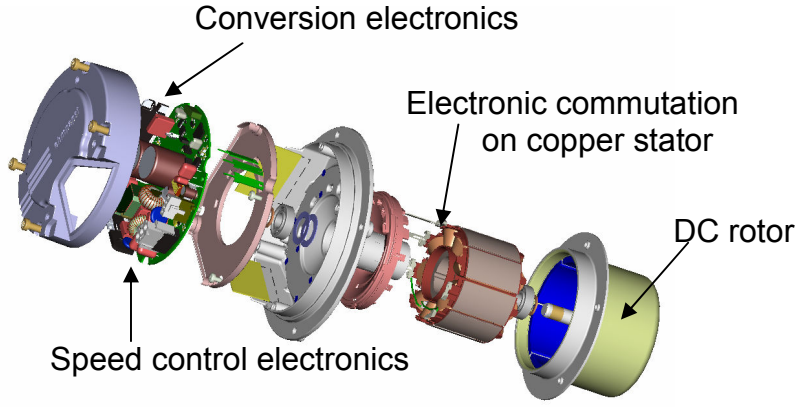
EC fans and motors give simple speed control

In 2003 ebm-papst and Gert Haeussermann realised the first fully integrated EC high efficiency fan for ventilation purposes. Now 60% of ebm-papst globally turn over of 1.3b Euro is made up of high efficiency EC fans and motors.

DC motors and drives have been used in the automotive market for many years cooling radiators or actuating mechanical solutions. Traditional DC motors are inherently power efficient but commonly unreliable due to the carbon brush method of commutation. New Electronic commutation (EC) or EC technology has brought together high efficient DC motors with electrical commutation and integrated speed control, below, providing a greater than 90% motor efficiency motor. Due to the reduction in internal temperatures resultant of this efficiency increase life times can double in comparison to some AC, lower efficiency air movement products used in building service applications.



In the development of electronics to convert alternating current supply to direct current supply, many other features were made available. The two main features being:

Integrated PID Speed control – with the use of 0-10V or PWM supplies EC fans and motors can be controlled over 100% of their speed without the loss of efficiency.

Integrated communication protocols – RS485 connections allows remote site control and monitoring. This subsequently encourages both response based, proactive maintenance (i.e. a failing or aging system can be identified prior to failure and subsequent system failure) as well as fine tuning of equipment by remote site, dynamic balancing of building service systems.

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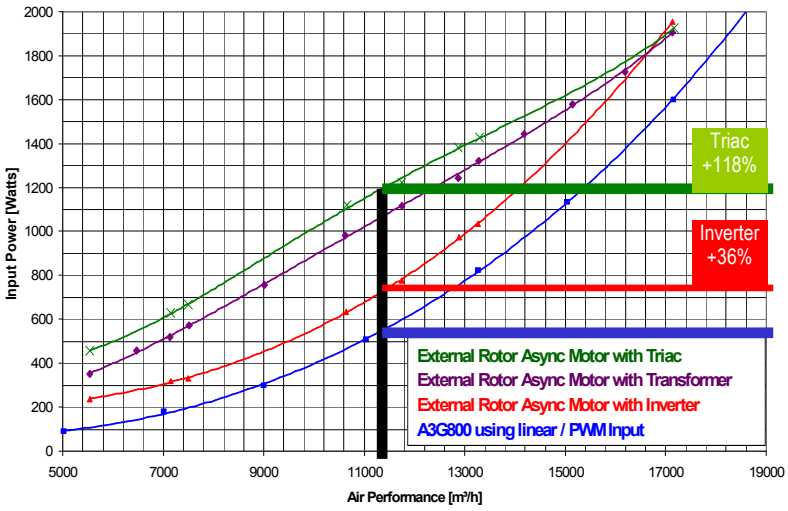
Speed control is the most significant variable allowing building users to reduce power consumption. According to fan laws, power consumption is proportional to speed to the power three i.e.

$$P_a = k.(n)^3$$

Where P_a = power absorbed [W]
K = control factor\
n = speed [rpm]

As shown below, a 20% reduction in air volume can approximately half power consumption: NOTE for a given system, air volume is proportional to speed. Here is shown the variation in “k” factor applicable with various speed control techniques



As can be seen, EC technology approached the theoretical third power relations set out by the fan laws and all other speed control techniques have inherent losses in their methodology. For instance at the same duty point inverter control techniques can typically absorb 36% more power than EC and similarly triac control systems consume 118% more.

Integration of EC systems into Modbus or other communication protocols is simple. RS485 outputs from EC fans is used to feedback speed and performance data as well as fault finding and fault history. This allows fine tuning of the fan systems to be achieved as well as performance monitoring for maintenance. This ensures peak system efficiency for the maximum time.

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