Climate Emergency

Mitigating carbon emissions with fans

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Fan-it's an invention that is perhaps not much talked about, or even appreciated much. Yet, it is one appliance that every Indian house has. And with the growing number of houses, the demand for fans is only going up. And this is one appliance which definitely has the potential to reduce the energy poverty in India.

Hi, this is Sharada Balasubramanian, and I am here with a podcast on energy efficient fans for Suno India's Climate Emergency podcast.

Here in Coimbatore, I headed to Versa Drives, one of the earliest companies in India that started making energy efficient fans- way back in 2012. I caught up with Sundar Muruganandham, the managing director of Versa Drives, that makes Super Fans. When you actually look at a Superfan, the logo S would remind you of the S from Superman. Well, that was exactly why this logo was chosen, said Sundar. And S here is for super efficiency. Let's hear from him on how fans evolved.

Host: So it'll be great if you can start telling me a little bit about the history of fans in India.

Sundar: Why India, I'll just generally like to tell you the history about ceiling fans themselves. We always have visiri here in Tamilnadu, where with palm leaves, we make that visiri and we get air. In the late 19th century, in the US, they invented ceiling fans when the motors were invented. So that was the first fan. In India, about 80 years ago, fans were introduced. There were companies in Calcutta that were manufacturing ceiling fans, those days, it was supposed to be a luxury item. Unfortunately, the Indian government still thinks it's a luxury item. So, ceiling fans attract the highest rate of taxes. Initially the ceiling fans were made to circulate air to the high roofs. In the olden days, the building construction itself had ventilation for hot air to move out and fresh air to come in. So at the time, where it was hot and humid, people were using ceiling fans when they could afford it. Basically you needed to have electricity. There are ceiling fans which are run using hot air or water using the turbine principles. But the electric ceiling fans are rarely the prevalent ones. The ceiling fans, then they made table fans, pedestal fans, wall fans.

When it was easy for people to get a loan and build their own homes, then came really the style of housing where the houses were too close by. So even the ventilation did not really like help, then ceiling fans are used in large numbers. So that's when the ceiling fan manufacturers brought

down the cost of the ceiling fan that anyone can afford. So today you can see whenever there is a new house built, whether there will be people in that room, ceiling fans are still being installed. Okay. Nowadays, people even install ceiling fans in the balcony, where it is supposed to be a natural raft of air. So that's ceiling fans history now.

Well, that's how fans came in. However, energy efficiency or performance wasn't really the concern back then.

Host: So can you tell us a little about the transition now like ceiling fans have already come in like, like you said, not just in India, but it's more popular everywhere right. So now this transition of energy efficient fan from ceiling fan to energy efficient fans, how did that transition sort of happen?

Sundar: When people started looking at energy efficiency, usually people who are looking at air conditioners, geysers. Those who are the ones consume a lot of power in a home. People never looked at ceiling fans, because that was supposed to be a low technology product. And the instant consumption of the ceiling fan is about 75 watts at the peak speed. That's for a 1200 mm span or a 48-inch span ceiling fan. So people never cared about, you know how much electricity the ceiling fan was consuming. But then in around 2006-07, there was a NGO called Prayas based in Pune. They conducted research and some of the numbers were very revealing.

At that time, they estimated that there were about 35 crores of ceiling fans in operation in India, so they saw a large scope though, the instant consumption of ceiling fan is only 75 watts but the ceiling fans operate for a long time. Like if you compare a geyser, the geysers are on only for a short time till the water gets heated up and, then the next day only they use it. Whereas ceiling fans, depending on the condition, prevailing in that home it could be really running for long hours. So by running long hours, ceiling fans also consume a considerable amount of electricity. One yard stick is, if you really like to look at cities like Chennai, where it's warm and humid, the ceiling fans should be always running at top speed. So, in that condition, the fan would run for about 13 hours consuming one unit of electricity. That's how the recent power consumption of ceiling fans was till BLDC technology was introduced.

Essentially, BLDC, or brushless DC is a technology that uses electronics in fans. These are not found in ordinary fans. In a fan, there is an induction motor- which has two components, stator and rotor. Both have to be energized for the fan to rotate. However, in the case of BLDC fans, permanent magnets are used. This eliminates the need to supply energy for the rotor. And that's how energy consumption is reduced.

Host: So, when this BLDC technology that we talk about, how does it sort of bring in energy efficiency, what are the dynamics? How is it different from a normal fan?

Sundar: The normal ceiling fans use single phase induction motors, the single phase induction motors are easy to construct, easy to manufacture, they're inexpensive also. And they can be

operated directly from the mains using just a capacitor. But all the advantages are nullified, looking at its efficiency that operates at about 35% efficiency. So, that gave us hope for really looking for alternatives. So, in 2010 Versa drives started looking at ways of improving the fan's efficiency. So the first thing we looked at was really the motors because that was our expertise motors and the motor drives. So, we saw that already abroad people are using brushless DC motors for ceiling fans, but they were very expensive. Typically, in the US a regular induction motor ceiling fan would cost about $50 whereas the BLDC ceiling fans would cost about $300 and above. So, that was a cost difference. So, we saw that yes, this technology was there, but then for Indian consumers it may not be affordable. So, we studied the technology, we made changes to it, adapted to the Indian condition. And we developed the first BLDC ceiling fan for the Indian market.

So, that's how energy efficient fans are different from normal fans. When it comes to energy consumption, here's a fact-for every one unit of electricity saved, 600 grams of carbon emission is saved.

For Auroville, a community that is into sustainability, Superfans did make a lot of sense. I spoke to Toine van Megen, Co-Founder of Auroville Consulting on super-efficient fans in their community.

Toine: We were always on the lookout for energy efficient equipment. We came to know somehow that this fan was available. We have a unit in our office called Sunlit Future. It is our department that takes care of the solar installations. They purchased some Super fans and installed them inside our building. We monitored them very closely, we took measurements. We checked if the claims were really happening. When we make a new building, we don't consider any other fan but a super efficient fan. We checked if the consumption they claimed was actually happening, so we put energy metre on the fan and we checked them and we found that they were performing as per the marketing documentation. In my own house I tested them, connected kw metre and ran the super fan and compared it with regular fan and we could see that the energy consumption was drastically lower. Then we were convinced that it is a very good product.

The fans were energy efficient, no doubt. However, for a consumer the larger concern was the cost. While talking to Sundar, I also tried to figure out why these fans are more expensive than normal fans. Also, how people could actually save money with a slash in their electricity bills. And how that could be a winning point with the consumers.

Sundar: The BLDC fans are more expensive for two reasons. One is magnets. The second one is unlike the induction motor, which can be started and run using a capacitor, the BLDC fans need electronic drive. The electronic drive is expensive. It has a microprocessor and software built into it. So that makes it really expensive.

And then, they had other challenges too.

Sundar: So what we looked at was first, when we developed the first BLDC motor base ceiling fan, the efficiency was quite high, we were able to save about 56% of electricity at the top speed. Then we looked at the market, we started seeing what are the other problems that are there with the regular ceiling fans. When we were working on it, Tamil Nadu went through a bad patch in electric electricity supply, there were power cuts of 10 to 12 hours per day, even in the cities. We saw during that time that the supply voltage was very low at the time the induction motor based fans even did not start or they would run at very slow speeds. You would set it at a top speed, but then it would run at lowest speed or it won't run at all. So we decided that the BLDC ceiling fan we made incidentally, we named it as super fan for super efficient ceiling fan.

And while they were developing a super-efficient fan, the company also looked at how fans could be convenient, user friendly, and deliver stable air flow. And here's what they introduced for convenience- fans with remote.

Sundar: So when we designed Superfan, we had one criteria that fans should run from very low voltage to very high voltage, because in India, there is a possibility that the voltages could go to 300. So the normal voltage is 230. So we first did that. And when we did that, we also realized that in the early mornings, the regular fans would run very fast. Typically, the industries are shut down at the time the voltage goes above 230 volts, and they run very fast. That's the time people want they are in deep sleep, they want no disturbance at all. In the winter season, the fan could be running fast and there is always a question of okay, if there are a couple who would really get up and change the fan speed.

So, that actually showed that there are two problems there. One is when the supply voltage varies, the speed also changes. So we needed to arrest that. And then who would really like to get up and change the speed or turn off the fan. So, for the first problem, we incorporated some circuits where, irrespective of the supply voltage, even if it fluctuates, whatever speed is set by the user, it would stick to it, it will run at that speed. So we achieved that, then, in spite of that, if you really needed to change the speed, then we introduced remote control. Since there is a microprocessor involved in that electronic drive for the BLDC motor, we are able to incorporate these features.

So the thought for the given price increase, we can solve the issues in the existing fans and compensate the user apart from the money he would save from the electricity bill, we wanted to make the product user friendly. We wanted to make it a great experience for the user to use Superfan. So we looked at the overall product, we did not look at only the energy efficiency.

Host: So now you said that almost 56% of energy, electricity can be saved with energy efficient fans and so on. Is there any research and development that's happening here, which looks at any sort of increasing that efficiency or how what kind of technology can achieve that?

Sundar: Yeah, so we actually brought the energy consumption from 75 watts to 35 watts, without compromising on the air flow.

When the product was launched, yes, a potential was noticed. But, large fan manufacturers were not took keen. For a simple reason, that they had to revamp the existing system. For consumers, cost was an issue. They had to pay more for this fan, and they prefered to have a low initial investment. While all this was happening, the government opened up the fan market. That market was about three to 4 million fans per year.

They got fans for PSUs- the railways and other such enterprises. After that, large manufacturers jumped in. In the last eight years, hospitals, educational institutions, railways turned to super efficient fans.

In the meanwhile, Versa Drives looked at how efficiency could be increased further. Well, with electronics, they had touched maximum efficiency. When they thought what next..they started looking at blades...

It's then when they across a design from University of Central Florida. And they licensed this technology. For this technology, they needed plastic material- that would add to further cost, so the innovators developed an intermediate technique. That would not push the cost too much, but increase the energy efficiency by 12-15%. So, from 35, they are looking at 25 watts.

To reach to an individual consumer was a larger challenge. Well, that changed too. Recently, BIS and BEE introduced new efficiency standards. BEE was more involved in this process- they started advertising, promoting- just the way they did for LED lights. And slowly, the individual consumers started coming in. Let me tell you, this standard, originally, was created in 1978. Though there were some changes here and there, the major change happened only last year when BLDC fans came into the mainstream segment of the fan industry.

Today, large manufacturers have BLDC fans in their portfolio and now it's widespread in the

market.

Host: When we talk about energy efficiency, again, fans, this is something which only picked momentum in the last maybe six or seven years, maybe like when we talk about energy efficiency means look looking and we've been ignoring facts for a long time. So how do you think it can actually contribute to India's one of the SDGs right, like the Sustainable Development Goals? How fan could be a game changer in that, because India is also committed to all these goals. So if we promote energy efficiency fans, how do you think the connection between that could be established?

Sundar: Yeah, India is one of our largest consumers of ceiling fans. In 2019, about four crore ceiling fans were made and sold. So that's a huge number. So if you think about all those fans at about average consumption of 75 watts. And then now if the technology can change, and then if all the fans would be made as BLDC ceiling fans, then you see a huge savings in electricity for the government because of the higher price they would get higher tax income, which they are all asking them to really like reduce their taxes and give it back to the consumer.

With an 18 percent GST, fans are under one of the highest tax slabs. The company has been requesting the government to consider tax reduction to offset the fan price. When we compare a regular fan with a BLDC fan, at top speed, a regular fan would consume one unit of electricity and run for 13 hours. The BLDC fans run for 29 hours, delivering the same amount of air. And when the speed lowers, energy consumption lowers too. So, savings is higher.

And here's what Sundar said. Instead of building new power plans, the government could promote BLDC fans. The money that would go into building a new setup, could be used to incentivize consumers for buying energy efficient fans by reducing the prices of these fans.

And when it comes to sustainable development goals, Toine told me how it makes sense to have energy efficient fans if there are solar panels in your house.

Toine: In the case of solar, why it makes additional sense? You have already planned and calculated the solar capacity to take care of the building. Instead of normal light and fan, if you use an energy efficient fan and energy efficient light, then the size of the solar system can be smaller. In those cases, the payback is typically a minute. You save significantly on solar panels and the battery capacity, when it works on a battery system. So I would say it would make more sense in any case, especially more when you go for solar because you need less solar, as simple as that. The number of panels, and the systems that work in standalone mode. In a standalone system, at night, the system depends on the battery, if you use energy efficient fans, it consumes less power and the battery runs longer. You can ride through a more cloudy day, through a longer night, with the same battery capacity.

This did make sense. In rural India, where solar panels are used for electrification, energy efficient fans did have the potential to reduce energy demand. Sundar says more.

Sundar: That's one of the segments where this BLDC based ceiling fans are used. Government is promoting low cost rural housing for which they don't provide grid from the electricity, like each home is provided with 50 watts or 75 watts or hundred watts or 100 watts panels. So we developed special ceiling fans for this segment, where within that 50 watts, people could afford three LED lamps, one small TV and one ceiling fan. So the ceiling fans we provided were consuming anywhere from 15 watts to 21 watts, depending on the specification of that house.

I also spoke to R Mahendran, who has been working in the research and development wing of Versa Drives. He talks about how there is a shift in the mindset of people with more awareness.

Mahendran: Change is there actually, when we launched the fan in 2012 at that time, awareness was not much because generally people ceiling fan is concerned people want at they will see that have the flow, they are not bothered about power consumption at the time. So after introducing Superfan people came to know that this kind of fan is there. So, at the time it was difficult for us to convince the people. So, after two to three years, I think so, then people realized that, they changed. Now, it is almost about eight years. They realize the benefit of energy efficiency. So within two years they can pay the payback period. So they realized within two years. And one more thing is now that energy auditors are there, they're creating awareness among the people and among large institutions. And we are also creating awareness among that feisty ceiling fans. So, in that way, people are aware of this energy efficiency.

In 2019, the Indian government introduced India Cooling Action Plan, or ICAP. It was specifically aimed at bringing in energy efficiency in cooling systems -essentially those substances that cause ozone layer depletion. For instance, say hydroflouro carbons or HFCs that are in refrigerators or airconditioners. The MOEFCC's Ozone Cell—now has a task to phase down those substances that impact the ozone layer. The government along with its stakeholders, including partners like the Bureau of Energy efficiency formed a committee to work on this. One of the aims of this committee is to reduce cooling energy requirements by 25% to 40% by 2037-38. And fans would also be a part of this. And this hopefully, should give an impetus in promoting energy efficient fans to the masses.

Also, when larger companies like Crompton or Havels steps in, and promotes energy efficient fans, there can be a change. However, even for these companies, an incentive is needed to do this. Of course, today, these companies do have a segment selling super efficient fans- but the point here is the volumes of such fans are low. A major change can happen, when their most selling fans

would be replaced by energy efficient fans.

Well, the companies are going to find the technology expensive. So, some effort from the government to incentivize the manufacturers to do this would help. I also spoke to Maheshwari Krishnasamy, the Director of Versa Drives. From a long time, she has been talking to the Bureau of Energy Efficiency and the Bureau of Indian Standards to improve testing standards. Also, with BEE, she has been trying hard to push for better star rating systems- more like giving super efficient fans the rating that they deserve in the market. And now, after many years of struggle and push, some change is visible. From 2013, to 2019, it took six years to even bring a voluntary labeling scheme in fans.

Beyond all this, there is one question I was waiting to get an answer to. How could fans come under the category of luxury goods. Also how is a high GST for fans justified, considering that it's not a luxury good?

Maheshwari: After six years or after four years, when the One Nation One Tax system came in, at the time, it was shocking, because they brought this ceiling fan under the category of luxury items. But there should be a clear approach or goal to make things easy for a common man MSMEs because many times good solutions are arriving out of MSMEs, small industries, medium industries only able to do lot of innovative things, creative things. So that support has to be there, they should be able to get through with things quickly. Someone has to do real work on how to really make sure that India is a manufacturing hub. Otherwise companies like us can keep finding innovative solutions, creative solutions, and we all put our brains, something good will come out. But big things won't happen.

If you look at the electronic appliances, you would see star rating on the product- be it refrigerators, airconditioners. More the star, better the energy savings. So, essentially a five star rated appliance reduces energy consumption and saves your electricity bill. In fans too, Bureau of Energy Efficiency had brought in a more robust rating system. But as of now, it is only voluntary, and not mandatory.

From voluntary labelling, there was a thrust to bring in mandatory labelling, but Covid 19 has pushed this too. The company has been pushing towards a more efficient rating system, and after almost seven years, there is a change. So, what has changed? There is something called service value in fans. In simple words it means, the air delivered for every watt of energy consumed. Earlier, all the fans that had service value less than four or four were under the five star category- but not anymore. Only if the service value is greater than 6, it would now be under five star. So, all the fans that were earlier in the five star category with lesser service value would now be one star. That was a big change that happened in the rating mechanism.

Host: So now the government is also looking at the Atma Nirbhar Bharat, right like make in

India and you know, trying to be more self-reliant and so how do you think this could be a good opportunity for you to I mean, not just the healthcare or the railways or the larger PSUs, but also at an individual level, at a consumer level do you think this would also kind of give a lot of impetus to a company which is Indian company, which is making fans like these. So how do you think that particular scheme would work in your favour?

Sundar: One of the things we observe is Indian consumers are now more forthcoming, they're looking for products that are loaded with features, which make their lives easier. So, sometimes now, it appears like whenever we go to the market segments, like PSUs, railways or hospitals, they are talking about energy consumption. Whereas now when we go to the consumers, the remote control, the speed not changing during fluctuation, those are the things that seem to really like attract the consumer. But still, when we mention about energy efficiency, that becomes the clincher at the time of purchase.

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