Energy Efficient Electric Motors in Indonesia

Policy brief

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Introduction

Everything that turns and moves in this world is driven by a motor, most of them electric. It may not be surprising, therefore, that almost half of the world's electricity consumption flows to an electric motor. At the same time, due to long lifetimes that are often extended through the rewinding industry, most electric motors in use are very old. Typically the efficiency is bad, which leads to a waste of electricity.

However, this is something that can be changed. Just as fans, fridges and irons have energy efficiency standards and labels, electric motors are available in five international classes, ranging from 'the bad ones', up to motors that are described as 'super premium'. The main argument against this idea from the user perspective is that high efficient motors are more expensive. Yet this is only true at the time of purchase. Looking at the motor's whole lifetime expense, less than 5% comes from the cost of buying the equipment, the remaining 95% is dominated by the cost of power.

High efficiency electric motors therefore deliver significant cost savings for firms over time.

Furthermore, if you look at the whole system that is driven by the electric motor, savings can easily be doubled or even tripled. Many countries have already achieved large power and cost savings by implementing relevant policies. This is something that is currently being considered in Indonesia. This briefing note introduces the situation in Indonesia, the options for government in tackling this challenge and the next steps to make this happen.

Indonesian motor facts

There is not much data available on the present Indonesian motor stock. A more comprehensive market survey on industrial electric motors was last done in 2009 (JLC & PT.EMI, 2009). If we analyse the efficiency of the 560 motors evaluated in this survey, the outcome would be that about 50% are already rated as 'high efficiency'. In terms of international classes, this would be 'at least class IE2', as shown in the table on the right. But it is important to note that this survey only included motors from the major brands ABB, Tatung and Teco. A survey that apparently includes other brand names as well can be found in SOLVIN & ICA (2013). According to this survey, only 22% of the 60 evaluated electric motors are rated as high efficiency. A tentative conclusion would be that motors that are purchased from brand names other than the 'big three', probably will have efficiencies below what is preferable. Anecdotally, it is often heard that many low efficiency motors are imported from China and other countries in the region. According to that later study (2013), almost 50% of all imported electric motors come from China.

Motor efficiency class	International rating
Super premium	**IE4**
Premium	**IE3**
High	**IE2**
Standard	**IE1**
Below standard	**IE0**

From Chausovsky (2014) we know that 93% of all produced Chinese electric motors are standard motors or below standard. At the same time, we know that China only accepts a minimum of class IE2 for their own market, and that they will move towards the mandatory efficiency of class IE3 in 2017. All other motors are exported abroad to countries as Indonesia. This coincides with the previous findings of the surveys, that low efficiency motors are arriving in Indonesia from smaller manufacturers, although the evidence is still weak.

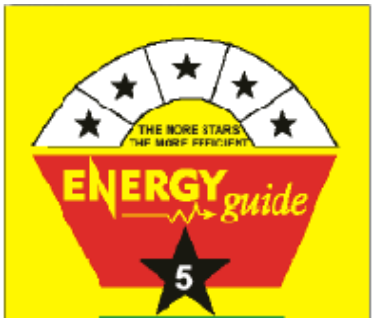
Introducing MEPS and labels

What can governments do about this situation? Many countries and regions have introduced, firstly, Minimum Energy Performance Standards (MEPS) and, secondly, labels for electric motors. MEPS are specifications which stipulate the minimum level of energy performance that products must meet. Where MEPS are mandatory, products that do not meet these requirements may not be offered for sale. Energy labels are the use of a physical label, displayed on the product itself, to indicate the

energy performance of that product (usually in terms of its energy efficiency). Labels allow consumers to identify the better performing products in the market

A database with information on 20 countries is given by CLASP (2015). If we analyse this information, we see that:

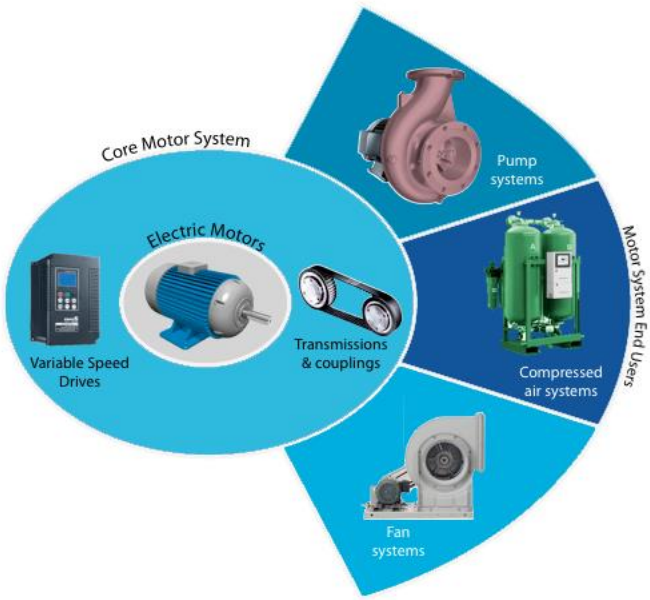
- 95% of countries choose some form of MEPS
- From these, 15 countries (75%) have chosen for mandatory MEPS.
- From these, 9 countries do this without complementary labels
- The other 6 countries chose a combination of MEPS with a so-called comparative or endorsement label.



Endorsement labels (left-most) are essentially "seals of approval". It gives the consumer an easily visibly prove that a motor in fact meets the governmental adopted MEPS, e.g. IE2. Comparative labels (right-most) allow consumers to compare further among models of similar products which motivate the market to offer even higher quality.

From (IEC, 2015) we know that only three countries have adopted the lowest efficiency class, which is IE1, and this was in the past, e.g. in 2006. Others adopted the 'high efficiency class' (IE2) and have scheduled the 'premium class' (IE3) in the future. Four countries in fact shift to IE3 in this year 2015.

For MEPS in Indonesia to have a significant impact it will be important that it aims at levels above IE1 (for example IE2 or higher). This is because many motors sold in Indonesia are already at the IE1 level. This could ideally be done directly when MEPS are first introduced, or introduced later once the lower IE1 standard has been accepted, as currently planned. A combination with comparative labelling would also be beneficial in Indonesia. Indonesia is mostly not a motor producing country, therefore the target group is mainly the consumer. Labels allow customers to more easily understand the benefits of higher efficiency motors and can help to drive sales of motors that are better than the MEPS level.



It is about electric motor driven systems

To have a large impact on energy use, it is important to realise that it is not only about the electric motor itself. Most countries look at complete 'electric motor driven systems'. That's where the real saving potential lies. The Industrial Efficiency Technology Database shows the most important elements of such a system that should be reviewed (IETD, 2015). When looking at motors only, most efficiency

improvements will result in about 5% electricity savings, but by considering the equipment around the motor, savings of 30% or more can be reached.

In most cases, improving the efficiency of a motor system includes the following:

1. Use of energy efficient motors
2. Selecting the surrounding core components like pumps, fans, compressors, transmissions, variable speed drives, with the right type and size and high efficiency
3. Optimisation of the design and operation of the complete system

This is more challenging than motor MEPS or labels alone, but offers much larger benefits. To achieve this, successful best practices of other countries can be used to design a suitable policy programme for Indonesia. A few good report give guidance on developing a policy package, including EMSA (2011), EMSA (2014), UNIDO (2011) and Waide & Brunner (2011). Besides MEPS and labels, the following elements are often part of such a programme, targeting several stakeholders:

- Voluntary agreements with industry
- Energy management programmes
- Energy audit programmes
- Company motor policies
- Financial incentives
- Raising awareness and providing information

Next steps for Indonesia

For Indonesia to be able to make strong improvements in energy efficiency it is vital to take on the challenge of motors and motor systems. As described here, the foundation relies on MEPs and labels, but it is important to look more broadly. ECN in partnership with the Ministry of Energy and Mineral Resources is currently conducting interviews with stakeholders to determine what policies are most appropriate and could have the largest impact. In the next step, the project will discuss the findings with stakeholders in an effort to design an effective and acceptable approach to improving motor systems in Indonesia.

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