Case Study: Replacing AC Fans with EC Fans *for improved energy efficiency*

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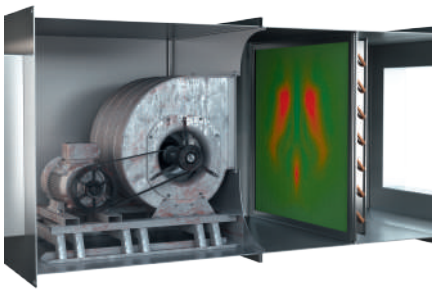
Project Introduction

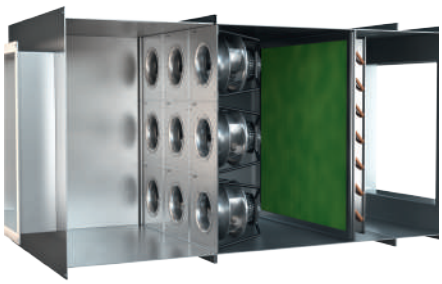
Situation: The client manages an **immense facility** in Singapore that is in **operation 24/7**. In order to safeguard the client's reputation of providing **high customer comfort,** the air-conditioning system must be **powerful** and **reliable**.

Problem: The 12-years-old AC ventilation system is **inefficient** and **requires regular maintainence**. The client wanted more **efficient** technologies that can help **reduce operation costs**.

Solution: The AC fans of 7 Air Handling Units (AHUs) were replaced with ebm-papst EC fans. The AHUs supply cold air to chiller plant rooms and high transit areas. It takes roughly **one day for each AHU replacement**.

Replacement: AC Fan to EC fans (Based on 1 AHU)





Factor	Conventional System	ebm-papst FanGrid Solution
Type of Motor	Alternating Current (AC)	Electronically Commutated (EC)
Number of Fans	1	5
Fan Type	Belt-driven AC Fan	EC Fan (No belt); Integrated System
Maintainence Required	Regular	Minimum
Operational Redundancy***	No	Yes
Energy Used (kWh)	27	16
Approx Energy Savings	**40%**	

*** If the **single fan** in the AC system **breaks down,** the AHU will **no longer be able to operate** until the faulty component is repaired. This could be **inconvenient** to the facility managers and **uncomfortable** for the facility's visitors. In contrast, ebm-papst's FanGrid solution resolves this by having **multiple fans operating in parallel**. If one fan breaks down, the **speed of other fans will increase to bring the airflow back up** to the desired levels.

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Why are EC systems more efficient than AC systems?

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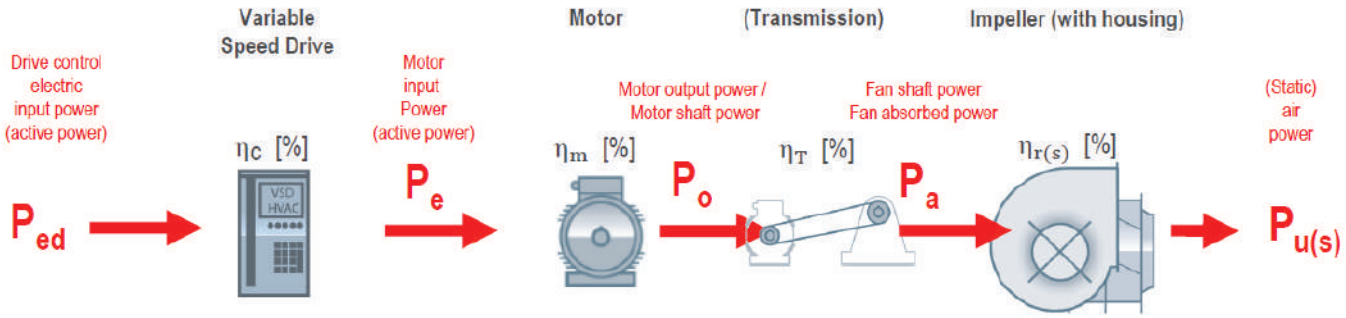
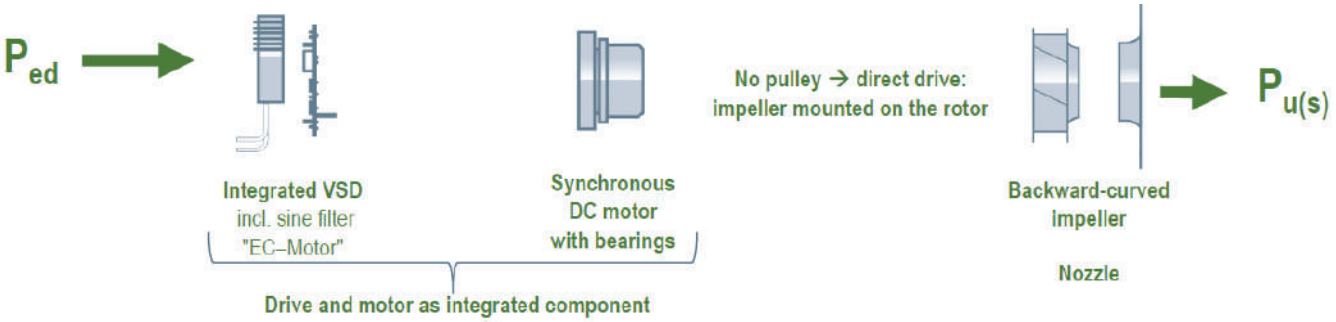
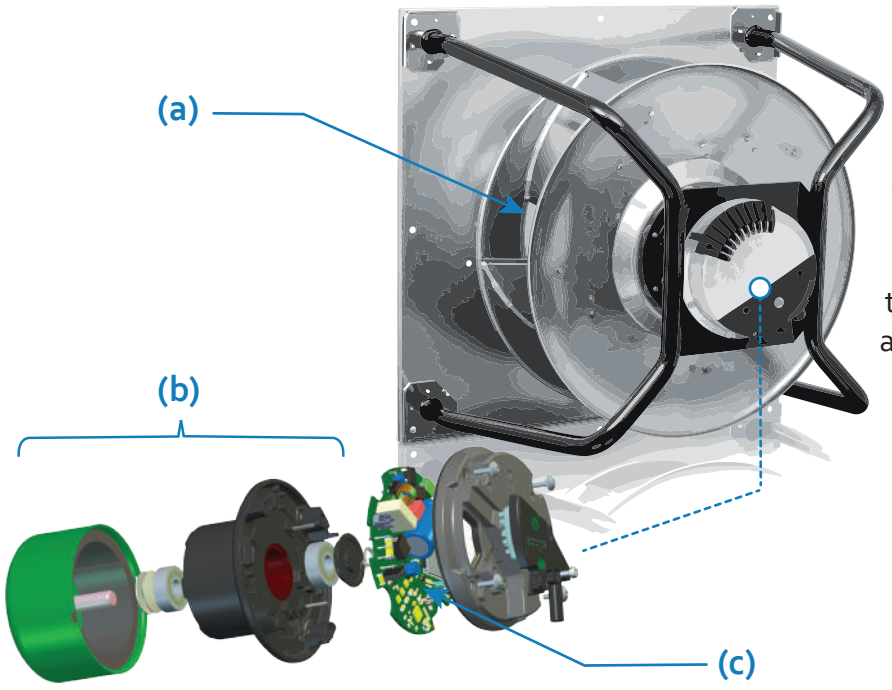
A conventional fan system is usually made up of several components (e.g. belts, pulleys, motors and etc). It is inefficient in moving air due to the **inherent losses** within each component.



In contrast, the ebm-papst EC direct drive FanGrid solution is provided as **a complete assembly**. There is minimal power loss with the integrated system.





The three critical components that make up a good fan are the (a) impeller, (b) motor and (c) electronics. Various enhancements made to each of these components pave the way to an incredibly efficient ventilation solution.

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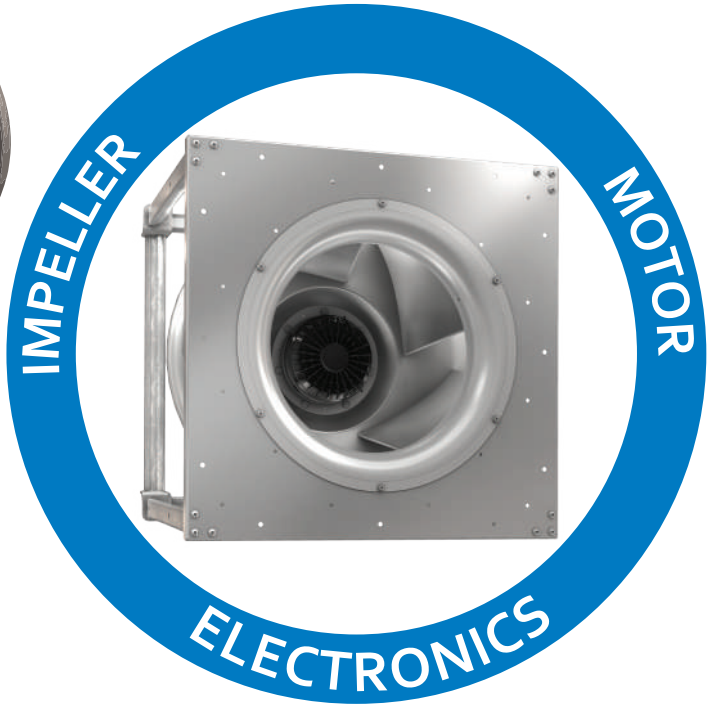
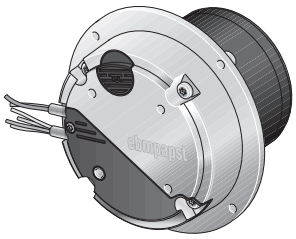
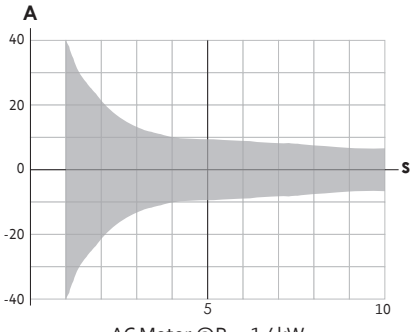
Improved **aerodynamics** imply **reduced turbulence** and **noise production.**

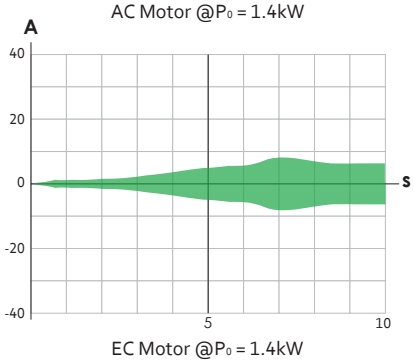


High efficiency of motor (including electronics) of up to **90%; Permanent Magnet Motor,** which is more efficient than an induction motor.





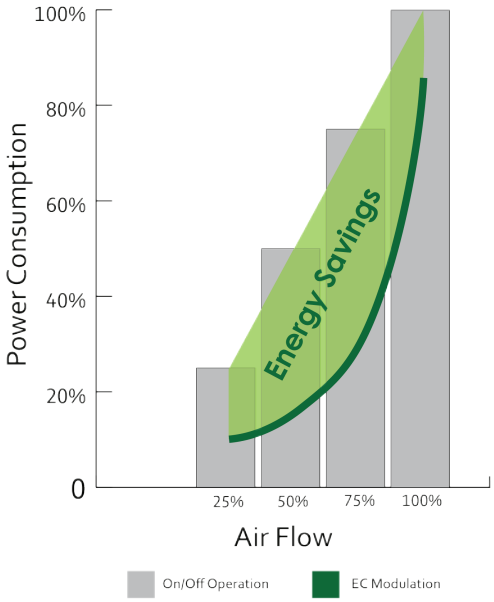
AC Motor @P_0 = 1.4kW



EC Motor @P_0 = 1.4kW

0 – 100% continuous speed control (Right): In AC motors, there are limited speed settings. This results in energy wastage. In contrast, EC motors can **regulate energy use based on the conditions of the environment,** resulting in high energy efficiency.

Soft-Start (Left): When switching an AC motor on, it reaches its peak power rating before tapering off to the desired power level. In contrast, for EC motors, a soft-start occurs before it elevates to the desired power level.



EC fans have **high efficiency over a wide operating point** because the **integrated components are optimised for each other**. AC fans are not able to replicate this.

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