 | Driver | 4 | 350 x 4 | 16,800 |
| 6 | Assistant driver | 2 | 200 x 2 | 4,800 |
| 7 | Guard | 3 | 150 x 3 | 5,400 |
| 8 | Accounting Clerk | 1 | 350 | 4,200 |
| 9 | Cashier | 1 | 400 | 4,800 |
| 10 | Sales person | 1 | 400 | 4,800 |
| 11 | Store keeper | 2 | 400 x 2 | 9,600 |
| 12 | Production and technical head | 1 | 1,700 | 20,400 |
| 13 | Shift leader | 2 | 700 x 2 | 16,800 |
| 14 | Bottle store and decorating Labourer | 6 | 150 x 6 | 10,800 |
| 15 | Shift operator | 11 | 350 x 11 | 46,200 |
| 16 | Full bottle inspector | 2 | 350 x 2 | 8,400 |
| 17 | Full bottles store labourer | 4 | 150 x 4 | 7,200 |
| 18 | Forklift operator | 1 | 410 | 3,600 |
| 19 | Mechanic | 4 | 550 x 4 | 26,400 |
| 20 | Electrician | 2 | 550 x 2 | 13,200 |
| 21 | Welder | 1 | 450 | 5,400 |
| 22 | Plumber | 2 | 200 x 2 | 4,800 |
| | **Sub-Total** | **54** | **21,950** | **263,400** |
| | Employees' Benefit (20% of Basic Salary) | - | 4,390 | 52,680 |
| | **Grand Total** | | **26,340** | **316,080** |

## B. TRAINING REQUIREMENT

The quality controller, two shift leaders, eleven shift operators, and four mechanics and two electricians should be given a three weeks on-the-job training by the advanced technicians of the equipment supplier during plant commissioning. The total cost of training is estimated at Birr 55,000, out of which 40% will be required in foreign currency.

## VII. FINANCIAL ANALYSIS

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

| | |
|---|---|
| Construction period | 1 years |
| Source of finance | 30 % equity |
| | 70 % loan |
| Tax holidays | 3 years |
| Bank interest | 7.5 % |
| Discounted cashflow | 8.5 % |
| | |
| Repair and maintenance | 3 % of the total plant and machinery |
| Accounts receivable | 30 days |
| Raw material, local | 30 days |
| Raw materials, import | 90 days |
| Finished products | 30 days |
| Cash in hand | 5 days |
| Accounts payable | 30 days |

### A. TOTAL INITIAL INVESTMENT COST

The total initial investment cost of the project including working capital is estimated at 16.5 million, of which 45.8 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 ('000 BIRR) |
|---|---|---|
| 1 | Land lease value | 1,400 |
| 2. | Building and Civil Work | 1,680 |
| 3. | Plant Machinery and Equipment | 1,845.5 |
| 4. | Office Furniture and Equipment | 50 |
| 5. | Vehicle | 1,860 |
| 6. | Pre-production Expenditure* | 55 |
| 7 | Working Capital | 8,719.2 |
| | **Total Investment cost** | **16,483.9** |
| | **Foreign share** | **45.8%** |

** N.B Pre-production expenditure includes interest during construction (Birr 874 thousand), training (Birr 50 thousand), and ( Birr 5 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 28.9 million (see Table 7.2). The material and utility cost accounts for 93.3 per cent while repair and maintenance take 0.2 per cent of the production cost.

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

| Items | Cost | % |
|---|---|---|
| Raw Material and Inputs | 26613 | 92.1 |
| Utilities | 344 | 1.2 |
| Maintenance and repair | 49.8 | 0.2 |
| Labour direct | 263.4 | 0.9 |
| Factory overheads * | 52.7 | 0.2 |
| Administration Cost ** | 41 | 0.1 |
| **Total Operating Costs** | **27,353.6** | **94.6** |
| Depreciation | 726.6 | 2.5 |
| Cost of Finance | 826.1 | 2.9 |
| **Total Production Cost** | **28,906.2** | **100.0** |

## 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 lifetime 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 operates at full capacity ( year 3 ) is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 54.3\ \%$$

* *Factory overhead cost includes salaries and wages of supervisors, insurance of factory workers, social costs on salaries of direct labour, etc.*

** *Administrative cost includes salaries and wages, insurance, social costs, materials and services used by administrative staff etc.*

### 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 8 years.

### 4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 13.46 % and the net present value at 8.5% discount rate is Birr 6.1million.

## D. ECONOMIC BENEFITS

The project can create employment for 54 persons. In addition to supply of the domestic needs, the project will generate Birr 0.5 million per annum in terms of tax revenue when it starts to operate at full capacity. Moreover, the Regional Government can collect employment, income tax and sales tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports.