



Collective **inspiration**

Standards for **Energy Efficient Motors**

A Position Statement provided by
the Institution of **Engineering and
Technology**



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About This Position Statement

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As engineering and technology become increasingly interdisciplinary, global and inclusive, the Institution of Engineering and Technology reflects that progression and welcomes involvement from, and communication between, all sectors of science, engineering and technology.

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Cover illustration:

IE3 Premium efficiency level (per IEC 60034-30) motor
courtesy of Baldor Electric Company

Summary

The Institution of Engineering & Technology (IET) strongly believes in the need to enhance policy measures aimed at reducing the demand for energy and the resultant environmental impact. We therefore welcome the increased interest in energy conservation at both the UK and the EU level. We believe there is a strong case for putting in place mandatory EU-level standards for the energy efficiency of electric motors. The carbon savings from this measure have the potential to make a significant contribution to UK emissions targets, while raising efficiency standards in the global market.

The potential

Between 60 and 65% of all electrical energy used by industry in the developed world is converted back into mechanical energy in induction motors, and the average motor in use today has an efficiency of 88%. In UK terms, this means that if we were able to increase the average efficiency to a technically achievable 96%, we could achieve annual power savings in the order of 5TWh, which translate into over 2 MtCO₂ per year, or 0.5 MtC¹. That substantial savings in energy can be made by improving motor efficiency has been acknowledged by governments throughout the world. In North America, there is legal specification for a minimum permissible efficiency for each size and power rating of machine. Similar legislation exists (or comes into force shortly) in Australia, and even China has enacted legislation which will come into force in 2010.

The reality

In the EU we have had a 5-year voluntary agreement, which came into force in 1997, and has led to the introduction of efficiency bands and labelling: High efficiency (Eff1), Standard efficiency (Eff2), and Low efficiency (Eff3). The agreement was signed by 36 manufacturers, and the labelling scheme has been adopted and recognised even in non-EU countries. In addition, the signatories undertook to reduce the number of Eff3 motors sold in the EU. The relative numbers of motors sold in the EU by the signatories are as follows.

1997	Eff1 2%	Eff2 30%	Eff3 68%
2004	Eff1 7%	Eff2 85%	Eff3 8%

The energy savings in 2004 as a result of this market transformation are estimated at 4.25TWh². However:

- There are still many non-signatories who are selling low-efficiency motors into Europe at significant volumes (30% of the total EU market).
- The uptake of Eff1 motors is minimal, largely because they cost 20-30% more than Eff2 because they contain more active material. This, even though the pay-back time for the extra cost is usually reckoned in months, not years.
- The purchasers of motors are generally not the end users, who receive them embedded in other equipment. As a result, the energy cost savings do not benefit the purchaser, creating a split incentive similar to the landlord-tenant dilemma.
- The minimum efficiency which allows a motor to be labelled Eff1 is lower than the corresponding mandatory EPACT efficiency, and is lower than the 2010 Chinese standard (which is also mandatory).
- At least one major manufacturer who geared up all of his production for Eff1 has now switched back to Eff2 in order to stay competitive. This is a clear sign that the voluntary standards policy is failing in key aspects.

The IET's recommendation

Mandatory rather than voluntary minimum efficiency standards will be needed for key equipment items purchased in the EU in order to overcome these barriers. Motors represent an opportunity for large scale energy and emissions savings to be achieved cost-effectively, and with minimal 'pain' to equipment users and manufacturers. The examples of other markets where such measures have been introduced suggest that given enough warning, industry can plan ahead and adapt at little or no cost. The UK should use the opportunity of ongoing negotiations on the EU Energy Efficiency Action Plan to argue for the adoption of Community-wide mandatory standards for motors.

End Notes

¹ Based on electricity consumption by the industrial sector of 117.8TWh in 2004 (DTI Energy in Brief, July 2005), using the Energy Saving Trust's conversion factor of 0.43 kgCO₂/kWh for mains electricity.

² Figures presented by the chairman of CEMEP (the European Motor Manufacturers Association) at the 2005 Energy Efficiency in Motor Driven Systems Conference (EEMODS 05) in Heidelberg.