

The European project EU-MORE (an acronym for European Motor Renovation initiative) aims at seizing the benefits deriving from the acceleration of the replacement rate of old inefficient motors through the development of new policies

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Industry and service

Speeding up the adoption of state-of-the-art electric motors



In 2015, according to data by IEA – International Energy Agency – 53% of the electricity on a world scale was used in systems with electric motors. In Europe, electric motors represent about 70% of industry's electricity consumption and 40% of the service sector's consumptions. To influence these consumptions, there are naturally some directives on a European scale like for instance the Ecodesign directive that introduces some standard minimum requisites of energy efficiency also for electric motors but the penetration rate of more efficient technologies is slowed down by the fact that motors' service life is longer than what expected, and this delays and decreases the implementation of the regulation's energy saving potential. As states Tomas Jezdinsky from ECI - European Copper Institute and partner of a European project just started that intends to face precisely this problem and to find ways to speed up more efficient motors' penetration on the market. The project is called EU-MORE, acronym of European Motor Renovation.

Europe: continent with many old motors

As Jezdinsky explains, motors' average life is generally estimated from 12 to 20 years, depending on the nominal power.

However, some analyses on the field have demonstrated that these mean values underestimate the real durations: actually, there are on the market very old motors still in operation.

«In an analysis carried out in Switzerland¹ they assessed 4,124 different motor systems in 18 factories. The analysis deduced that 56% of all motors and of

respective systems were older than the expected service life. Some of them even had a double age in comparison with the one foreseen. Moreover: In 2021, an updated estimate of the market of motor systems in the United States, carried out by Lawrence Berkeley National Laboratory (LBNL) was published, it provides an updated and more complete estimate of the installed fleet of motor systems in both the industrial and the commercial sector in the United States². This analysis is compliant with the direction of the Swiss study³. And, finally, Europe: «There is no granular census of the electric motors installed on the European market but there is no reason for believing the situation is different from the United States or Switzerland. A first analysis carried out by EU-MORE project proves that over 70% of the motors installed in the EU-27 in 2020 are still in the IE2, or lower efficiency class, despite the regulation on the eco-compatible design in force. This obviously notably slows down the establishment of more efficient technologies and decreases the possibility of exploiting as fast as possible the advantage of these efficient motors, because companies are not inclined to change motors if theirs still work.» Certainly, if a motor still works, it is hard to think of replacing it. Like saying "never change a winning team".

«It is true, in fact among the reasons listed for explaining the reluctance of the owners of systems with electric motors to change the motor there is precisely the propensity for repairing the motor instead of replacing it because it has always worked and, from the technical point of view, the repair is less risky than a substitution. In other cases, you may have stocks of old "second-hand"

An acceleration in the replacement rate of old and inefficient motors would allow exploiting faster the potential of energy efficiency of new technologies

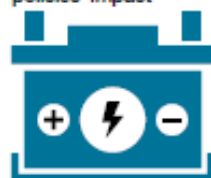


The targets of the EU-MORE project

The development of policies to accelerate the replacement rate of old inefficient electric motors



The development of tools for the projection, the monitoring and the assessment of policies' impact



The creation of a knowledge-exchange platform to facilitate the sharing of experiences among energy agencies and the primary stakeholders



An analysis of the current European market of electric motors



motors and there is a natural tendency to use these motors, due to both a matter of quick availability and cost reasons. However, the initial cost issue is an overestimated theme because often, despite higher initial costs, the absolute figures of electricity saving are significant, especially now when costs are high owing to the crisis in Ukraine. Finally, there is certainly a missing awareness of the co-benefits of high energy-efficiency motors. The lower maintenance, for instance, due to the inferior operation temperatures and the improvements of processes, the reduction of downtimes, the possibility of remote monitoring and predictive maintenance».

An efficiency leap

However, how much are state-of-the-art motors more efficient than old? «Today, there are on the market motors that reach and exceed IE4 and IE5 efficiency levels, using the standard induction motor technology (IE4) and other technologies, such as permanent-magnet synchronous motors (PMSM), synchronous reluctance motors (SynRM) and induction motors with copper rotor (IE4 and IE5). They are technologically mature solutions that can be quickly scaled up. The efficiency difference between IE1 and IE4 is on average by 5.5%. Anyway- as Jezdinsky explains – the saving may be even higher if the replacement of the motor is accompanied by measures that improve the efficiency of the whole motor system, such as the correct motor sizing, digitizing, sensors, the elimination of unnecessary transmissions, the use of inverters and so on. In other words, if motors are directed towards 4.0.

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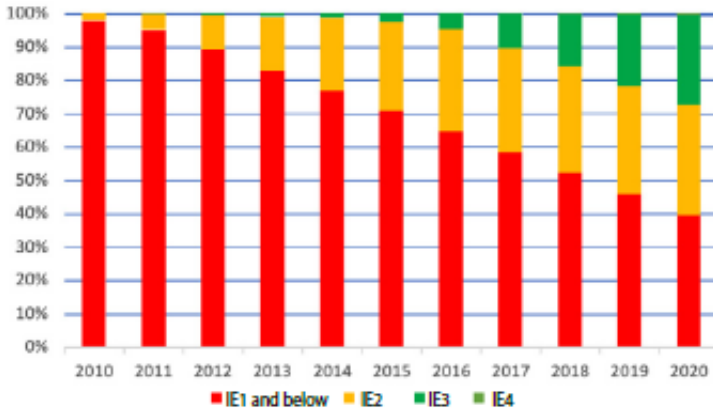


Tomas Jezdinsky, ECI - European Copper Institute

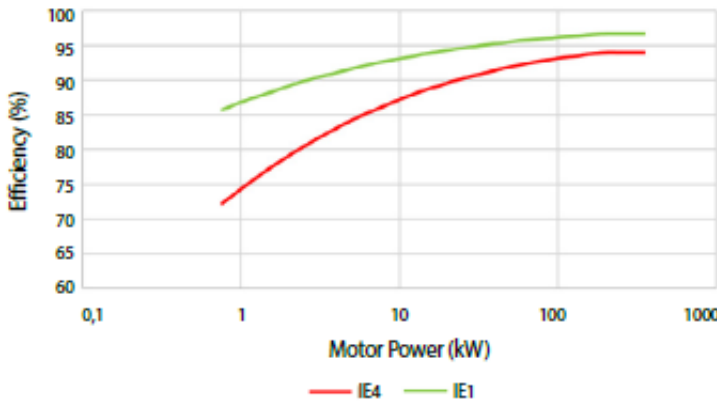
THE EU-LIFE “EU-MORE” PROJECT

The Life EU-MORE project was funded by the European Executive Agency for climatic infrastructures and the environment in the ambit of the tender LIFE-2021-CET-POLICY, with grant agreement n. 101076631. Further information: www.eu-more.eu

RESEARCH AND DEVELOPMENT



Motor stock in EU-27 by efficiency classes (Credits and Source: Life EU-MORE Project)



Efficiency for IE1 and IE4 efficiency classes motors (Credits and Source: Life EU-MORE project)

Recycling and circular economy

In the future of EU, the recycling of materials and the circular economy are a key matter to be able to prosecute the decarbonization of economy. A system based on electrification – and then on electric motors – needs in fact a series of minerals like copper, aluminium, rare metals and so on that are not necessarily produced in Europe and that are not renewable, then they are subjected to depletion in a future of which we do not know precisely the expiry term.

However, luckily there are already recovery and recycling economies for many of these minerals. Jezdinsky affirms: «At present, 32% of the copper used on a world scale derives from recycling. In the EU this percentage even rises to 60%».

The EU-MORE project intends to promote the recycling and the circularity of the materials used in the electric motor manufacturing. «Electric motors are highly suitable for a circular economy because they are mainly made with recyclable materials such as cast iron, electric steel, simple carbon steel, aluminium and copper. The recycling needs much less energy than the production of virgin materials and, therefore, the recycling of materials would notably decrease the

NOTES

- [1] Werle, R., Brunner, C.U., Tieben, R.: Swiss motor efficiency program EASY: results 2010 - 2014, in proceedings of ACEEE Summer Study on Energy Efficiency in Industry, 2015
- [2] <https://www.osti.gov/biblio/1760267/>
- [3] <https://ec.europa.eu/research-and-innovation/en/projects/success-stories/all/rare-metals-have-huge-potential-recycling-europeit-~:text=Copper%20recycling%20well%20developed&text=QUMEC%20found%20that%20for%20copper,scrap%20is%20exported%20for%20recycling.>

emissions currently associated to the production of primary materials» Jezdinsky explains. Producing steel or copper from recycling, for instance, needs much less energy than the primary production. EU-MORE recycling will carry out a specific investigation to characterize the state-of-the-art of motor recycling, which will be evaluated with reference to the Action Plan for the circular economy and the Initiative for sustainable products.

Hindrances? Of non-technological nature

According to the partners of EU-MORE project, today the major obstacle to a fast adoption of efficient state-of-the-art electric motors is not technology – the latter exists, it is well established and provides good solutions. Jezdinsky affirms: «The adoption is eventually slowed down by economic and cultural reasons and by the shortage of policies that more actively drive the adoption of new technologies». Here the

EU-more project intends to intervene, setting up the following goals:

- The development of policies to accelerate the replacement rate of old inefficient electric motors, combined – when possible - with the optimization of the motor system and digitizing.
- The development of tools for the projection, the monitoring and the assessment of policies' impact
- The creation of a knowledge-exchange platform to facilitate the sharing of experiences among energy agencies and the primary stakeholders, forming a cooperative community of experts who take care of energy efficiency policies and of high energy-efficiency electric motors.

In the ambit of these goals, EU-MORE will also carry out an analysis of the current European market of electric motors to create a reliable basis for the estimate of the energy saving potential of the political options developed.

This article has been drawn starting from an interview with Tomas Jezdinsky and from the document of EU-MORE project entitled "Accelerated replacement of old, inefficient electric motors to harvest energy savings".