

# **ELECTRICAL FANS/EXHAUST ITEMS**

## **1. INTRODUCTION:**

Fan is a machine used to create flow within a fluid, typically a gas such as air. The fan consists of a rotating arrangement of vanes or blades which act on the fluid. The rotating assembly of blades and hub is known as an impeller, a rotor, or a runner. Usually, it is contained within some form of housing or case. This may direct the airflow or increase safety by preventing objects from contacting the fan blades. Most fans are powered by electric motors, but other sources of power may be used, including hydraulic motors hand cranks and internal combustion engines. Fans produce flows with high volume and low pressure as opposed to compressors which produce high pressures at a comparatively low volume. A fan blade will often rotate when exposed to a fluid stream, and devices that take advantage of this, such as anemometers and wind turbines, often have designs similar to that of a fan. We have proposed to manufacture Kitchen exhaust fans. Exhaust fans find a wide variety of use in households and industries. It is also used as a part by equipment manufacturers whose products require higher degrees of forced ventilation (computers, freezers, auto-mobiles). Therefore there is a good market for the product provided the manufacturer is prepared to design and make fans suitable for a broad spectrum of activity.

## **2. PRODUCT & ITS APPLICATION:**

Revolving blade fans: Revolving blade fans are made in a wide range of designs. They are used on the floor, table, desk, or hung from the ceiling. They can also be built into a window, wall, roof, chimney, etc. Most electronic systems such as computers include fans to cool circuits inside, and in appliances such as hair dryers and portable space heaters and mounted/installed wall heaters. They are also used for moving air in air-conditioning systems, and in automotive engines, where they are driven by belts or by direct motor. Fans used for comfort create a wind chill by increasing the heat transfer coefficient, but do not

lower temperatures directly. Fans used to cool electrical equipment or in engines or other machines do cool the equipment directly by forcing hot air into the cooler environment outside the machine. There are three main types of fans used for moving air, axial, centrifugal (also called radial) and cross flow (also called tangential). The American Society of Mechanical Engineers Performance Testing Code provides standard procedures for conducting and reporting tests on fans, including those of the centrifugal, axial, and mixed flows.

**Axial-flow:** Axial-flow fans have blades that force air to move parallel to the shaft about which the blades rotate. This type of fan is used in a wide variety of applications, ranging from small cooling fans for electronics to the giant fans used in wind tunnels. Axial flow fans are applied in air conditioning and industrial process applications. Standard axial flow fans have diameters from 300–400 mm or 1800 to 2000 mm and work under pressures up to 800 Pa. Special types of fans are used as low pressure compressor stages in aircraft engines.

**Centrifugal:** Often called a "squirrel cage" or "scroll fan", the centrifugal fan has a moving component (called an impeller) that consists of a central shaft about which a set of blades, or ribs, are positioned. Centrifugal fans blow air at right angles to the intake of the fan, and spin the air outwards to the outlet (by deflection and centrifugal force). The impeller rotates, causing air to enter the fan near the shaft and move perpendicularly from the shaft to the opening in the scroll-shaped fan casing. A centrifugal fan produces more pressure for a given air volume, and is used where this is desirable such as in leaf blowers, blow-dryers, air mattress inflators, inflatable structures, climate control, and various industrial purposes. They are typically quieter than comparable axial fans.

**Cross-flow:** The cross-flow or tangential fan, sometimes known as a tubular fan, was patented in 1893 by Paul Mortier, and is used extensively in the HVAC industry. The fan is usually long in relation to the diameter, so the flow approximately remains two-dimensional away from the ends. The CFF uses an impeller with forward curved blades, placed in a housing consisting of a rear wall and vortex wall. Unlike radial machines, the main flow moves transversely across the impeller, passing the blading twice.

### **3. DESIRED QUALIFICATIONS FOR PROMOTER:**

Graduate in any discipline, having engineering knowledge.

### **4. MARKET POTENTIAL AND MARKETING ISSUES, IF ANY:**

India is a tropical country and thus fans are necessary. Therefore the Fan industry in India is well-established and has grown significantly over the years. The fan market in India consists of ceiling fans (which have dominant share), table fans, pedestal fans, wall fans and exhaust fans and manufacture special purpose fans for industrial applications. The Indian market is estimated at 2.5 million fans per month and it is growing at about 10% per annum. India has large number of manufacturing plants located across the country and producing world class fans. In fact the export of fans from India has doubled in the last few years and are a testimony to the quality and development of the Indian fan Industry. The distribution of fans in India is also well developed with over 1, 00,000 selling points for fans, across the country covering towns right up to the 5<sup>th</sup> population. The fan industry has taken significant steps to ensure consumer satisfaction and leading brands not only provide good quality but also back this up with good after sales service. The organized market is dominated by players like Usha, Crompton, Orient and Khaitan. These players are facing stiff competition from the local players who compete on the basis of price. The organized players try to defend their position banking on their brand equity. Although the fan industry size is huge, the industry players are facing issues of competition from un-organized sector. Un-organized sector holds around half of the total market. It has to be noted that in the early 1990s the market was in the hand of four of five players like Usha, Polar, and Khaitan etc. But later regional players hit the market with low priced fans which eroded the market share of these major players. According to India Fan Market Overview, sales of fan were growing with a CAGR of 9.13% over last five years. With the housing sector growing at a rapid rate and the disposable incomes at a high rate, the demand for electric fans continued to grow. But due to involvement of lesser technological inputs and low entry barrier, the market is equally divided among the organized and un-organized players. Un-organized sector leads the industry in terms of volume whereas organized market leads in terms of revenues.

## **5. RAW MATERIAL REQUIREMENTS:**

The major raw materials required for this projects are winding wire, motor case, stamping, aluminum casting for body and cover, ball bearings, MS shaft, Super enameled copper wire, Blade assembly, frame mounting, capacitors, insulation materials, hardware, etc.

## **6. MANUFACTURING PROCESS:**

The steps for manufacturing exhaust fans are: The body casting is machined as per design. The stator core and rotor winding is then carried out and assembled in the casing. The blades/vanes are fixed on the shaft. The unit is tested for performance and quality and packed. Standalone fans are usually powered by electric motors, often attached directly to the motor's output with no gears or belts. The motor is either hidden in the fan's center hub or extends behind it. For big industrial fans, three-phase asynchronous motors are commonly used, placed near the fan and driving it through a belt and pulleys. Smaller fans are often powered by shaded pole AC motors, or brushed or brushless DC motors. AC-powered fans usually use mains voltage, while DC-powered fans use low voltage, typically 24, 12, or 5 V. Cooling fans for computer equipment always use brush less DC motors, which generate much less electromagnetic interference than other types. In machines with a rotating part, the fan is often connected to it rather than being powered separately. This is commonly seen in motor vehicles with internal combustion engines, where the fan is connected to the drive shaft directly or through a belt and pulleys. A common configuration is a dual-shaft motor, where one end of the shaft drives a mechanism, while the other has a fan mounted on it to cool the motor itself. Window air conditioners commonly use a dual-shaft fan to operate separate blowers for the interior and exterior parts of the device. Where electrical power or rotating parts are not available, fans may be drive by other methods. High-pressure gases such as steam can be used to drive a small turbine, and high-pressure liquids can be used to drive a peloton wheel, which can provide the rotational drive for a fan. Large, slow-moving energy sources such as a flowing river can also power a fan using a water wheel and a train of gears or pulleys.

## 7. MANPOWER REQUIREMENT:

Sr. No.	Designation Of Employees	Salary Per Person	Monthly Salary ₹	Number of employees required				
				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	36000	3	3	3	4	4
3	Helpers	10,000	100000	10	10	10	12	12
4	Admin Manager	15,000	30000	2	2	2	2	2
5	Accounts/Stores Assistant	12,500	50000	4	4	4	5	5
6	Office Boy	9,000	27000	3	3	3	3	3
	Total		261000	27	27	27	32	32

## 8. IMPLEMENTATION SCHEDULE:

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

Sr. No.	Activity	Time Required ( <i>in months</i> )
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 ( <i>some activities shall run concurrently</i> )	4.00

## 9. COST OF PROJECT:

The project shall cost ₹ 65.80 lacs as detailed below:

Sr. No.	Particulars	₹ in Lacs
1	Land 1000 sq.Mtr @ 1000	10.00
2	Building	15.00
3	Plant & Machinery	12.00
4	Furniture, Electrical Installations	3.00
5	Other Assets including Preliminary / Pre-operative expenses	1.80
6	Margin for Working Capital	24.00
	<b>Total</b>	<b>65.80</b>

## 10. MEANS OF FINANCE:

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

Sr. No.	Particulars	₹ in Lacs
1	Promoter's contribution	16.45
2	Bank Finance	49.35
	<b>Total</b>	<b>65.80</b>

## 11. WORKING CAPITAL CALCULATION:

Sr. No.	Particulars	Gross Amt	Margin %	Margin Amt	Bank Finance
1	Inventories	12.00	0.25	3.00	9.00
2	Receivables	6.00	0.25	1.50	4.50
3	Overheads	6.00	100%	6.00	0.00
4	Creditors	-		0.00	0.00
	<b>Total</b>	24.00		10.50	13.50

## 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 Acetylene Cylinder with accessories.

A detail of important machinery is given below: Power Requirement: 40 HP

Sr. No.	Particulars	UOM	Qty	Rate ( ₹ )	Value ( ₹ in Lacs)
	<b>Plant &amp; Machinery / Equipments</b>				
<b>a)</b>	<b>Main Machinery</b>				
i.	Cnc Lathe Machining	NOS.	1	700000	7.00
	And Accessories				
ii.	Motor Winding & Assembling	Nos	1	125000	1.25
iii.	Other Machineries	Nos	1	150000	1.50
<b>IV</b>	Installation, Erection And Electrification			100,000	1.00
V	Taxes, Transportation			125000	1.25
	<i>Sub-Total Plant &amp; Machinery</i>				<b>12.00</b>
	<b>Furniture / Electrical Installations</b>				
a)	Office Furniture	LS	1	100000	1.00
b)	Stores Cupboards	LS	1	100,000	1.00
c)	Computer & Printer	L. S.	1	100000	1.00
	<i>Sub Total</i>				<b>3.00</b>
	<b>Other Assets</b>				
a)	Preliminary And Preoperative				1.80
	<i>Sub-Total Other Assets</i>				1.80
	<b>Total</b>				<b>16.80</b>

### 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	<b>Net Profit before tax</b>	₹. In Lacs	<b>-53.85</b>	<b>-33.23</b>	<b>-12.83</b>	<b>2.23</b>	<b>10.36</b>

### 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	$BEP = FC/(SR-VC) \times 100 =$	% of capacity	42.37%