182. PROFILE ON PRODUCTION OF BAKER'S YEAST

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I. SUMMARY

This profile envisages the establishment of a plant for the production of baker's yeast with a capacity of 300 tonnes per annum.

The present demand for the proposed product is estimated at 246 tonnes per annum. The demand is expected to reach 764 tonnes by the year 2017.

The plant will create employment opportunities for 35 persons.

The total investment requirement is estimated at Birr 25.44 million, out of which Birr 20 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 20 % and a net present value (NPV) of Birr 10.15 million, discounted at 8.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Yeast is a living unicellular micro-organism until it is destroyed by heat or other physical or chemical means of about one hundredth of a millimeter in size, and can therefore not be observed with the naked eye. The scientific name for baker's yeast is saccharomyces cerevisiae. The latin word "saccharo" means sweet or sugar and "myces" means fungus. There are hundreds of different yeast species, each with their own specific characteristics (e.g. for wine production or for brewing). Yeasts have been used since prehistoric times in the making of breads.

Yeast has three principal functions in dough:

- It produces carbon dioxide gas which raises the dough to the required volume and gives it the light sponge-like texture necessary for the production of baked products with good eating properties. Good eating properties include; crumb softness, short bite, elastic crumb, easy to slice, fine even texture.

- It matures or develops the dough through the action of fermentation on the gluten structure.
- It provides flavour and aroma through the production of complex chemical compounds (organic acids and alcohols), which are by-products of the fermentation process.

The final baker's yeast product may take the form of liquid yeast, dried yeast cells, or the yeast may be pressed into cakes with some starchy material.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Baker's yeast or sodium bicarbonate as the name implies is used in the production of bread. The baking process is a complex set of physical, chemical, biochemical and biological activities. Yeast is the primary biological agent in dough formation which is responsible for the most important process called fermentation. The three main functions of yeast in dough formation are leavening, dough maturation and development and flavour development.

Households in both rural and urban areas use home made yeast though there is a growing trend in using commercially available yeast products.

Supply of commercial yeast is mainly met through import. Imported supply of baker's yeast as shown in Table 3.1 was on average 205 tonnes for the last ten years. Excluding the very low import figure of 2002, the average annual import figure of 2002, the average annual import amounts 223 tonnes. Since the demand for yeast is directly associated with the demand for bread and there is an ever increasing demand for bread, it is reasonable to estimate the current effective demand at 10% growth rate. Based on the annual average import of 223 tonnes, the current effective demand is estimated to be 246 tonnes.

Table 3.1

SUPPLY OF IMPORTED BAKER'S YEAST

Year	Tonnes
1997	146.9
1998	105.7
1999	459.1
2000	124.5
2001	370.8
2002	22.0
2003	247.1
2004	139.9
2005	164.4
2006	269.5

Source: *Customs Authority.*

2. Projected Demand

The demand for bakers yeast is the function of the demand for bread, particularly commercially prepared bread. Growth in income and population, urbanization and the shift from traditional to fast foods and bread have an increasing impact on the demand for bakers yeast. Considering this positive impact on the demand for baker's yeast 12% annual growth rate is assumed to project the demand for yeast. Accordingly, the demand for yeast by the year 2017 will be 764 tonnes. Projected demand is presented in Table 3.2.

Table 3.2

PROJECTED DEMAND FOR BAKER'S YEAST (TONNES)

Year	Projected Demand
2008	276
2009	309
2010	346
2011	387
2012	434
2013	486
2014	544
2015	609
2016	682
2017	764

3. Pricing and Distribution

According to the Customs Authority records, the latest CIF value of baker's yeast is Birr 173 per tonne.

Factory get price of Birr 250/tonne is recommended for the new product.

The distribution of baker's yeast as an industrial product will be handled through the existing channel. In addition to the prevailing distribution method' the new product will find its outlets through direct delivery to potential bakeries.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

Based on the market study, the envisaged plant is proposed to have annual production capacity of 300 tonnes. The plant will operate in a single shift of 8 hours a day, and for 300 days a year.

2. Production Programme

Production will commence at 70%, and then will grow to 85% and 100% in the second year, and the third year and then after, respectively. The plant will take two years to penetrate to the market and develop skill in the production of baker's yeast. Detail production programme is shown in Table 3.3 below.

Table 3.3
PRODUCTION PROGRAMME

Year	1	2	3-10
Capacity utilization (%)	70	85	100
Production (tonnes)	210	255	300

IV. MATERIALS AND INPUTS

A. RAW AND AUXILIARY MATERIALS

The major raw material used to produce baker's yeast is molasses. Chemicals like sulfuric acid ammonium sulphate, ammonium phosphate, ammonia, sodium chloride, antifoaming, potato starch, emulsifying agent and sodium hydroxide are also used as input in small amount. Annual consumption of raw and auxiliary materials at full production capacity is given in Table 4.1 below. The total annual cost of raw material is estimated at Birr 2316.814 thousands.

Table 4.1

RAW AND AUXILIARY MATERIALS REQUIREMENT AND COST

Sr. No.	Description	Qty[Tonnes]	Cost, ['000 Birr]		
			LC	FC	TC
1	molasses	1,350	135	-	135
2	sulfuric acid	15	75	-	75
3	ammonium sulphate	54	-	972	972
4	Ammonium phosphate	18	-	216	216
5	Ammonia	9.3	-	37.2	37.2
6	Sodium chloride	37.5	56.25	-	56.25
7	Antifoaming	1.5	-	111.659	111.659
8	Potato starch	15	-	61.5	61.5
9	Emulsifying agent	4.5	-	135.005	135.005
10	Sodium hydroxide	4.5	36	-	36
11	Wrapping & packing materials(aluminum foil bag and cartoon)	lumpsum	481.2	-	481.2
	Grand Total		**783.45**	**1,533.364**	**2,316.814**

B. UTILITIES

Electricity, water and fuel oil are the utilities required for the production of baker's yeast. Details of utilities are shown in Table 4.2. The total annual cost of utilities is estimated at Birr 1,877,800.

Table 4.2

UTILITIES REQUIREMENT AND COST

Sr. No.	Description	Quantity	Unit price (Birr)	Total Cost, Birr
1	Electricity (kWh)	500,000	0.4736	236,800
2	Water (m^3)	200,000	5.5	1,100,000
3	Furnace oil (lt.)	100,000	5.41	541,000
	Grand Total			**1,877,800**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

Yeast production is relatively simple operation. It consists in developing a selected strain in a vegetative medium adjusted to the requirements of the yeast for a fast and maximum multiplication. The production process is described in detail as follows:

Yeast strains that are suitable for bread production are selected under very strictly controlled circumstances and allow them to reproduce gradually (until several hundred grams of yeast are available). This small quantity of yeast is then transmitted to the factory where it is reproduced until sufficient quantities are obtained of what is called “mother yeast”. This mother yeast is the basis for the production of the actual baker's yeast.

The mother yeast is introduced into fermenters. These are large fermentation tanks in which nutrients and sugar (in the form of molasses) are added on the one hand, and huge amounts of sterile air on the other. Air compressors blow this air through a ventilation system into the tanks and through the mother yeast. Temperature, pH value, airflow and molasses supply are

parameters that are permanently controlled. During fermentation, the yeast is constantly cooled in order to prevent the temperature developed by the yeast during its growth from rising to high.

After fermentation, the yeast is fully-grown and the suspension is subsequently centrifuged in order to separate the yeast from the remainders of molasses. The yeast cream is quickly cooled down to 4°C and stored in refrigerated tanks.

The yeast cream in those refrigerated tanks is then processed into 3 sorts of yeast products.
Part of the yeast cream is sold as liquid yeast.

The remaining yeast cream is further processed into fresh or dry yeast. The yeast cream is transferred to a rotating vacuum filter and is spread out on the filter cloth of this rotating drum, thus removing the remaining water until the desired dry substance (about 30%) and consistency are obtained.
Next, the yeast is scraped off the drum with a knife. Some of the yeast flakes obtained is pressed into blocks (block yeast or pressed yeast). The blocks are arranged in cardboard boxes and stored in refrigerated areas (2°C) awaiting transportation to the customers.

The remaining yeast that is scraped off the rotating vacuum filter is taken to drying units where the yeast is dehydrated according to a very specific procedure in order to create a granular structure. This is the dry or instant yeast. Dry yeast has a moisture content of maximum 5%, but it becomes viable again after contact with water. This is an important distinction between dried yeast and any other instant product like milk powder or instant coffee.

Next this yeast is carefully vacuum-packed in aluminum bags. Contact with air, water and light must absolutely be avoided as this reduces the activity and shelf life of the dry yeast.
After that, the packs are stored

2. Source of Technology

The technology of baker's yeast production is not simple. Machinery can be purchased from Austria. Address of a machinery supplier is given below:-

1. VOGELBUSCH Gmbh
   Blechturmgasse 11
   A-1051 Vienna
   Austria
   Phone: +43 1 54661-0
   Fax: +43 1 545 2979
   E-mail: office @ Vienna vogelbusch.com

B. ENGINEERING

1. Machinery and Equipment

The list of machinery and equipment required by the envisaged plant is given in Table 5.1 below. The total cost of machinery and equipment with the envisaged capacity is estimated at Birr 20 million, out of which Birr16 million is required in foreign currency.

Table 5.1

MACHINERY AND EQUIPMENT REQUIREMENT

Sr. No.	Description	Qty. (No.)
1	Molasses tank and pump	2
2	Molasses filter	2
3	Sulfuric acid tank	2
4	Centrifugal decanter	2
5	Weighting tank with agitator	1
6	Fermenters	3
7	Plate exchanger for cooling mash	3
8	Nutrient salt tank	1
9	Ammonia solution tank	**1**
10	Sulfuric acid dosing tank	2
11	Circulation pump	2
12	Mash filter	2
14	Washing sprayer	2
15	Cream yeast pump	1
16	Cream yeast cooler	1
17	Cream yeast tank with agitator	3
18	Transfer pump	2
19	Revolving filter	2
20	Vacuum pump	2
21	Granulator	2
22	Belt conveyor	1
23	Hopper	2
24	Differential balance	2
25	Packing machine	1

2. Land, Building and Civil Works

The total land requirement, including provision for open space is 2000 m^2, of which 1,000 m^2 will be covered by building. Estimating unit building construction cost of Birr 2,300 per m^2, the total cost of building will be Birr 2,300,000. The cost of land leasing is Birr 0.1 per m^2, and for 80 years land holding will be Birr 16,000. Thus, the total investment cost of land, building and civil works will be Birr 2,316,000.

3. Proposed Location

Baker's yeast is mainly consumed by the urban population. The location for baker's yeast plant is a compromise between the availability of major raw material molasses and market for the finished product. The availability of the basic infrastructure like electricity, water, and road which are vital for the smooth operation of the plant. Aleta woreda, Aleta wondo town is therefore, the appropriate location for the envisaged baker's yeast plant.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The plant requires 35 workers, and their annual expenditure, including fringe benefits, is estimated at Birr 334,500. For details see Table 6.1 below.

B. TRAINING REQUIREMENT

The production operators will be trained on the operation and maintenance of machinery for about two weeks during commissioning period by the expert of machinery supplier. The total cost of training is estimated at Birr 30,000.

Table 6.1

MANPOWER REQUIREMENT AND ANNUAL LABOUR COST

Sr. No.	Description	Req. No.	Salary, (Birr)	
			Monthly	**Annual**
1	Plant manager	1	2,500	30,000
2	Secretary	1	700	8,400
3	Accountant	1	900	10,800
4	Clerk	1	500	6,000
5	Production head	1	1,800	21,600
6	Operator	8	4,800	57,600
7	Assistant operators	8	3,600	43,200
8	Mechanic	2	1,200	14,400
9	Electrician	2	1,200	14,400
10	Store keeper	1	500	6,000
11	Purchaser	1	900	10,800
12	Sales man	1	900	10,800
13	Personnel	1	900	10,800
14	Time keeper	1	400	4,800
15	Cashier	1	500	6,000
16	Driver	1	300	3,600
17	Guard	2	500	6,000
17	Cleaner	1	200	2,400
	Sub-total	**35**	**22,300**	**267,600**
	Employee benefit (20% BS)			66,900
	Total			**334,500**

VII. FINANCIAL ANALYSIS

The financial analysis of the baker's yeast project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 year
Source of finance	30 % equity
	70 % loan
Tax holidays	3 years
Bank interest	8%
Discount cash flow	8.5%
Accounts receivable	30 days
Raw material local	30days
Raw material, import	90days
Work in progress	2 days
Finished products	30 days
Cash in hand	5 days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 25.44 million, of which 56 per cent will be required in foreign currency.

The major breakdown of the total initial investment cost is shown in Table 7.1.

Table 7.1

INITIAL INVESTMENT COST

Sr. No.	Cost Items	Total Cost ('000 Birr)
1	Land lease value	16.0
2	Building and Civil Work	2,316.0
3	Plant Machinery and Equipment	20,000.0
4	Office Furniture and Equipment	150.0
5	Vehicle	450.0
6	Pre-production Expenditure*	1,618.3
7	Working Capital	891.2
	Total Investment cost	**25,441.2**
	Foreign Share	56

** N.B Pre-production expenditure includes interest during construction (Birr 1.4 million) training (Birr 30 thousand) and Birr 170 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 8.25 million (see Table 7.2). The material and utility cost accounts for 50.81 per cent, while repair and maintenance take 3.03 per cent of the production cost.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	2,316.84	28.07
Utilities	1,877.8	22.75
Maintenance and repair	250	3.03
Labour direct	200.7	2.43
Factory overheads	83.63	1.01
Administration Costs	133.8	1.62
Total Operating Costs	4,862.77	58.91
Depreciation	2,260.8	27.39
Cost of Finance	1,131.28	13.70
Total Production Cost	**8,254.85**	**100**

C. FINANCIAL EVALUATION

1. Profitability

According to the projected income statement, the project will start generating profit in the first year of operation. Important ratios such as profit to total sales, net profit to equity (Return on equity) and net profit plus interest on total investment (return on total investment) show an increasing trend during the life-time of the project.

2. Break-even Analysis

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

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 46\ \%$$

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 5 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 20 % and the net present value at 8.5% discount rate is Birr 10.14 million.

D. ECONOMIC BENEFITS

The project can create employment for 35 persons. In addition to supply of the domestic needs, the project will generate Birr 7.67 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.