

CERTIFIED EFFICIENCY

There's a new normative and legislative scenario, born mainly in the last 2 years, concerning the efficiency of electric motors, composed by:

- The local laws of some European and Extra-European Countries that incentivize the purchase of high efficiency motors
- The new world-wide recognized IEC norms, and their corresponding European EN norms, with the numbers 34-30 of October 2008 "*Efficiency classes of single speed, three-phase, cage-induction motors (IE-code)*", and 34-2-1 of September 2007 "*Standard methods for determining losses and efficiency from tests*"
- The Directive 2005/32/CE of the European Parliament and Council "*establishing a framework for the setting of ecodesign requirements for energy-using products*", and
- the Regulation (EC) nr 640/2009 of 22 July 2009 "*implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for electric motors*"

It's worth mentioning that the latest document says that

- From June 2011, the motors with efficiency lower than IE-2 ("high efficiency", similar to CEMEP Eff.1) will be forbidden
- From 2015, the minimum efficiency for motors from 7,5 to 375kW will be IE-3 ("Premium efficiency", higher than Eff.1), and
- From 2017, the obligation of IE-3 will be extended to the motors from 0,75kW to 5,5kW

The details of such new scenario can be found in the newsletters of many motors manufacturers, including Motive, and in the web-site www.motive.it.

A question comes out: who controls that norms and laws and declarations
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are really respected, in order also to protect the customer from a possible useless waste of money?

The CE 640 Regulation, when talking about the "*Verification procedure for market surveillance purposes*", better described in the annex III, mentions too synthetically a future system that appears to us potentially weak and ineffective.

Let's also consider that, nowadays, in Europe, an external control is probably impossible for the lack of properly equipped and qualified testing laboratories that can test the efficiency of our motors under the rated load. What they can do now is to test small motors like those used in washing machines and similar households. Such control difficulty increases the expectation of a poor credibility of the manufacturers declarations, even if their truth is an important factor not just for the law and environment respect, but, also, for the customer that is going to pay a higher price based on the trust that it's going to get a better motor that will make him save much more in the electricity bill.

In fact, the purchase cost of a motor is less than 10% of the total costs of its life (only 2-3% according to a survey of the Italian "Confindustria"). The balance is energy consumption costs.

Comparing Eff.1 motors to Eff.2, for instance, the purchase price difference is normally recovered in less than one year of energy saving. Furthermore, an higher efficiency motor will heat less, slow down the aging cycle of the insulating material, and consequently live much longer. Of course, such

saving is there only if the high/premium efficiency motor is really there, not just written on a plate or catalogue.

Our internal tests on the samples of several brands bought on the market, have demonstrated that in most of the cases the declared efficiency level of asynchronous electric motors is not the real one, even after that we considered the tolerances admitted by the norms.

On the other hand, it's not difficult to intuit this market inclination if you think about how suddenly, when several years ago CEMEP issued the classification "Eff.1/2/3", all motors were plated Eff.2. Is it possible the Eff.3 had disappeared? In reality, our controls revealed that eff.3 motors are still a high percentage of the eff.2 plated motors in the market.



Imagine how enticing it is for a manufacturer or trader or wholesaler to sell as "high efficiency" a motor that has the manufacturing costs (and consequently the quality) of a low efficiency motor. You can also reasonably expect that when IE1 and IE2 efficiency levels will be forbidden, those that did not update in time their products to the new rules will not stop

selling and close their company; their solution will be to "play" with the declared data.

Perhaps, now, some are not even thinking about updating and upgrading their motors design and production, and in the meantime they "stay at the window", because producing higher efficiency motors is a not easy and

surely expensive objective, that involves design, tests, machining precision, materials choice, final tests and that, in any case, cannot be reached if you don't increase in a relevant way the magnetic material (laminations and copper)



After all, wishing to turn around the obstacle of costs and difficulties, a manufacturer could simply ask himself how many customers are able to make a reliable test by simulating with certainty the rated torque and speed in order to compare the supplied power with the consumed power. Who could prove to the manufacturer that the declared data are false and he didn't get what he paid for? For the user it is too difficult. According to our experience, he often simply compares the current [A] that is absorbed by two different motors in order to have a Motive news March-10

raw idea about which is the most efficient; but this is a wrong evaluation, because what matters and what we pay is the absorbed power [W], that is mathematically connected also to the power factor [cosφ]. In fact, under the same power load and voltage, a motor could have a better efficiency (less consumed power) than another, but at the same time a similar or higher current (see graph 1). Anyway, even if the absorbed power is correctly measured, how can the user know the given/loaded power? OK, one can say that the two motors are

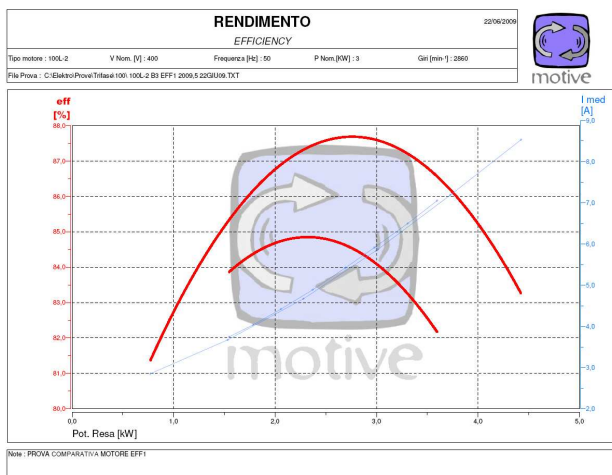
compared under the same load, but what seems better under that load could be worse under another load (see graph 2). And even if, strangely, it can know the exact given/loaded power because it could measure the torque and the speed, is it the motor rated load/power? Without the rated power, the rated efficiency cannot be measured/controlled. To measure the given power and set/simulate the rated power, you need a proper test position, the so-called "brake bench".



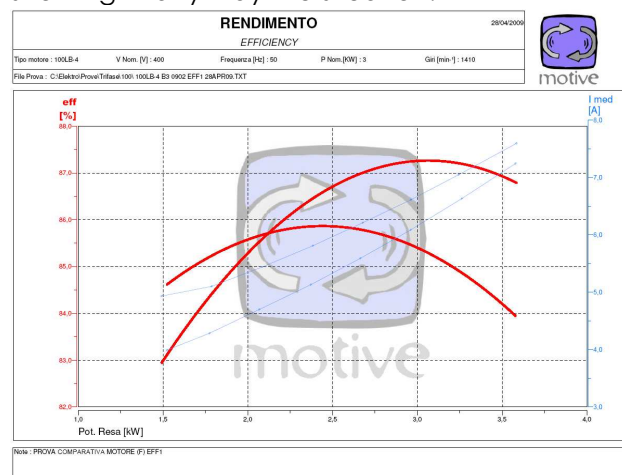
The relation between efficiency and power is not a constant but a curve, and under different loads there are different results. Each motor, each design, has its own curve. Not necessarily under the rated load you find

the best efficiency. Not necessarily, a motor that has a better efficiency than another under the rated load, has a better efficiency also at other loads (see graph 2).

Graph 1: Example of 2 not intersecting curves, representing the **absorbed current** and the **efficiency** (given power/absorbed power) under different power loads of 2 different motors having the same rated power (3kW). One motor has a better efficiency (red curves) then another under any power load, but the absorbed current is nearly the same (blue curves).



Graph 2: Example of 2 intersecting curves, representing the **absorbed current** and the **efficiency** (given power/absorbed power) under different power loads of 2 different motors having the same rated power (3kW). One motor has a better efficiency than the other under the rated power load, but the positions are reversed when the load is only 50% (1,5kW). You can also see that, anyway, the current of the first is always lower, thus not showing in any way the situation.



Correctly, the European Regulation nr 640/2009 is asking to manufacturers to declare also the efficiency under 75% and 50% of the rated load.

The customer can then only trust in what the manufacturer


declares? Well, if there was a certification issued by an equipped, independent and recognized laboratory, he could have a good further option. The efficiency certification could then be the difference between who tells and who proves. But

there's another problem: which is the recognized body that can issue such certification, with suitable brake benches for our motors powers? We tried to find it, but we didn't succeed.

What was then our solution in Motive?

1. upload on Motive web-site all the test reports that back the data declared in the catalogues and in the plates
2. make IMQ, the biggest electric products certification body in Italy, certify the compliance of Motive internal test department with the norm IEC/ISO 17025 (a norm about the requirements that a test laboratory should follow to be used by an accredited certification body)
3. get IMQ supervision of the internal tests on some samples picked from Motive warehouse, in order to prove the correctness and truth of our test-reports and declarations.

The result is a clear document, accepted worldwide, issued by a certification body recognized in several continents, that can really protect the customer and assure the return of his investment.

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Milan, September 30, 2008

Attention to Company


Motive S.r.l.
Via Artigianale, 110/112
25010 Montirone (BS) - ITALY

Dear Mr Giorgio Basio,

Herewith I confirm that Motive's laboratory, evaluated according to the requirements of standard IEC/ISO 17025, is found in compliance with main requirements of the above mentioned standard. The following motors were tested according to standard IEC 60034-2 with supervision of IMQ qualified personnel.

Model designation	rated power (kW)
90L-4 Eff1	1,5
100LB-4 Eff1	3
112M-4 Eff1	4
132M-4 Eff1	7,5
90L-2 Eff1	2,2
112M-2 Eff1	4
132SB-2 Eff1	7,5
112M-6 Eff1	2,2
132S-6 Eff1	3
100LA-8 Eff1	0,75
132M-8 Eff1	3

With Regards


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