One of the biggest challenges mankind is facing today is battling climate change. The effects are very real and very visible. The world’s energy demand is forecasted to surge by 37% by the year 2040. The bulk of it will be from countries driven with robust economic and demographic growth, such as India.

Based on International Energy Agency (IEA) estimates, energy efficiency is projected to contribute 51% of the cumulative abatement of energy-related emissions by the year 2035, significantly higher than the shift to alternative sources of energy.

Consider this: - Indian industries consume about 50% of the total commercial energy usage. - Energy intensive industries, like cement, textile, aluminum, paper & pulp, chloralkali, thermal power, railways, fertilizers, iron & steel, identified under the Perform Achieve & Trade (PAT) scheme of the Bureau of Energy Efficiency (BEE), consume about 65% of the total Indian industrial energy sector usage. - While electric motors and motor-driven systems alone consume 69% of the industrial electricity consumption.

Hence, it is a prudent decision to upgrade and adopt higher efficiency motors which in turn can increase energy and cost savings to the industry.

Motor efficiency Standards

Three-phase LT a.c. Induction motors are the most commonly used motors in industrial and commercial applications, having a share of 67% compared to other types of motors. In India, the Bureau of Indian Standards (BIS) defines the standards for energy efficient three-phase squirrel cage induction motors in Indian Standards (IS):12615: 2018. Since June 30, 2011, the industry started following the second revision of the IS:12615: 2011 standards based on the International Electrotechnical Commission’s (IEC) 60034-30 standards. In India, the Line operated three-phase a.c. motors are covered under IS 12615: 2018 by BIS, which is based on IEC 60034-30-1: 2014 issued by the International Electrotechnical Commission. This standard includes specifications for 3 phase motors of the following efficiency classes-

- High efficiency (IE2)
- Premium efficiency (IE3)
- Super-premium efficiency (IE4)
- Ultra Premium efficiency (IE5) [Proposed]

Acknowledging the need for energy saving given the
energy scarcity, climate change mitigations, and the potential that exists with energy efficient motors, a number of countries have issued directives to withdraw lower efficiency classes and adopt higher efficiency class motors as per IEC 60034-30-1: 2014 thus defining minimum efficiency performance standards (MEPS) in their countries. In India, there has been a shift from sub-standard and standard efficiency (IE1) motors to Higher Efficiency Motors (IE2 & above) primarily due to government’s ban on IE1 motors thereby making IE2 mandatory.

Internationally, forty-one countries representing 76% of the energy consumed by motor systems have worked to transform their regional and national markets towards higher efficiency motors and motor systems through a combination of regulatory measures and supporting policies. These countries include China, USA, EU28 (plus Norway, Switzerland and Turkey), Japan, South Korea, Brazil, Canada, Mexico, Saudi Arabia, Australia and New Zealand. Other countries, including Egypt and Indonesia, are working to develop such policies. The majority of these countries have adopted IE3 as MEPS.

The LT motor manufacturers are represented by members of Indian Electrical & Electronics Manufacturers’ Association (IEEMA), All India Motor Manufacturers Association (AIEMMA), Southern India Engineering Manufacturing Association (SIEMA). The IEEMA member companies contribute to approximately 75% of the market, while the balance is catered by non-IEEMA members, comprising mostly MSME motor manufacturers. As per IEEMA production statistics the LT motors market is around 16,000 MW for FY 2020.

Post notification of Quality control order for IS 12615, in 2017, the share of IE2 and IE3 motors have improved significantly, from IE1 and below efficiency motors. The market share of non-IE/IE1 motors has drastically declined from 56% in FY 2018, to a mere 8% in FY 2020, while the share of IE3 motors in the same period, has moved from 8% to 23% in MW terms, which has resulted in huge energy savings for industry and the nation.

Looking at the current trend of shifting towards IE3 motors and in line with global scenario of improving
the minimum efficiency of motors as a performance standard, it is imperative that the current MEPS be upgraded from IE2 to IE3.

There has been increased awareness created by motor manufacturers and organisations, like International Copper Association India, IEEMA, EESL, CII etc. through a number of initiatives on different platforms, to encourage the adoption of IE3 motors by the end users.

Manufacturing capability of Indian manufacturers

The BIS website indicates that a total 107 licenses have been issued for manufacturing motors as per IS 12615 in India. Of these, 60% of licenses have been issued for IE3 motors, which indicates that a significant number of manufacturers are capable of manufacturing these motors as per customer demand. It may be noted that these 60% of the manufacturers contribute more than 80% of the IE3 motors production capacity in India.

Minimum Eff. class IE3 in purchase specifications

Several industries have started specifying minimum IE3 motors as a part of their central procurement policy and specifications for all their new projects and replacement in their plants. End users like NTPC, SAIL, Mahindra & Mahindra, Tata Steel and ACC Cement, have procured a large number of IE3 motors. Even, consultants like EIL and Holetec, are specifying IE3 in their specifications.

National Motor Replacement Program

Industry is moving at a faster pace in adopting energy efficient technologies including premium efficiency motors, also due to government initiatives like the National motor replacement program (NMRP) and other policies and guidelines like the PAT scheme for energy intensive industries, with defined targets to reduce the energy consumption.

Energy Efficiency Services Ltd. (EESL) started NMRP in 2018 with an aim to transform the energy efficient motors market. NMRP, largely through its demand aggregation and ESCO model, has been able to provide innovative solutions to industry for buying IE3 motors either at a lower initial cost, or without any upfront cost to the user. The program has been able to create a large amount of awareness regarding the adoption of IE3 motors and their benefits for industries and the nation.

Benefits of IE3 motors for industries

IE3 motors save not only energy cost, but also operation and maintenance costs and gives substantial savings in production loss during breakdown of the plant, due to high reliability. Additionally, IE3 motors deliver the following advantages over standard efficiency motors:

- Efficiency increase by 6%-14% and better manufacturing tolerances.
- Flat efficiency curve from 60% to 100% load, making efficient operation possible at varying loads.
- Reduced operation and maintenance cost.
- Higher insulation life (VPI & Thixotropic resin)
- Longer bearing life
- Lower vibrations and noise levels
- Better tolerances to thermal and electric stresses
- Ability to operate at higher ambient temperature
- Low failure rate implying longer warranties by manufacturers
- Suitable for VFD application

In addition to these benefits under the National Motor program by EESL, industries can also access innovative financing options and procure IE3 motors at zero upfront cost, which will be beneficial for them to replace a greater number of motors together.

The concern on Green House Gas (GHG) emission is being raised at various forums globally. Premium Efficiency IE3 motors could help in reducing GHG emissions by a significant extent. It is worth mentioning that 20-30% reduction is possible in electricity consumption by deploying energy efficient measures such as mandating Premium efficiency IE3 motors and adjustable speed drives. Achieving such savings will require individual and concerted action on the part of all players, including regulators, policy makers and standards development agencies.

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