

4.3.6 Electric motor driven sub-systems³⁴

Electric motors are widely used in industry. Replacement by electrically efficient motors (EEMs) and variable speed drives (VSDs) is one of the easiest measures when considering energy efficiency. However, this should be done in the context of considering the whole system the motor sits in, otherwise there are risks of:

- losing the potential benefits of optimising the use and size of the systems, and subsequently optimising the motor drive requirements
- losing energy if a VSD is applied in the wrong context.

The key systems using electric motors are:

- compressed air (CAS, see Section 3.7)
- pumping (see Section 3.8)
- heating, ventilation and air conditioning (see Section 3.9)
- cooling (see the ICS BREF).

24.BAT is to optimise electric motors in the following order (see Section 3.6):

1. optimise the entire system the motor(s) is part of (e.g. cooling system, see Section 1.5.1)
2. then optimise the motor(s) in the system according to the newly-determined load requirements, by applying one or more of the techniques in Table 4.5, according to applicability

Driven system energy savings measure	Applicability	Section in this document ¹
SYSTEM INSTALLATION or REFURBISHMENT		
Using energy efficient motors (EEM)	Lifetime cost benefit	3.6.1
Proper motor sizing	Lifetime cost benefit	3.6.2
Installing variable speed drives (VSD)	Use of VSDs may be limited by security and safety requirements. According to load. Note in multi-machine systems with variable load systems (e.g. CAS) it may be optimal to use only one VSD motor	3.6.3
Installing high efficiency transmission/reducers	Lifetime cost benefit	3.6.4
Use: <ul style="list-style-type: none"> • direct coupling where possible • synchronous belts or cogged V-belts in place of V belts • helical gears in place of worm gears 	All	3.6.4
Energy efficient motor repair (EEMR) or replacement with an EEM	At time of repair	3.6.5
Rewinding: avoid rewinding and replace with an EEM, or use a certified rewinding contractor (EEMR)	At time of repair	3.6.6
Power quality control	Lifetime cost benefit	3.5
SYSTEM OPERATION and MAINTENANCE		
Lubrication, adjustments, tuning	All cases	2.9
Note ¹ : Cross-media effects, Applicability and Economics are given in Section 3.6.7		

Table 4.5: Electric motor techniques to improve energy efficiency

3. when the energy-using systems have been optimised, then optimise the remaining (non-optimised) motors according to Table 4.5 and criteria such as:
 - i. prioritising the remaining motors running more than 2000 hrs per year for replacement with EEMs
 - ii. electric motors driving a variable load operating at less than 50 % of capacity more than 20 % of their operating time, and operating for more than 2000 hours a year should be considered for equipping with variable speed drives.

³⁴ In this document 'system' is used to refer to a set of connected items or devices which operate together for a specific purpose, e.g. ventilation, CAS. See the discussion on system boundaries in Sections 1.3.5 and 1.5.1. These systems usually include motor sub-systems (or component systems).

