

Technology Fact Sheet for Mitigation

IX. High efficiency electric motors ⁱ

Introduction

High efficiency electric motors are normally 2-8% more efficient than normal or standard motors. The International Electrotechnical Commission (IEC) has introduced new standards related to energy efficient motors.

IEC/EN 60034-2-1 specifies new rules concerning efficiency testing methods and IEC 60034-30 defines new efficiency classes IE1, IE2 and IE3 for DOL (Direct-On-Line) motors. In addition, standard IEC/EN 60034-31 defines super premium efficiency class IE4 for both DOL and driven motors. These standards provide major energy and cost savings to industrial and commercial motor users, while helping to moderate the growth in the world's electricity demand. As of now IE3 is the highest efficiency class prevalent among the countries adopting IEC standards.

Technology characteristics

These motors are more efficient due to better construction quality and therefore have less windage loss, stator copper loss, rotor loss, iron and stray loss. IE efficiency class motors, as compared to the non IE motors available in the market, offer substantial savings in energy. For example, when IE3 motors are used the customers can save anywhere up to 10% depending on the frame sizes. The advantages of high efficient motors are:

- Optimum use of energy as operating losses is lower

- Efficiency figures remain constant up to 75% of the rated output and drop maximum by 1% at 50% rated output

- Reduced magnetic loss resulting in cooler applications

- Low life cycle cost

- Robust design to take care of wider supply variations ($\pm 10\%$) and ambient temperature up to 80°C.

Country specific applicability and potential

In industrial sector, 70-75% of energy is handled by motors with conservation potential of up to 25%. Bhutan has many iron and steel, ferro alloy and cement industries which have highest potential of energy efficient motors. Most of the electricity consumption goes into running motors. Old motors (10 year old or more) which are standard could be replaced with energy efficient motors. Motors which are rewound twice or more could be replaced with energy efficient motors. New motors that are purchased by industry should be minimum IE2.

Pilot audit can be done on specific industry to find overall energy reduction potential of energy efficient motors in these industry.

Status of technology in Bhutan

All major motor technology vendors provide energy efficient motors namely Siemens, ABB, Kirloskar etc. The Royal Government of Bhutan can adopt the energy efficient motors standards as adopted in India and globally to promote energy efficient motors.

Benefits to economic / social and environmental development

Energy efficient motors provide huge financial savings due to lower life cycle cost of energy efficient motors. Energy efficient motors, if promoted in industries, can generate business opportunities for individuals and business dealing in this technology, thus generating employment for people. In addition, energy efficient motors consume less energy, thereby bringing in substantial energy and associated cost savings.

Climate change mitigation benefits

Electricity savings will directly leads to CO₂ mitigation benefits.

Financial requirements and costs

The typical payback on above mentioned replacement should be less than 1-2 years but since cost of power is low in Bhutan it may go up to 3-4 years. If one analyzes the life cycle cost of these motors, 2-5% cost is generally purchase cost, 5 % maintenance costs and 90-92 % is running cost of motor. Purchase of Energy Efficient Motors requires more upfront costs but it usually recovered in less than 3-4 years.

ⁱ This fact sheet has been extracted from TNA Report – Technology Needs Assessment and Technology Action Plans For Climate Change Mitigation– Bhutan. You can access the complete report from the TNA project website <http://tech-action.org/>