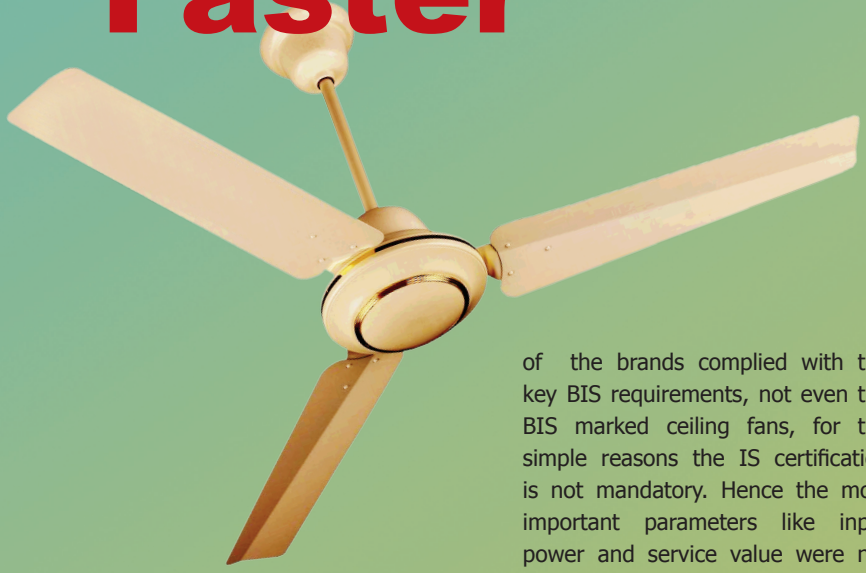
Ceiling Fans: Revolving Faster

In our previous study, two manufacturers decided to provide energy efficient fans consuming around 50 watts, delivering the minimum required air for thermal comfort and with the Input Power reduced by 15 % to 20%. The introduction of such fans as well super efficient fans will lead to massive power saving in consumer bills.



Manufacturer's Name	Model	Rank
ORTEM	Winner	1
KHAITAN	ECR	2
RELAXO		3
ORIENT	PSPO Summer King	4
USHA	ACE-EX	5
CROMPTON GREAVES	Cool Breeze	6
Bajaj	Bahar	7
Havells	Pacer	8
MMI	Sweep	9
Elpar		10

We conducted a comparative lab test of 1400 mm (56") ceiling fan of regular models category. Testing the fans mainly focussed on three parameters: safety, performance and energy. An earlier comparative testing study done by *Consumer VOICE* for regular most selling size (1200 mm size) of ceiling fans revealed that except two brands, all fans consumed much higher energy power and gave less service value (air-delivery/watt) than the minimum values specified in the Indian Standard.

A decade later we find that 1400mm fans are also under-performing. We found that none of the brands complied with the key BIS requirements, not even the BIS marked ceiling fans, for the simple reasons the IS certification is not mandatory. Hence the most important parameters like input power and service value were not complied by any brand. However all the fans were found to be safe to use in terms of mechanical and electrical safety.

Ceiling fan is an essential appliance in every home and fans are finding place even in the homes of the poor also having electricity connections. Now fans are used at full speed and through out the day and ceiling fans are now an insignificant member in the electric appliances that populate consumer homes.

Why did we choose 1400mm size?

The choice for 1400 mm is generally for the larger size(wider) rooms of more than 100 sq. ft. in area. The testing has been limited to this 1400 mm (56") size with 3 blades regular models and non decorative fans (VOICE has already conducted comparative testing of 1200 mm sizes, the largest selling category in India). *Consumer VOICE* test findings will be shared with BEE to bring this second most selling category also into its energy labelling program. Another objective of selecting 1400mm size fan was to understand the overall performance including Air Delivery, Input Power, Service Value, Safety and mechanical Strength to give consumers an informed choice in this product of daily use .

How we tested?

VOICE carried out testing on regular selling 10 brands in India.

Ceiling Fans' Energy & Economy Performance (w.r.t BIS requirements of 60 W maximum)*

Brand & model	Air delivery (in M.cube /min.)	Service value (Air Delivery/ Power Input)	Input Power Consumption in Watts)	Electricity bill# in a year (in ₹)	You over-spend every year w.r.t Energy Efficient Fans (in ₹)
KHAITAN	268.9	3.73	72.0	2129	355
RELAXO	246.4	3.34	73.7	2179	405
HAVELLS	247.6	3.31	74.6	2206	432
USHA	251	3.35	74.9	2214	440
CROMPTION GREAVES	252.4	3.16	79.8	2359	585
BAJAJ	246.9	3.08	80	2365	591
MMI	250.7	3.05	82	2424	650
ORIENT	258.9	3.11	83	2454	680
ORTEM	289.2	3.45	83.8	2478	704
ELPAR	275.8	2.89	95.2	2815	1041
* E. Efficient fan	245	4.1	60	1774	000.00

Note: Khaitan good buy from the above brands & models. Elpar not recommended. * 18 hours per day use

The test programme followed IS : 374 – 1979 (Electric Ceiling Type Fans & Regulators) with its latest amendments. The comparative testing covers mainly the air delivery, service value, fan revolution, power consumption, electrical and mechanical safety & some physical tests like silent operation, net weight, design etc.

Key Findings

- Ortem performed on the top.
- Khaitan is an intelligent buy as it scored highest in key performance tests viz Input Power and Service Value.
- Input power high in all brands.
- All the brands passed in Air Delivery test but Input Power is high. Ortem and Khaitan delivered the maximum air during the test.
- No brands were found to be energy efficient.
- Orient was the heaviest weighing 4.58 kg compared to Crompton Greaves weighing only 3.07 kg.
- No brand satisfied the minimum IS requirements for Input Power and Service Value.
- Only Relaxo – has the ISI Mark, and even it did not meet the BIS standards requirement in terms of Input Power & Service value.
- Companies no longer provide regulators along with ceiling fans as a package, thus making consumers pay extra for the regulators.
- Though the sample of Elpar was replaced, the second sample also did not function satisfactorily.

Comfortable but costly air delivery

Air delivery essentially defines the amount of air a fan delivers - a crucial parameter since it translates into how comfortable you feel sitting under a running fan, and if sufficient air is being delivered or not. Most of the brands could just score over the (revised) minimum air delivery, required for an energy efficient fan, which is 245m3/minute (previous BIS requirements being 270 m3/minutes). Brand Ortem (289.2 m3/min) scored the highest in this category, followed by Khaitan (268.9m.cube/min and Orient (258.9m.cube/min).

Power Consumption crossing the limits

The power input test defines the energy consumption of a fan. Indian standards lay down that the maximum 'power input' value of a ceiling fan (like the 1400mm fans we tested) should not exceed 60%W. All the brands crossed the limits as they consumed input power between 72 W to 83.8 W. Power consumption was the highest of Elpar at 95.2W followed

Fan: The Energy Efficient Variety

One may have seen the older versions of the ceiling fan, which were heavier and bigger in weight and size. Though they were bulky, one of their salient features was that they were largely energy efficient. Almost all of them met the BIS power input requirement. They were slower than the present-day ceiling fan variety in terms of Revolutions Per Minute (RPM). Now, fans are much lighter and have more RPM but this comes at the cost of higher energy consumption and increased wear and tear. In order to increase air delivery, economical power consumption has been compromised by manufacturers. This is an alarming development since the rest of the world is moving towards maximising energy efficiency. USA and Japan have initiated energy conservation reforms, resulting in saving of 6 to 9% of energy. In the Indian residential sector, fans appear to be the largest electricity end-use appliance. The use of energy-efficient motors, improved aerodynamics of blades and acceptable speed controllers can significantly bring down average power input to a fan.

by Orient at 83.8W. The lowest power input consumption was of Khaitan at 72 W.

Khaitan delivers the highest Service Value

In addition, none of the brands met the requirement of Service Value (Air delivery/Power input). Service value denotes the air delivery in metre cube/min divided by electrical power input to the fan in watts, at test voltage and at full speed. In simpler terms, service value means the amount of air delivery per minute per wattage of electricity. Khaitan scored the highest at 3.73 followed by Ortem at 3.45 and Usha at 3.35.

Not revolving on the BIS axis

We also investigated on the RPM (Revolution per minute) of the fans. Unfortunately fastest rotating fans also could not achieve the service value of 4.1 m^3/minute as the minimum limit of BIS. On the other hand, if the blade design & angle of cutting the air is appropriate even a lower RPM fan would deliver higher air output. The lowest RPM was of Khaitan.

Are the Ceiling Fans Power Guzzlers?

According to experts even if 10% to 30% saving in electrical energy can be realized by manufacturing fans with energy efficient motors, the total energy saving can be tremendous, as more than a million ceiling fans are sold every year in India - in 2010 itself 30 million ceiling fans were sold. The input power of ceiling fans is much higher ranging between 72 to 95.2 watts against BIS requirement of 60 watts max. This is just to achieve the required minimum air delivery of 245 mcube per minute. The increase in power consumption costs the consumer between 25% to 50%.

BIS Marking flouted

Surprisingly the revised BIS requirement, of service value, which was lowered from 4.3 to 4.1, was still not met by any of the fans even though one of them has BIS mark - Relaxo.

All brands followed safety rules with precision

We also conducted safety tests on all the ceiling fans as specified in the BIS specification. These test covered the electrical and mechanical safety. In the electrical safety test, we covered parameters namely Insulation Resistance, High Voltage Test, Effective Earthing connections, Leakage current, Creepage distance & clearance (in the fan motor assembly)

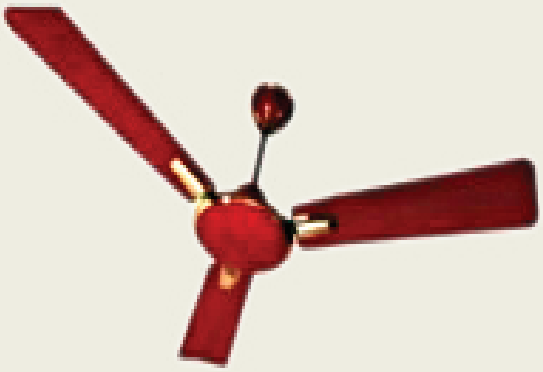
Sturdy and Safe Fan Regulators

Consumers have to pay extra to purchase a necessary accessory, namely the fan regulator. The plea taken by manufacturers for this additional cost for consumers is that this provides choice to consumers to purchase the kind of regulator most suited to their needs - namely instead of the bulkier, earlier models, consumers now have the choice to buy electronic fan regulators. This saves at least ₹ 60 - 100 for manufactures and allows them to show no price increase for consumers thus maintaining the earlier price range for the fan but minus the regulator. Thus the cost has actually been transferred to consumers for whom the package, ceiling fan plus regulator, is at least ₹ 60 - 100 costlier.

A regulator should be capable of reducing the speed of fan to at least 50 percent of full the speed at test voltage. As per manufacturers, now a day consumers do not use there supplied regulators and generally use switch/socket size electronic regulators. The choices need to be left with the consumers whether to buy fan with the Energy Efficient Regulator or without the cost deducted by retailer. Electronic fan regulators were supplied with fan.

Impact of *VOICE* study of recent years

Energy labelling program for 1200 mm ceiling has been implemented through a voluntary scheme of BEE, taking reference of *VOICE* findings, by which National, regional and local brands of ceiling fans have energy labelling and available in the markets.



etc. All the brands qualified to be electrically safe. In the mechanical safety, the test were conducted on fan suspension system particularly for clamp and down-rod where both should not break /snap after applying 1000 kg of torque. All the brand passed this test.

No worries of fan falling: Thankfully all the fans withstood the test of suspension system.

Other Observations at a glance

Elpar Noisy: Elpar was found to be the noisiest at 60 db, followed by CG and the least noisy was Havells.

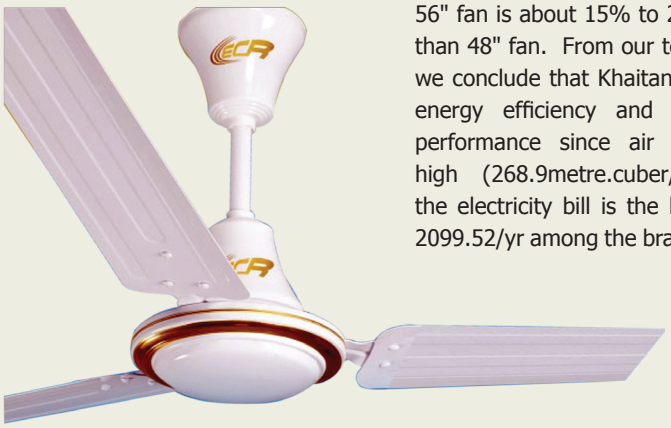
Overall Score

The highest Overall Grade was achieved by Ortem closely followed by Khaitan. Elpar, MMI, Bajaj, and Havells got lower scores comparatively. The higher score in terms of Energy (Input Power), Air Delivery and thus Service Value parameters was achieved by Khaitan followed by Ortem. Lowest score was in case of Elpar, MMI and Bajaj.

Indian manufacturers need to put in extra efforts, especially to reduce the Power input, improve Air delivery as well as Service value to reach a level of customer satisfaction.

Good Buy

A consumer buys a 56" fan for a large room, or for commercial purpose. A 56" variety eliminates the need of two fans in the room which is too big for a 48 " variety and too small to hold two fans. For those who use the 56" inch fan, the air does reach to a distance that a 48" inch fan cannot. However consumer hesitates to buy a bigger fan fearing the bill. The energy consumption of a 56" fan is about 15% to 20% higher than 48" fan. From our test findings we conclude that Khaitan has better energy efficiency and economical performance since air delivery is high (268.9metre.cuber/min) and the electricity bill is the lowest at ₹ 2099.52/yr among the brands tested.



We would also not recommend Elpar as its input power and electricity bills are the highest at 95.2 W and ₹ 2815 respectively besides lowest service value.

Conclusion

With advanced technology, the weight of ceiling fans have been brought down from about 10 kg to 3.0 kg, by changing the fan casing from iron to aluminium alloy. Also copper motor winding wire has reduced the weight of fan from 1 kg to less than 500 gms. Stamping (rotor /stator laminations) has also been reduced to 1/3rd of earlier fans. However the overall cutting down has impacted on the higher power consumption raising it from 72W to 95 watts.

Energy Efficiency Tips for Cooling Your House

- Close windows and doors during hot days and open them at night.
- Close drapes and shades during hot days.
- Reduce use of oven, incandescent light and appliances that generate heat, near bedroom.
- Use ceiling fans to circulate air in individual rooms.

Comparative Performance Score of Ceiling fans (1400 mm Size)

Brand → / Parameters →	% wt.	Ortem	Khaitan	Relaxo	Orient	Usha	Crompton Greave	Bajaj	Havells	MMI	Elpar
Model →		Winner	ECR		PSPO Summer King	ACE-EX	Cool Breeze	BAHAR	Pacer	Sweep	
Retail Price/ MRP₹		1430/1445	1250/1408	1200/1260	1400/1642	1250/1450	1350/1530	1312/1370	1733/1905	1150/1238	1237/1295
Warranty , yrs		2	1	NM	2	1	2	2	2	NM	2
Performance Tests		**53.23**	**52.65**	**48.91**	**48.12**	**48.61**	**47.24**	**47.15**	**48.2**	**46.38**	**44.05**
Air delivery	20	20	16.28	12.23	14.48	13.07	13.31	12.33	12.46	13.01	16.99
Input Power	15	9.04	12	11.59	9.25	11.27	10.05	10	11.3	9.4	5.28
Service value	10	7.66	8.28	7.42	6.91	7.44	7.02	6.8	7.35	6.77	6.42
Starting & Running	5	5	5	5	5	5	5	5	5	5	5
RPM	5	2.43	2.11	3.45	3.88	2.76	3.26	3.79	2.98	3.13	2.76
Power Factor	5	5	5	5	5	5	5	5	5	5	5
Noise level , dB	5	4.1	3.98	4.22	3.6	4.07	3.6	4.23	4.11	4.07	2.6
Safety & General tests		**31.13**	**31.48**	**31.77**	**31.01**	**29.76**	**31.13**	**30.58**	**29.41**	**27.64**	**28.29**
Suspension System	5	5	5	5	5	5	5	5	5	5	5
Earthing connections	2	2	2	2	2	2	2	2	2	2	2
Temperature Rise	7	5.06	6.26	7	4.01	3.320	5.830	3.870	4.01	3.08	3.83
Creepage distance	1	1	1	1	1	1	1	1	1	1	1
High Voltage	3	3	3	3	3	3	3	3	3	3	3
Insulation Resistance	2	2	2	2	2	2	2	2	2	2	2
Leakage current	2	2	2	2	2	2	2	2	2	2	2
Mass of fan	5	4.07	3.72	3.77	5	3.94	3.35	4.21	3.52	3.61	4.46
Size of fan	1	1	1	1	1	1	0.95	1	0.88	0.95	1
Packing & Marking	7	6	5.5	5	6	6.5	6	6.5	6	5	4
Overall SCORE	**100**	**84.36**	**84.13**	**80.68**	**79.13**	**78.37**	**78.37**	**77.73**	**77.61**	**74.02**	**72.34**

Rating: >90 – Excellent *****, 71-90- Very Good ****, 51-70- Good ***, 31-50- Average **, upto 30 – Poor *-* NM Not Mentioned.

Service value: The air delivery divided by power input to the fan at specified voltage & frequency.