Profile No.: 39 **NIC Code: 28192**

MANUFACTURING A.C MOTORS

1. INTRODUCTION:

Torque motors are designed to provide high starting torque and sloping characteristics (torque is highest at zero speed and decreases steadily with increasing speed), along with operating over a wide speed range. They also provide stable operation, especially in the low speed range or under a locked rotor condition. The torque produced by three phase Torque motor depends upon the following three factors. Firstly the magnitude of rotor current, secondly the flux which interact with the rotor of three phase. Torque motor and is responsible for producing emf in the rotor part of Torque motor, lastly the power factor of rotor of the three phase Torque motor. We propose to manufacture Single Phase and Three Phase Motors, Torque Motors, Flame Proof Motors.

We all know that without electricity, we cannot do any of our jobs. If we look into the world we live in, the major development in technology and civilization took place only after the introduction of electricity and electrical devices. Can we imagine a life without air conditioners/ceiling fans, lights, computers and communication devices and many more. So it is quite evident that electricity and electrical equipments play a vital role in every inch of our life. One such equipment which created a giant leap to the mankind in both domestic & industrial sectors is the "Motor". The usage of AC motors is much more prevalent than DC motors due to several practical reasons which we shall learn later on. A.C. Motors are playing a very vital role in everyday life, right from pumping water to overhead tank to modern robot's maneuvering arm. The main factor which lead to the adoption & wide usage in various fields is its flexibility and its huge variety which can be matched with almost any kind of demand. To know what are the different types of A.C.Motors available, to match it perfectly with the demand, it is highly essential to know about the different classifications of A.C.Motors.

2. PRODUCT & ITS APPLICATION:

Classification Based On Principle of Operation: (a) Synchronous Motors. 1. Plain 2. Super (b) Asynchronous Motors. 1. Induction Motors: (a) Squirrel Cage (b) Slip-Ring (external resistance). 2. Commutator Motors: (a) Series (b) Compensated (c) Shunt (d) Repulsion (e) Repulsion-start induction (f) Repulsion induction Classification Based on Type of Current: 1. Single Phase 2. Three Phase.
Classification Based On Speed of Operation: 1. Constant Speed. 2. Variable Speed. 3. Adjustable Speed.
Classification Based On Structural Features: 1. Open 2. Enclosed 3. Semi-enclosed 4. Ventilated 5. Pipe-ventilated 6. Riveted frame-eye.

1. Synchronous Motors & its Uses: These motors have the rotor (which is connected to the load) rotating at the same speed as the speed of rotation of the stator current. In other words, we can say these motors don't have slip with respect to the stator current. They are sometimes used no to drive the load but instead act as "synchronous condenser", to improve the power factor of the local grid to which it is connected to. These kinds of motors are used even in high precision positioning devices like modern robots. They can also act as stepper motors.

2. Asynchronous Motors & it's Uses: The most common form of motor which is used in everyday life from pumping water up the overhead tank to power plant boiler feed pumps, these kind of motors rule. These motors are very flexible to use and matches the load demand almost for everything. The most widely used Induction Motors are very important for many industries due to their load bearing capacity and flexibility. These motors, unlike synchronous motors, slip when compared to the stator current field. They are generally used for various types of pumps, compressors and acts as prime movers for many types of machinery.

3. Single & Three Phase Motors and their Uses: The A.C.Motors can find their usage in 2 forms based on their power supply. The single phase motors are generally found their use in low power requirements/domestic appliances like ceiling fans, mixer grinders, portable power

tools etc. The three phase motors are generally found for high power requirements like power drives for compressors, hydraulic pumps, air conditioning compressors, irrigation pumps and many more.

4. Constant, Variable & Adjustable Speed Motors: As already said, A.C.Motors is highly flexible in many ways including their speed control. There are motors which should be run at a constant speed for air compressors. Certain cooling water pumps driven by a.c.motors can be run at two or three speeds by just switching the number of poles used. If the number of poles is changed then the speed also changes. These serve best for sea water cooling pumps in marine engine room applications & many power plants. The speed of the motors can also be varied continuously by some electronic arrangements thus this can be suited for certain applications like a ship's cargo pump, whose discharge rate has to lowered as per the terminals requirement.

5. Varied Structure Motors: These types of motors have different outer cage arrangements, depending upon the usage or any special industrial requirement. For motors used in gas and oil terminals, the casing must be of intrinsically safe, thus it may either have an enclosed casing or a pipe ventilated arrangement such that the sparks produced inside the motor does not cause a fire outside it. Also many motors are totally enclosed as it may be open to weather like those used in hydro-electric power plants.

3. DESIRED QUALIFICATIONS FOR PROMOTER:

Graduate in any discipline.

4. MARKET POTENTIAL AND MARKETING ISSUES, IF ANY:

The global electric motor sales market size was estimated at USD 107.5 billion in 2016 and is expected to grow significantly, owing to their increased usage across a broad range of commercial, industrial, and residential applications in elevators, fans, refrigerators, compressors, pumps, and various other systems. They have high endurance (toward

fluctuating voltages), low maintenance, low energy consumption, and longer operating life and are gaining much importance. Electric motors are extensively used in material handling equipment, household appliances, and so on. An unmitigated rise in fuel prices and the need to reduce air pollution have generated an inimitable preference for these vehicles in various countries. This is further anticipated to upsurge the demand over the forecast period. Low Voltage Motors – Market Data reports that ≈ 44 million low voltage motors shipped in 2010. Revenue earned for the year 2008 was $13,541.2, that of for 2009, $10,912.8, 2010 $12,471.9 2011 $14,975.0, 2012 $17,444.9, 2013 $20,121.9, 2014 $22,969.7, 2015 $26,068.6. THUS THE PROJECT HAS VERY GOOD SCOPE.

5. RAW MATERIAL REQUIREMENTS:

The major raw material required and their suppliers are: Silicon steel - Essar Steel, Hazira (Gujarat) (one of the largest steel producer in India), Gujarat Iron and steel company, Ahmedabad (Gujarat), Panchmahal steel Ltd, Panchmahal (Gujarat). Copper: Hindustan Copper Ltd, Khetri (Rajasthan), Sterlite Industries Ltd, Thoothukudi (Tamil Nadu). Aluminum : Bharat Aluminum Company (Balco), Jasugora (Odisha). Hindustan Aluminum Company (Hindalco), Alupuram (Kerala).

6. MANUFACTURING PROCESS:

Rotor

Main article: Rotor (electric)

In an electric motor, the moving part is the rotor, which turns the shaft to deliver the mechanical power. The rotor usually has conductors laid into it that carry currents, which interact with the magnetic field of the stator to generate the forces that turn the shaft. However, some rotors carry permanent magnets, and the stator holds the conductors.

Bearings

The rotor is supported by bearings, which allow the rotor to turn on its axis. The bearings are in turn supported by the motor housing. The motor shaft extends through the bearings

to the outside of the motor, where the load is applied. Because the forces of the load are exerted beyond the outermost bearing, the load is said to be overhung.[54]

Stator

Main article: Stator

The stator is the stationary part of the motor's electromagnetic circuit and usually consists of either windings or permanent magnets. The stator core is made up of many thin metal sheets, called laminations. Laminations are used to reduce energy losses that would result if a solid core were used.

Air gap

The distance between the rotor and stator is called the air gap. The air gap has important effects, and is generally as small as possible, as a large gap has a strong negative effect on the performance of an electric motor. It is the main source of the low power factor at which motors operate. The air gap increases the magnetizing current needed. For this reason, the air gap should be minimal. Very small gaps may pose mechanical problems in addition to noise and losses.

Windings are wires that are laid in coils, usually wrapped around a laminated soft iron magnetic core so as to form magnetic poles when energized with current.

Electric machines come in two basic magnet field pole configurations: salient-pole machine and nonsalient-pole machine. In the salient-pole machine the pole's magnetic field is produced by a winding wound around the pole below the pole face. In the nonsalient-pole, or distributed field, or round-rotor, machine, the winding is distributed in pole face slots.[55]

A shaded-pole motor has a winding around part of the pole that delays the phase of the magnetic field for that pole.

Some motors have conductors that consist of thicker metal, such as bars or sheets of metal, usually copper, although sometimes aluminum is used. These are usually powered by electromagnetic induction.

7. MANPOWER REQUIREMENT:

The enterprise requires 41 employees as detailed below**:**

Sr. No.	Designation of Employees	Salary Per Person	Monthly Salary ₹	Year-1	Year-2	Year-3	Year-4	Year-5
1	Production Manager	18,000	18000	1	1	1	1	1
2	Operators	12,000	60000	5	5	5	5	5
3	Helpers	10,000	150000	15	15	15	15	15
4	Admin Manager	15,000	30000	2	2	2	2	2
5	Accounts/Stores Assistant	12,500	50000	4	4	4	4	4
6	Office Boy	9,000	80000	5	5	5	5	5
	Total		458000	41	41	41	41	41

8. IMPLEMENTATION SCHEDULE:

The project can be implemented in 4 months' time as detailed below:

Sr. No.	Activity	Time Required *(in months)*
1	Acquisition of premises	1.00
2	Construction (if applicable)	1.00
3	Procurement & installation of Plant & Machinery	2.00
4	Arrangement of Finance	2.00
5	Recruitment of required manpower	1.00
	Total time required *(some activities shall run concurrently)*	4.00

9. COST OF PROJECT:

The project shall cost ₹ 186.20 lacs as detailed below:

Sr. No.	Particulars	₹ in Lacs
1	Land 1500 sq. mtr@ 1000	15.00
2	Building	28.00
3	Plant & Machinery	82.00
4	Furniture, Electrical Installations	5.00
5	Other Assets including Preliminary / Pre-operative expenses	8.20
6	Margin for Working Capital	48.00
	Total	**186.20**

10. MEANS OF FINANCE:

Bank term loans are assumed @ 75 % of fixed assets.

Sr. No.	Particulars	₹ in Lacs
1	Promoter's contribution	46.55
2	Bank Finance	139.65
	Total	**186.20**

11. WORKING CAPITAL CALCULATION:

Sr. No.	Particulars	Gross Amt	Margin %	Margin Amt	Bank Finance
1	Inventories	24.00	0.25	6.00	18.00
2	Receivables	12.00	0.25	3.00	9.00
3	Overheads	12.00	100%	12.00	0.00
4	Creditors	-		0.00	0.00
	Total	48.00		21.00	27.00

12. LIST OF MACHINERY REQUIRED:

The main Plant and machineries required are : Centre Lathe , Radial drill Machine, Bench Drill Machine, Shaper Stroke, Cylindrical Grinder C.D. Hydraulic Press, Hand Press, Double ended Grinder, Hacksaw Machine, Balancing Machine, Coil Winding Machine ,Hand Shear ,Air Compressor with Accessories, Oxygen Acyteline Cylinder with accessories.

A detail of important machinery is given below: Power Requirement: 500 HP

Sr. No.	Particulars	UOM	Qtty	Rate (₹)	Value (₹ in Lacs)
	Plant & Machinery / equipments				
a)	***Main Machinery***				
i.	Rotor plant	NO	1	22.00	22.00
ii.	Bearing plant	NO	1	18.00	18.00
iii.	Starter and other parts plant	NO	1	13.00	13.00
b)	*Ancilliary machinery*	L.S.	1	11.00	11.00
i.	Testing laboratory	NO	1	7.00	7.00
ii.	Installation, Electrification , taxes and transportation.	L.S.	1	11.00	11.00
	sub-total Plant & Machinery				**82.00**
	Furniture / Electrical installations				
a)	Office furniture	LS	1	200000	2.00
b)	Stores Almirah	LS	1	100000	1.00
c)	Computer & Printer		L. S.	200000	2.00
	sub total				**5.00**
	Other Assets				
a)	preliminary and preoperative				8.20
	sub-total Other Assets				8.20
	Total				**95.20**

13. PROFITABILITY CALCULATIONS:

Sr. No.	Particulars	UOM	Year-1	Year-2	Year-3	Year-4	Year-5
1	Capacity Utilization	%	60%	70%	80%	90%	100%
2	Sales	₹. In Lacs	144.00	168.00	192.00	216.00	240.00
3	Raw Materials & Other direct inputs	₹. In Lacs	114.00	133.00	152.00	171.00	190.00
4	Gross Margin	₹. In Lacs	30.00	35.00	40.00	45.00	50.00
5	Overheads except interest	₹. In Lacs	12.48	13.26	14.82	15.29	15.60
6	Interest	₹. In Lacs	13.97	13.97	9.31	6.98	5.59
7	Depreciation	₹. In Lacs	57.40	41.00	28.70	20.50	18.45
8	**Net Profit before tax**	₹. In Lacs	**-53.85**	**-33.23**	**-12.83**	**2.23**	**10.36**

14. BREAKEVEN ANALYSIS:

The project shall reach cash break-even at 42.37 % of projected capacity as detailed below:

Sr. No.	Particulars	UOM	Value
1	Sales at full capacity	₹. In Lacs	240.00
2	Variable costs	₹. In Lacs	190.00
3	Fixed costs incl. interest	₹. In Lacs	21.19
4	BEP = FC/(SR-VC) x 100 =	% of capacity	42.37%