

1. PRODUCT DESCRIPTION:

Centrifugal Water Pumps are amongst the most commonly used variety of pumps to lift water at higher head. They are also used in industrial application for pumping of liquids. Thus, water pumps find application both for domestic and industrial purposes. This profile describes about the manufacture of Centrifugal Pumps for use in residential buildings for pumping water for storage. These are of self-priming variety.

A Centrifugal Pump comprises an impeller rotating at a high speed inside a stationary casing. Water is spun around at sufficient speed to raise its level or pressure. The point at which the shaft enters the casing requires a stuffing box with gland packing or a seal. Sleeves, neck rings, wearing rings etc. are provided at points where stationary and rotating parts are close together. The shaft requires thrust bearings and a coupling from the driving entry.

Simple pumps of single stage type have cast iron casings, impeller and bearing brackets. The shaft material is usually of carbon steel or stainless steel. Ball and roller bearings are generally used in simple pumps with grease lubrication. The casing is generally split. An improved version of Centrifugal Pump called, 'Self-Priming Pump' is convenient to pump water from ground level to overhead storage tanks.

2. PRESENT STATUS AND MARKET POTENTIAL:

There is one unit namely, Tomos Ghana Limited, Jumasi manufacturing water pumps in Ghana and hence majority of the requirements are met through imports. The pumps are required in multi-storeyed buildings in main cities like Accra and Kumasi. They are also used in hotels, mining industries, medium and large-scale enterprises and staff quarters provided

by large private and public-sector undertakings like Gold Mill. It is difficult to estimate the present demand of pumps. However, during discussions with knowledgeable persons in the line and some traders, it was revealed that there is good demand for water pumps in Ghana for various purposes. More construction of new buildings in Accra and elsewhere is going on through government agencies and private contractors. The replacement demand by the existing buildings and industrial users is also sizeable. With little modification, entrepreneurs can also produce special pumps required to lift various types of liquids by chemical processing industries, refinery, oil processing complex and food processing industries.

3. PLANT CAPACITY:

The proposed project will have annual capacity of 1,000 pumps per year based on one shift working per day and 300 days in a year. Generally, the pumps are characterised in terms of flow-rate of water per minute. Commonly used nomenclature designates the pump on the basis of size of 'suction' and 'delivery' nozzles. The typical size considered is 2" x 2" (suction and delivery) for household application. The unit can manufacture a range of centrifugal pumps with the proposed machinery. They will be supplied without electric motor which will be bought by the consumer from market.

In the first year of operation, the man-power will have to be trained properly in various manufacturing steps. Therefore, it is considered that the capacity utilisation during the first year would be 60% of the installed capacity. In other words, the unit will produce 600 pumps in the first year of operation.

4. TECHNICAL KNOWHOW:

The manufacture of pump from available castings and other raw materials requires skilled operators for machining of various castings and do precision work of making shaft and

impeller. As such, there is no need of entering into foreign collaboration or to buy technical knowhow from other sources. At the most, entrepreneur can obtain design and drawings with specifications from India where there are several pump manufacturers of repute at nominal cost and develop appropriate pumps to suit local needs. The manpower can be initially trained in institute like GRATIS, TEMA and KUMASI. The cost of training and drawings is estimated at million ₹ 1.50.

5. MANUFACTURING PROCESS:

The manufacture of pump sets consists of processing casted components and assembly of other items to complete a pump. Certain standard components like bearings, grease cups, nipples, bolts and nuts are to be purchased from market as per the sizes and specifications laid down for the pump. The main housing of the pump and the end cover are made of cast iron. Initially, these will be purchased from GIHOC Steel Limited, Accra as they have full-fledged facility for casting of various items. At a later stage, the unit can create facility for casting also.

The rough castings obtained from GIHOC Steel Limited are inspected and then machined to final required finish. The main cover and end cover is turned on a lathe machine and holes are drilled for fixing of fastners. The main shaft is prepared from steel bright bar of EN8 quality or from stainless steel. The bar is cut to the required length and then machined on a central lathe to finish its diameter including step turning. The keyway slot is milled on the shaft. Threading is done on the shaft end for inserting impeller, coupling etc.

The impeller is an important component of the pump. The rough casted impeller from brass/gun-metal is finished on a lathe and the boss is formed by turning. Further machining and groove cutting is done with the help of lathe and milling machine. Holes are drilled with a drilling machine. The

suction and delivery flanges are cut from steel plates, faced and turned, drilled and threaded. The flanges are then fitted on the pump set with short pipe section. The gland holder is prepared on lathe. Bushes are formed by purchasing brass castings and matching them to required sizes. The mounting bracket is made from mild steel section by fabrication and welding.

The different components manufactured are then checked and assembled. The pump is then tested for its efficiency and performance. Spray painting of pump is carried out for corrosion resistance and better appearance. It is then put in market with base-plate. The pump is coupled to a electric motor or diesel engine of prescribed rating for pumping of water.

6. RAW MATERIALS:

The major raw materials and components required are iron castings of pump body and end cover, bright steel bar, gun-metal/brass casting, steel brackets and sections as also standard components like ball-bearings, sleeves, nipples, bolts and nuts etc. The castings will have to be ordered with required specifications to GIHOC Steel Limited or any other foundry. The hardware and steel items can be procured from market. The quantitative requirement and estimated cost are as under for a production of 600 pumps in the first year:

Sr. No.	Raw Material.	Total Quantity required	Price per Kg.	Total value in million Cides
1.	ROUGH CASTINGS	20 Tonnes	₹ 50	1.00
2.	STAINLESS STEEL BARS	1.5 "	₹ 700	1.05
3.	BRASS CASTINGS	700 Kg.	₹ 800	0.56
4.	BALL-BEARINGS	600 Sets	₹ 1400 (per Set)	0.84
5.	OTHER BOUGHT-OUT ITEMS	Lumpsum		0.50
TOTAL ::				3.95

The cost of raw materials can be reduced if castings are made by the entrepreneur himself at later stage.

7. PROJECT OUTLAY:

It is estimated that the cost of project for installed capacity of 1,000 Pump Sets per year would be as under:

Sr. No.	Description.	Total Amount in million Cides.
1.	LAND AND BUILDING	3.25
2.	PLANT AND MACHINERY	7.53
3.	TECHNICAL KNOWHOW	1.50
4.	PRELIMINARY AND PRE-OPERATIVE EXPENSES	1.00
5.	WORKING CAPITAL	3.50
	TOTAL ::	16.78

Land and Building: It is estimated that the unit will require a plot area of 1,000 sq. metres looking to the future expansion in foundry operations. The prevailing land price in Accra is about $\text{¢ } 250/\text{sq. metre}$. The land price will be million $\text{¢ } 0.25$.

A built-up area required to house plant and machinery and create facility for storage of raw materials and finished goods, office and sanitary block will be 200 sq. metres. The construction cost with A.C. roofing sheets at 15 ft. height is estimated to be $\text{¢ } 15,000$ per sq. metre. Thus, the total cost of building works out to million $\text{¢ } 3.00$. The aggregate cost of land and building works out to million $\text{¢ } 3.25$.

Plant and Machinery: The details of plant and machinery needed to carry out different manufacturing operations are given in Annexure '1' together with specification, quantity, landed cost



and names and addresses of suppliers of machinery. The total cost of plant and machinery works out to million ₦ 7.53 including erection, installation electrification and commissioning. The equipment are available in India from several reputed suppliers. Alternatively, some of them can also be obtained from Ghana National Trading Corporation (GNT) Accra.

Technical Knowhow: As mentioned earlier, entrepreneur will have to obtain drawings of various components to be fabricated for pump assembly and train the man-power for precision work. The estimated cost of procuring drawings and imparting training is at million ₦ 1.50.

Preliminary and Pre-operative Expenses: The expenses required to be incurred for the establishment of project, preparation of project report, travelling cost during project finance arrangements, legal expenses, company formation, interest during construction period and start-up expenses are covered under this head. It is estimated that million ₦ 1.00 will be required for this purpose.

Working Capital: A provision for one month's stock of castings, two months' stock of components and steel is kept while calculating the total working capital requirement. Moreover, two weeks' goods-in-process, two weeks' stock of finished goods, two weeks' receiveables on sales and one month's overheads are considered sufficient to arrive at total working capital requirements.

8. OPERATING DETAILS:

The cost of production is estimated considering the following operational details:

- a. Raw Materials: The total requirement of different types of raw materials including wastage has been indicated at point No. 6 above. The total cost of raw materials is estimated at million ₦ 3.95.

- b. Electric Power: The total connected electric load required is about 20 HP. to run various equipment. The annual consumption works out to 33,600 kWh, considering 300 days' working and power factor of 0.70. The total cost of power would be million ₹ 0.24 at present power tariff.
- c. Man-Power: The requirement of various categories of man-power is worked out on the basis of manufacturing operations involved and nature of administrative functions. It is estimated that two supervisors holding Diploma in Mechanical Engineering possessing some experience, five skilled operators possessing experience on lathe, turning and milling machines and four unskilled workers to carry out miscellaneous jobs like assembly, spray painting and material handling will be necessary. Considering remuneration of ₹ 20,000 per month for Supervisors; ₹ 10,000 per month for skilled Operators and ₹ 4,000 per month for unskilled workers, the annual wage bill will aggregate to million ₹ 1.08. The administrative and other managerial functions will be performed by the entrepreneur himself and therefore no provision is made for these.
- d. Interest: The total cost of the project is million ₹ 16.78. On the basis of 70% finance from the financial institution as term-loan, the interest burden @ 30% shall be million ₹ 3.53.
- e. Depreciation: Depreciation on plant and machinery is considered @ 10% whereas on building it is calculated at 5%. Thus, the total depreciation works out to million ₹ 0.90 per annum.
- f. Maintenance Expenses: It is necessary to repair and maintain various equipment for smooth and uninterrupted production. It is estimated that annually million ₹ 0.23 will be required for this purpose considering 3% of machinery cost as maintenance expenses.



- g. Sales Expenses: The selling of water pumps will require some advertisement in local newspapers and through signboards. Moreover, entrepreneur will have to make extensive touring and offer discount to the dealers for sales promotion. A provision of million ₹ 1.25 is kept under this head @ 5% of sales proceeds in the first year of operation.
- h. Miscellaneous Expenses: In order to meet the expenses like postage, telephone, occasional technical and management consulting, water charges etc. a provision of million ₹ 0.50 is ear-marked for these expenses.

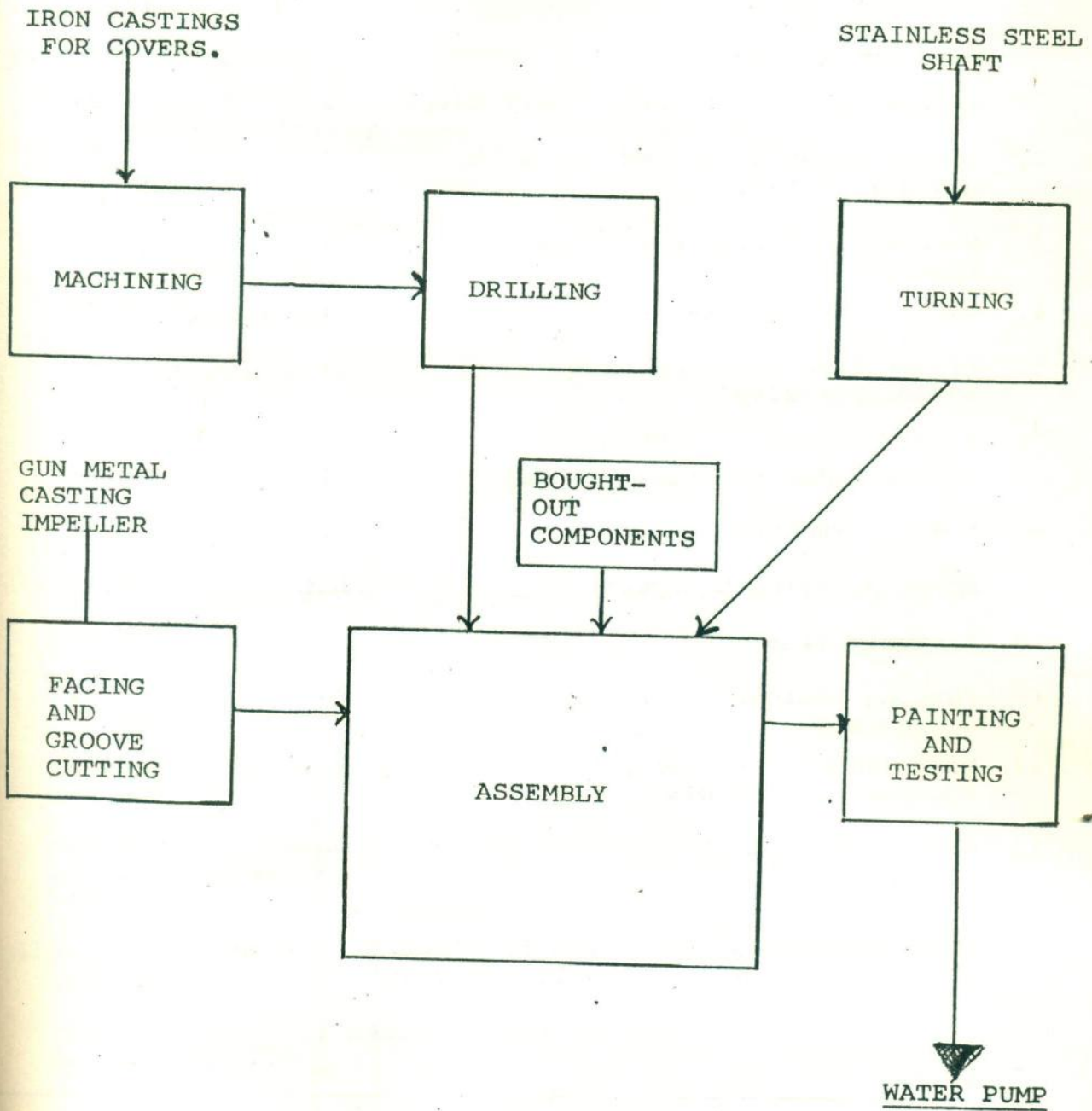
Thus, the total operating cost works out to million ₹ 11.68 for the first year of operation.

9. SALES REVENUE AND PROFITABILITY:

Annual sales for 600 Water Pumps in the first year works out to million ₹ 21.00 @ ₹ 35,000 per pump without Electric Motor. The approximate cost of an electric motor required to be coupled to the Pump Set is ₹ 14,000. Against the total sales proceeds of million ₹ 21.00, total operating cost works out to million ₹ 11.68. Therefore, annual surplus will result at million ₹ 9.32 after meeting all expenses of manufacturing and overheads.

F L O W C H A R T

(WATER PUMPS)



ANNEXURE '1'DETAILS OF PLANT AND EQUIPMENT
WITH THEIR SUPPLIERS.A. MACHINERY DETAILS:

Sr. No.	Description of Machinery.	Quantity. (Nos.)	Estimated landed cost in million Cides
1.	Centre Lathe 6 ft. bed, heavy duty	1	1.21
2.	Centre Lathe 6 ft. bed and 4 ft. bed all geared.	1	1.41
3.	Universal Milling Machine, Traverse 15"	1	0.84
4.	Shaping Machine 24" Stoke	1	0.77
5.	Pillar Type Drill Machine 50 mm. capacity	2	0.42
6.	Bench Grinder 8" Wheel Size	1	0.21
7.	Double Ended Pedestal Grinder	1	0.21
8.	Hacksaw Machine	1	0.21
9.	Spray Painting Equipment	Lot	0.21
10.	Assembly Jigs		0.24
11.	Testing Equipment, Flow Meters, Gauges etc.	Lot	0.32
12.	Miscellaneous Workshop Equipment and Tools	Lot	0.36
13.	Welding Equipment	Lot	0.42
		TOTAL ::	6.83
	<u>ADD:</u> Erection, installation, electrification and commissioning charges @ 10%		0.70
		GRAND TOTAL ::	<u>7.53</u>

B. MACHINERY SUPPLIERS:

1. M/s Batliboi & Co. Private Limited, Ajeeday House, Dr. V.B. Gandhi Marg, BOMBAY-400 001.
2. M/s Ashok Machine Tools Private Limited, Opp. Gujarat Bottling, Rakhial Industrial Area, AHMEDABAD-380 023.
3. M/s Perfect Machine Tools Private Limited, Sir Pherozechah Mehta Road, Bell Building, Fort, BOMBAY-400 001.

ANNEXURE '2'PROFITABILITY
(60% CAPACITY UTILISATION)Total Amount per
annum in million
Cides.I. RECURRING EXPENSES:
(ANNUAL OPERATING COST)

a. RAW MATERIALS	...	...	3.95
b. ELECTRIC POWER	...	...	0.24
c. MAN-POWER	...	...	1.08
d. INTEREST	...	...	3.53
e. DEPRECIATION	...	...	0.90
f. MAINTENANCE EXPENSES	0.23
g. SALES EXPENSES	1.25
h. MISCELLANEOUS EXPENSES	0.50
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	TOTAL ::	...	11.68

II. SALES REVENUE:

600 Water Pumps @ ϕ 35,000 without electric motor.	21.00
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III. ANNUAL SURPLUS (APPROXIMATE)...	9.32
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