



ABB HVAC WEBINARS

Managing your specification for HVACR projects

Guidelines for developing reliable and efficient infrastructures

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ABB at a glance

Facts and figures

What

Offering



Products

Pioneering technology



Systems



Services & software

For whom

Customers

Buildings



Industry



Transport & infrastructure



Where

Geographies

Asia, Middle East and Africa



Globally



Americas



Europe

Revenue ~\$28 bn

Countries ~100

Employees ~110,000*

Agenda

- Why are we making specifications
- The perils of making technology driven specifications
- Applying requirements equally to all solutions
- Managing sustainability

Why are we making specifications

Specifications drive functionality of a building

Increased focus on technologies

Specifications secure that technical requirements are met.

Technical requirements stem from several sources:

- **Legal requirements**, such as the EU Directives for electrical safety and electromagnetic noise limitation
- **Indoor environment requirements** from the client and from local legal requirements
- **The relationships with surroundings**, such as sound attenuation towards the neighbors
- **Securing the ability to upgrade** the building in the future, such as linking to smart devices and city infrastructure
- **Utility requirements** to avoid penalties, ex. for excessive non-wattage power use



Many factors influence the specification, but needs should drive the specification

Specifying needs is complex

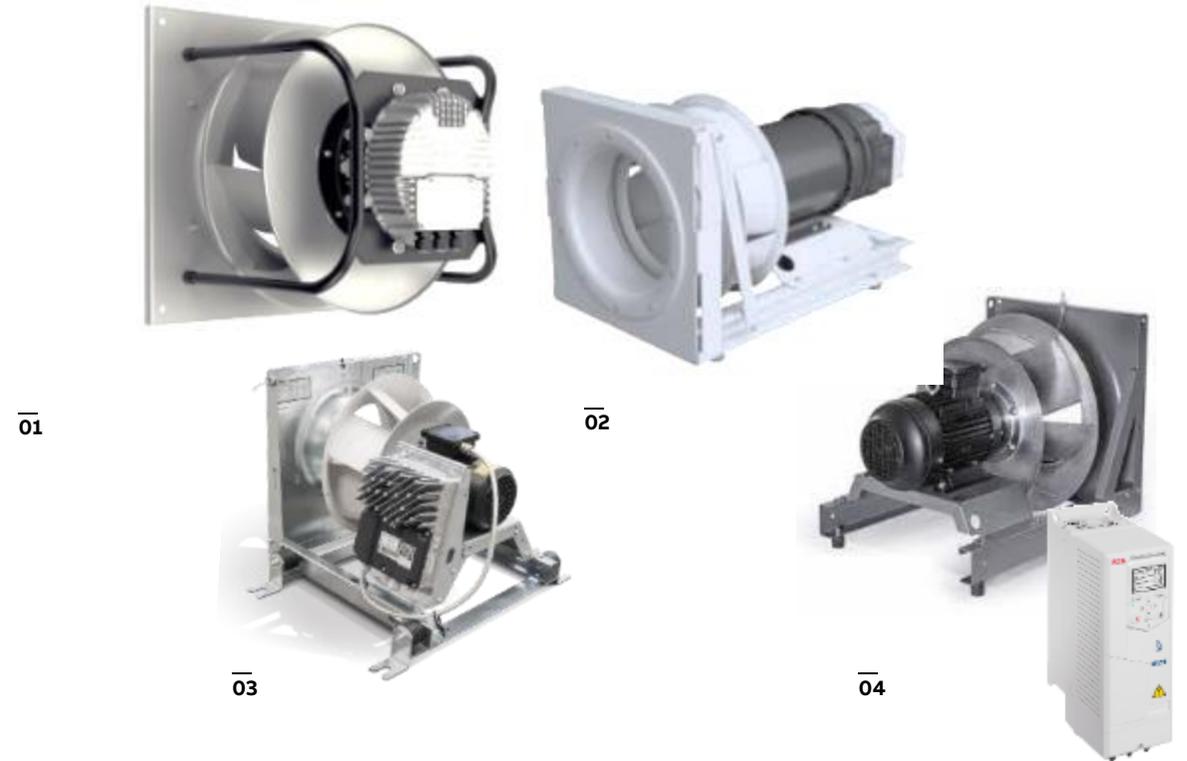
Needs change less than technologies, so it's worth the investment



The perils of making technology driven specifications

Specifying things, which are not specifiable

- EC motor means electronically commutated motor.
- EC essentially implies switching (commutating) the current to the motor electronically, which almost any variable speed control technology does.
- The EC fan name was brought to market by one manufacturer as a package branding and later became part of many mechanical specifications.
- Specifying EC fans in practice means that any variable speed technology can be applied – integrated, built on, standalone – see the examples on the right slide (all sold as EC solutions).
- There are many designs, and the actual efficiency varies a lot, as does the wire-to-air performance.
- But what was the intent of the specification really?

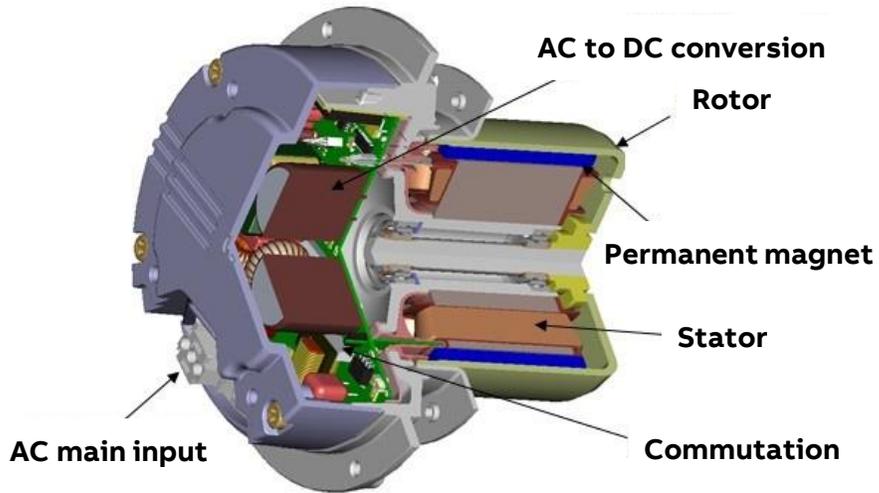


What you specify must have a unique meaning and always meet the intended requirement

What's inside

It might look like just a motor, but it's not

Is it really different?



EC motors have an AC/DC conversion with a rectifier built-in

- Rectifiers inherently cause distortion of the mains supply
- Depending on the rectifier and intermediate circuit design, the impact varies
- Specifications must include electrical noise requirements for all variable speed equipment

A commutation circuit is used to control the motor speed

- Most EC fan motors use custom brushless DC technology
- Standard drives can control any AC motor technology

When assumptions drive specifications to a technology

Assumption #1:

PM motors are efficient and specified without requirement for efficiency level.

Flaw: PM motors are available in IE2 through IE4.

Assumption #2:

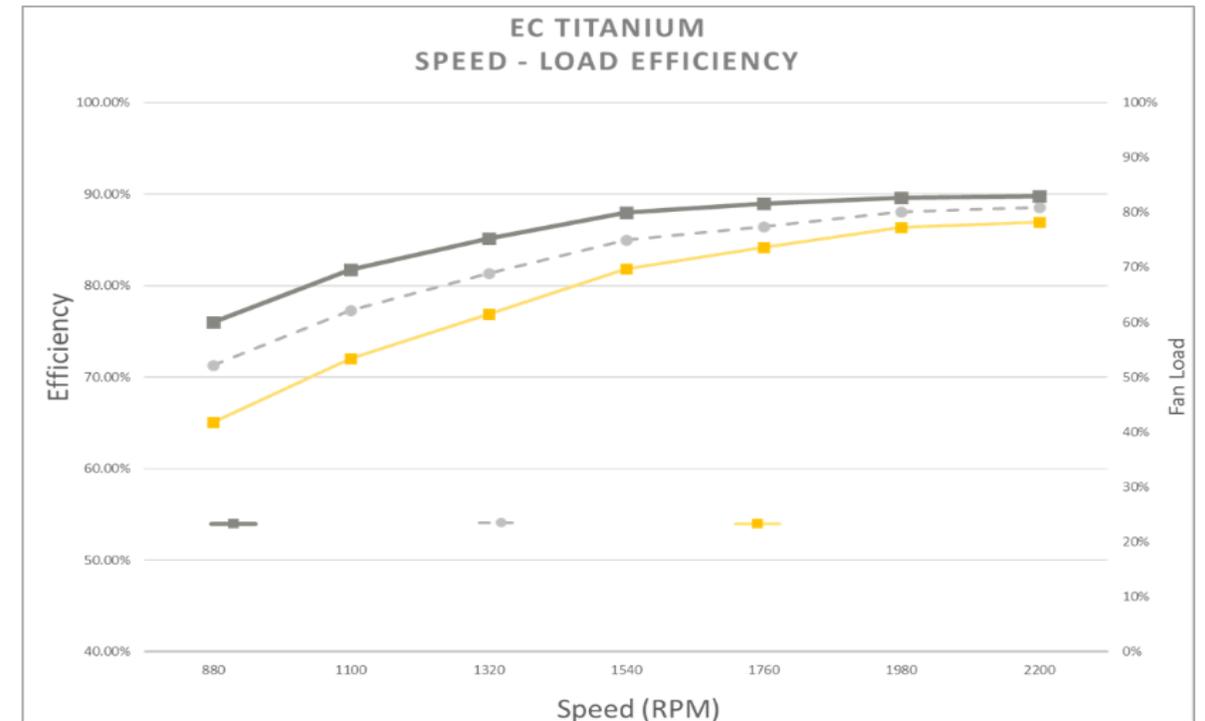
EC fans are state of the art and most efficient.

Flaw: EC fans can be with IE4 motors (but also exist with IE3). Other motor technologies allow you to reach IE5, which no known EC fan does today.

Assumption #3:

Specifying high efficiency on all components ensure the best performance.

Flaw: High levels of integration often causes flow issues and results in increased efficiency losses.



Specify the need, avoid making assumptions

Technology driven specification fail

Case: When a certain technology is specified, other technologies are not required to meet the specification.

Example: Specification for a “variable frequency drive” requires meeting THDi level of 10%. If EC fans are supplied, the above mentioned requirement does not apply – EC fans do not use variable frequency, but DC motor control. No specific requirements are set for EC fans or DC motor controllers.

Consequence: In a building with several AHUs and fan coil units, the THDv for the building will far exceed the threshold level. The worst case is the transformer fails due to overload, but likely the owner will be “just” charged extra for non-wattage power usage.



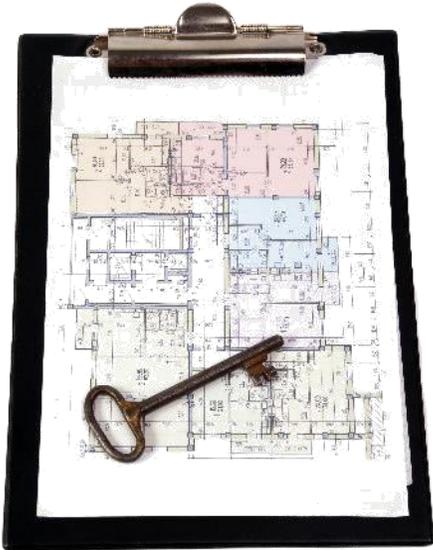
Writing specifications around technologies risk creating loop holes

Applying requirements equally to all solutions

The key to strong specifications

How to protect the requirements in the best way

Linking is key



- Most mechanical equipment supplied contains electronics for control.
- There's a substantial increase in HVAC OEM supply, which integrates variable speed and as such power electronics.
- HVAC equipment is specified in the mechanical package and often contains EC fans for AHUs.
- Requirements to variable speed drives are in the electrical package.
- Most specifications do not have an explicit link between the mechanical and electrical package.
- Securing that mechanical and electrical specifications are linked to each other is critical.

! Statement from a manufacturer about EC fans supplied to projects:

- ***“I’m not supplying drives, I’m supplying fans. There are no EMC requirements stated for fans!”***

What you need is what you should ask for

Moving to need based specifications

Do you really need it?



Focus on the actual need

Low energy consumption = energy usage over standardized load profile

Sustainable building = units must be repairable, ex. changing bearings in large motors or exchanging controls electronics

Future proof building = ability to upgrade hardware and software and add options, ex. wireless communication via 5G

Let manufacturers determine the best technical solution to the need of the building



Managing sustainability

Are our green buildings really green

Looking at the full life cycle



- Sustainability is essentially about the total environmental footprint.
- Specifying use of sustainably produced materials is easy.
- Focus on building energy consumption is quite widely applied.

But what about the serviceability and potential scrap in case of failures?

- The higher we integrate components, the more difficult it becomes to repair and the higher the scrap rate will be.

Which solutions are really the most sustainable?

Service

When sustainability and OPEX are overlooked

Drive + motor + fan

- Drive fails
 - can be replaced same day
 - no need to go inside AHU
- Motor fails
 - can be replaced the same day

EC motor (ECM) or integrated drive motor (IDM)

- EC motor: replace the whole package (motor and controller).
Lead time? Cost?
- IDM: drive and motor spare parts are frequently locked to a package supplier, but can often be replaced individually.
Lead time? Cost?

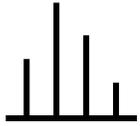
Sustainability is certainly an issue, when having to replace the whole package on any failure mode. How to quantify and specify this is still an open issue.





Summary

Specifying needs



Standard load profile

Specifying efficiency levels are tricky, but with setting a standard load profile, specific equipment energy usage can be compared.



Specify the need, not the technology

Specifying a technology is not a guarantee for meeting the needs, be it energy efficiency of system performance.



Let the manufacturer optimize for the need

Once all needs are met, the user will be happy, so leverage the development of technology and let manufacturers make the best technical proposal to meet the specified requirements.



Focus on need based specifications allow more sustainable specification

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Where to find the information?

Sources

- Global ABB HVACR web-page: <https://new.abb.com/drives/segments/hvac>
- ABB Data Center Cooling portal: <https://new.abb.com/data-centers/cooling-system>
- ABB ACH580 Drives: <https://new.abb.com/drives/low-voltage-ac/industry-specific-drives/ach580>
- ABB HVAC Motors (IEC): <https://new.abb.com/motors-generators/iec-low-voltage-motors/industries-applications/hvac>
- ABB HVAC Motors (NEMA): <https://new.abb.com/motors-generators/nema-low-voltage-ac-motors/hvac-motors/>
- EC Titanium Integrated Motor: <https://new.abb.com/motors-generators/nema-low-voltage-ac-motors/hvac-motors/ec-titanium-integrated-motor-drive> (also available for IEC market)

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