PROFILE ON THE PRODUCTION OF PURIFIED WATER

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I. SUMMARY

This profile envisages the establishment of a plant for the production of purified water with a capacity of 4,800 hectoliter per annum.

The principal raw material can be raw water either from a spring or a deep well.

The product has high local demand and export potential. The present demand for the proposed product is estimated at 435,688 hectoliters per annum. The demand is expected to reach at 697,551 hectoliters by the year 2020. The unsatisfied demand by the year 2010 is estimated at 22,961 hectoliters.

The total investment requirement is estimated at Birr 8.55 million, out of which Birr 1.48 million is required for plant and machinery. The plant will create employment opportunities for 26 persons.

The project is financially viable with an internal rate of return (IRR) of 19.26 % and a net present value (NPV) of Birr 7.68 million, discounted at 8.5%.

The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports. Moreover, the product can also be exported.

II. PRODUCT DESCRIPTION & APPLICATION

According to Quality and Standard Authority of Ethiopia (QSAE), industrially processed and bottled water can be classified into two major groups: bottled drinking water (ES 597:2001) and mineral water (ES 621:2001). The former is further classified into carbonated "sparkling" natural water and non-carbonated "still" natural water. If water has been made after possible treatment, effervescent by addition of carbon dioxide then it is called carbonated natural water. Non-carbonated water is by nature and after possible treatment does not contain free CO_2, in excess of the amount necessary to keep dissolved the hydrogen carbonates salts that are present in the water.

In this study, the non-carbonated "still" natural water has been considered.

III. MARKET AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

The country's requirement for purified water is met through domestic production and imports. Table 3.1 shows the supply of the product from domestic production and imports during 1997-2006. During the period under reference, domestic production, imports and total supply averaged at 404,950 hectoliters, 789 hectoliters and 405,740 hectoliters, respectively. Thus, domestic production, on the average, accounted for 99.8 percent of the total supply of purified water in the domestic market, revealing the relatively limited share of imports (0.20%) in the total supply of the product.

Table 3.1

SUPPLY OF PURIFIED WATER (HECTOLITERS)

Year	Domestic Production	Import	Total Supply	Market Share (%)	
				Domestic Production	Imports
1997	374,257	2,498	376,755	99.34	0.66
1998	390,068	967	391,035	99.75	0.25
1999	421,307	953	422,260	99.77	0.23
2000	399,763	1,007	400,770	99.75	0.25
2001	395,451	571	396,022	99.86	0.14
2002	394,632	198	394,830	99.95	0.05
2003	432,600	224	432,824	99.95	0.05
2004	398,844	47	398,891	99.99	0.01
2005	394,303	723	395,026	99.82	0.18
2006	448,279	704	448,983	99.84	0.16
Average	**404,950**	**789**	**405,740**	**99.80**	0.20

Source: *Customs Authority, External Trade Statistics, 1997-2005. CSA, Statistical Abstract, various years.*

During the period 1997-2006, the maximum total supply (apparent consumption) of purified water was 448,983 hectoliters in the year 2006, while a minimum of 376,755 hectoliters was registered in year 1997. In the remaining years, apparent consumption was fluctuating between these two extremes quantities. The mean of the total supply was 405,740 hectoliters and the average growth rate during the period under reference was 2%.

Accordingly, due to the fluctuating nature of the products total supply, it appears more appropriate to consider the average of the last four years of the period under reference (2003 – 2006) which was 418,931 hectoliters as the effective demand for the product for the year 2007.

In estimating the present (2008) effective demand for the product, since the consumption of purified water is associated with the urban population, the demand for the product is assumed to grow at the rate of 4% which corresponds to the annual growth rate of urbanization in the Country.

Accordingly, the present effective demand for purified water is, thus, estimated at 435,688 hectoliters.

2. Projected Demand

The future demand for purified water is a function of income, urban population growth and growth of catering and recreational establishments. Accordingly, the demand for purified water is forecasted to grow at a rate of 4% which is equivalent to the growth rate of urban population. Moreover, assuming that existing domestic producers will maintain their current production (year 2006) for the future, the unsatisfied demand for the product is depicted in Table 3.2.

Table 3.2

PROJECTED DEMAND FOR PURIFIED WATER (HECTOLITER)

Year	Projected Demand	Existing Factories	Unsatisfied Demand
2009	453,116	448,279	4,837
2010	471,240	448,279	22,961
2011	490,090	448,279	41,811
2012	509,694	448,279	61,415
2013	530,081	448,279	81,802
2014	551,285	448,279	103,006
2015	573,336	448,279	125,057
2016	596,269	448,279	147,990
2017	620,120	448,279	171,841
2018	644,925	448,279	196,646
2019	670,722	448,279	222,443
2020	697,551	448,279	249,272

3. Pricing and Distribution

Currently, the retail price of domestically produced purified water is Birr 6 per liter. Allowing 40 per cent for wholesale and retail margin, the factory-gate price for the product of the envisaged plant is estimated at Birr 3.6 per liter.

The envisaged plant can distribute its product through the existing wholesale and retail network, which includes department stores, merchandise shops and super markets.

B. PLANT CAPACITY & PRODUCTION PROGRAMME

1. Plant Capacity

The annual production capacity of the envisaged plant is determined to be 4,800 hectoliter, based on 300 working days per annum and 8 hours per day. In this study, the size of the plastic bottle is assumed to be 0.5 liters and 1 liters. Actually, these are the most popular and favored sizes, especially in lowland area. The one liter size is more popular than the half liter. Therefore, 75% of the total production shall be bottled in one liter and the balance in half liter.

2. Production Programme

At the initial stage of the production period, the envisaged project may require some years to capture a significant market share of the product. The plant may start production at 70% and 85% of its rated capacity in the first and second year of production, respectively. Full production shall be attained in the third year and then after. The proposed production programme is indicated in Table 3.3.

Table 3.3

PRODUCTION PROGRAMME

Sr. No.	Size of Bottles	Production Year		
		1	2	3-10
1	1.0 (‘000 pcs)	252	306	360
2	0.5 (‘000 pcs)	498	204	240
	Capacity utilization rate (%)	70	85	100

IV. MATERIAL AND INPUTS

A. RAW AND AUXILIARY MATERIALS

The source of raw water for the proposed project is ground water, which is abundantly available in the foot of the escarpment of Kality – Akaki Sub City.

The annual raw water requirement, including 10% allowance for impurities and processing loss, is estimated at 5,280 hectoliters. Raw water shall be supplied from a deep-well near the processing plant.

The major auxiliary materials are polyethylene terephtalate (PET) bottles with pilfer proof caps, labels, polypropylene rolls and different chemicals required to sanitation, disinfection and other purposes. PET bottles shall be imported in preforms and preheated and blown to final sizes. Caustic soda and Common salt is locally available while the other raw materials will be imported. The annual requirement (at full capacity) of raw & auxiliary materials and their estimated cost is indicated in Table 4.1.

Table 4.1

RAW & AUXILIARY MATERIALS REQUIREMENT AND COSTS

Sr. No.	Description	Unit	Annual Requirement	Unit Cost (Birr)	Cost ('000 Birr)		
					FC	LC	TOTAL
1	PET Pre form (1 lt)	Pcs	367,200	0.66	218.115	24.235	242.350
2	PET Pre form (0.5 lt)	Pcs	244,800	0.51	112.365	12.485	124.850
3	Pilfer – proof caps	Pcs	612,000	0.10	55.080	6.120	61.200
4	Label	Pcs	612,000	1.01	5.508	0.612	6.120
5	Polypropylene for wrapping bottles	Rolls	783	10	6.768	0.752	7.520
6	Caustic Soda	kg	1,026	3	-	3.079	3.079
7	Dive rite Deformer	kg	11.1	21	0.187	0.047	0.233
8	Common salt	kg	2,465	1	-	2	2.342
9	Brill tak	kg	128	7	1	0.167	0.829
10	Filter candle	Pcs	17.9	24	0.343	0.0865	0.430
11	Glue	kg	11.235	9.1	0.0818	0.02045	0.102
12	Hydrochloric Acid	kg	104	4.200	0.349	0.087	0.436
13	Hypochlorite	kg	83	7.000	0.467	0.117	0.583
14	Largo Medicated	kg	100	6.000	0.481	0.120	0.602
15	P_3 special	kg	21.85	13.1	0.229	0.05725	0.286
16	P_3 stabilon	kg	476	18.000	6.956	1.614	8.570
17	P_3 Ferisol	kg	20	1	20	20	40.000
18	Porcelain ring	kg	7.65	16	0.0979	0.0245	0.122
19	Silica Gel	kg	9.95	20	0.1592	0.0398	0.199
20	Sulphuric Acid	kg	6.8	4	0.02175	0.00545	0.027
21	Filter paper	Pce	87	4.000	0.277	0.069	0.346
22	Manganese Greensand	kg	34.8	12	0.3341	0.0835	0.418
23	Everite	lt	33.25	16	0.4256	0.1064	0.532
Grand Total					**428.906**	**72.269**	**501.175**

B. UTILITIES

The major utilities of the envisaged plant are electricity, water, furnace oil, dry air and compressed air. There are two sources of water, i.e., municipality and own source. Raw

water used for processing shall be supplied by a submersible pump, installed at the project site. Therefore, water indicated in Table 4.2 is municipality water, used for drinking and other sanitary purposes.

Table 4.2

ANNUAL UTILITIES REQUIRMENT AND COSTS

(AT FULL CAPACITY)

Sr. No	Description	Unit	Annual Requirement	Unit Cost (Birr)	Cost ('000 Birr)	
					LC	Total
1	Electricity	kWh	32,400	0.47	15.34	15.34
2	Furnace oil	Lt.	375	5.84	2.19	2.19
3	Lubricants	Kg	10	15	0.15	0.15
4	Water	m^3	500	3.25	1.625	1.625
Total Cost					19.31	19.31

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The processing technologies of mineral water are more or less similar. The major difference arises from the type of bottles, glass or plastic. The glass bottles are normally reused, about 6 to 7 times before they are discarded.

The type of plastic used for bottle making is known as polyethylene terephtalate (PET). They are thin and shatter-proof containers, with glass-like transparence and exceptional strength which results in increased safety.

Each type of bottling has its own advantages and drawbacks. The glass bottles, for example, are heavier, i.e., costly to transports, are brittle and have danger of breakage and need be washed thoroughly. On the other hand, they are reusable. Therefore, it has lower production cost. The PET bottles have some drawbacks such as relatively high production cost and larger factory floor area for their manufacturing. However, they are

lighter in weight and thus cheaper for transportation less damaged while filling and easy for handling. Therefore, either of the alternatives can be used based on the preference of the project owner. In this study the plastic bottle has been considered.

The production and bottling of purified water in PET bottles involves processes like raw water storage and treatment, filling and capping, labeling and wrapping.

The major operation in water storage and treatment unit include water color removal, raw water pumping and storage, chemical dosage, filtration using different types of filters, ultraviolet water disinfection ozone generation with recirculation system.

After proper water treatment, the PET bottles are automatically conveyed and transferred to the rinsing rotor where they are subject to rinsing jets. Then the bottles are transferred to the filling and capping rotors. After labeling and sealing, bottles are transferred to the discharge conveyor.

The production process does not have any adverse impact on the environment.

2. Source of Technology

The following firm could be a possible supplier of the required machinery.

Shivsu Water Private Limited
14, Spur Tank Road, Chetpet, Chennai- 6000 31. India
Fax 91-44-8256606
E-mail: waterk@vsnl.com

B. ENGINEERING

1. Machinery and Equipment

The major machinery and equipment of production sections are indicated in Table 5.1. The total cost of machinery is estimated to be Birr 1,481,798, out of which Birr 1,333,615 is required in foreign currency.

Table 5.1

MACHINERY, AND EQUIPMENT REQUIREMENT AND COST

Sr. No.	Description	Qty.	COST ('000 Birr)		
			FC	LC	Total
1	**Water Treatment**				
1.1	Feed Tank	1	10.16	1.13	11.29
1.2	Feed Pump	1	2.88	0.32	3.20
1.3	Multi-Media Filter	1	34.72	3.85	38.58
1.4	Cartridge Filter	1	34.72	3.85	38.58
1.5	Middle Tank	1	10.16	1.13	11.29
1.6	Middle Pump	1	2.88	0.32	3.20
1.7	Fine Filter	1	4.11	0.45	4.57
1.8	Micro Filter	1	42.46	4.71	47.18
1.9	Final Tank	1	10.16	1.13	11.29
1.10	Final Pump	1	2.88	0.32	3.20
1.11	Ozon System	Set	52.76	5.86	58.62
1.12	Pipes, valves and accessories	Set	5.82	0.64	6.47
1.13	Control Equipment	Set	15.40	1.71	17.12
2	**Filling, Capping, and Packing Unit**				
2.1	Rinser, Filter, and capper (with accessories)	Set	282.90	31.43	314.33
2.2	Light checking box	1	1.91	0.21	2.13
2.3	Caps sterilizing cabinet	1	21.16	2.35	23.51
2.4	Shrink labeling machine	1	44.59	4.95	49.54
2.5	Inkjet printer	1	96.50	10.72	107.22
2.6	Conveyor with motor and extension	Set	32.80	3.64	36.45
2.7	Label inserting table	1	5.13	0.57	5.70
2.8	Air compressor	1	5.4	0.6	6.0
3	PET stretch Blow Molding Unit				
3.1	Stretch blow moldings with 2 high pressure air compressor air receiving tank, 2 air filters, air drier, spare parts and tool	Set	385.94	42.88	428.82
3.2	Mould, ½ lt PET bottle	1	10.17	1.13	11.3
3.3	Mould, 1 lt PET bottle	1	18.18	2.02	20.20
4	Caps Production line				
4.1	Injection Machine	1	133.49	14.83	148.33
4.2	Auto loader	1	7.11	0.79	7.90
4.3	Mould for caps	1	59.13	6.57	65.70
Total			**1,333.61**	**148.18**	**1,481.79**

2. Land, Building and Civil Works

The total area of the project site is about 2,000 m^2 out of which 600 m^2 is a built-up area covered by production, office and other buildings. Out of the total built up area, 380m^2 will be used for production facility, 140m^2 for store and 80m^2 for office building. The total cost of building is Birr 1.38 million.

According to the Federal Legislation on the Lease Holding of Urban Land (Proclamation No 272/2002) 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 blow 5000 m^2 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 m^2 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.

The land lease price in the industrial zones varies from one place to the other. For example, a land was allocated with a lease price of Birr 284 /m^2 in Akakai-Kalti and Birr 341/ m^2 in Lebu and recently the city's Investment Agency has proposed a lease price of Birr 346 per m^2 for all industrial zones.

Accordingly, in order to estimate the land lease cost of the project profiles it is assumed that all manufacturing projects will be located in the industrial zones. Therefore, for the this profile since it is a manufacturing project a land lease rate of Birr 346 per m^2 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 5.2 shows incentives for lease payment.

Table 5.2

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 period of lease for industry is 60 years .

Accordingly, the total lease cost, for a period of 60 years with cost of Birr 346 per m^2, is estimated at Birr 41.52 million, of which 10% or Birr 4,152,000 will be paid in advance. The remaining Birr 37.37 million will be paid in equal installments with in 28 years i.e. Birr 1,334,571, annually.

VI. MANPOWER AND TRAINING REQUIRMENT

A. MANPOWER REQUIRMENT

The proposed manpower requirement of the envisaged plant and the estimated annual labour cost including the fringe benefits are given in Table 6.1. The total number of manpower is 26 persons and annual labour cost is estimated at Birr 318,000.

Table 6.1

MANPOWER REQUIRMENT AND ANNUAL LABOUR COST

Sr. No.	Description	Req. No.	Monthly Salary (Birr)	Annual Salary (Birr)
1	General Manager	1	3,000	36,000
2	Secretary	1	600	7,200
3	Accountant	1	1,500	18,000
4	Production & Technic	1	2,000	24,000
5	Sales man	2	3,000	36,000
6	Quality Control	1	1,500	18,000
7	supervisor	1	1,200	15,000
8	Operators	6	3,000	36,000
9	Bottle Inspectors	2	800	9,600
10	Forklift Operators	1	800	9,600
11	Electrician	1	600	7,200
12	Mechanics	1	600	7,200
13	Driver	1	600	7,200
14	Store keepers	1	450	5,400
15	Store Laborers	2	600	7,200
16	Guards	3	900	10,800
		26	**21,150**	**254,400**
	Workers Benefit =25% of Basic Salary		5,287.50	63,600.00
	Total Cost		**26,437.50**	**318,000.00**

B. TRAINING REQUIRMENT

Laborers should be given on-the-job training during plant erection and commissioning. The total cost of training is estimated at Birr 20,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the purified water 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	2 years
Bank interest	8.5%
Discount cash flow	8.5%
Accounts receivable	30 days
Raw material local	30 days
Raw material import	90 days
Work in progress	1 days
Finished products	30 days
Cash in hand	5 days
Accounts payable	30 days
Repair and maintenance	3% of machinery cost

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 8.55 million, of which 16 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 ('000 Birr)

Sr. No.	Cost Items	Local Cost	Foreign Cost	Total Cost
1	Land lease value	4,152.00	-	4,152.00
2	Building and Civil Work	1,380.00	-	1,380.00
3	Plant Machinery and Equipment	148.183	1333.62	1,481.80
4	Office Furniture and Equipment	100.00	-	100.00
5	Vehicle	450.00	-	450.00
6	Pre-production Expenditure*	536.21	-	536.21
7	Working Capital	456.78	-	456.78
	Total Investment cost	**7,223.17**	**1,333.62**	**8,556.79**

* *N.B Pre-production expenditure includes interest during construction (Birr 416.21 thousand), training (Birr 20 thousand) and Birr 100 thousand costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

B. PRODUCTION COST

The annual production cost at full operation capacity is estimated at Birr 1.68 million (see Table 7.2). The material cost accounts for 29.72% of the production cost. The other major components of the production cost are, depreciation, financial cost and labour direct which account for 24.46%, 21.42% and 9.05% respectively. The remaining 15.34% is the share of repair and maintenance, labour overhead and other administration cost.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	**501.17**	29.72
Utilities	19.31	1.15
Maintenance and repair	74.09	4.39
Labour direct	152.64	9.05
Labour overheads	63.60	3.77
Administration Costs	101.76	6.03
Land lease cost	-	-
Total Operating Costs	912.57	54.12
Depreciation	412.5	24.46
Cost of Finance	361.2	21.42
Total Production Cost	**1,686.34**	**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 899.12 thousand to Birr 1.60 million during the life of the project. Moreover, at the end of the project life the accumulated cash flow amounts to Birr 20.16 million.

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 of the project including cost of finance when it starts to operate at full capacity (year 3) is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 26\ \%$$

4. Payback Period

The pay back period, also called pay – off period is defined as the period required to recover 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 5 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 19.26 % 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 8.5% discount rate is found to be Birr 7.68 million which is acceptable.

D. ECONOMIC BENEFITS

The project can create employment for 26 persons. In addition to supply of the domestic needs, the project will generate Birr 926.12 thousand, 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 moreover, the product can also be exported.