

# Indices for an Objective Efficiency Comparison?

**Euromap 60.** Fully hydraulic injection molding machines as well as all-electric and hybrid injection molding machines have high part quality as their primary objective. At the same time, however, the subject of efficiency increasingly is becoming an important investment criterion. In this regard the „Euromap 60“ guideline provides the basis for an energy-based comparison. Will this standard be accepted by industry?

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In countries with a high level of technology and high labor costs, the primary sales argument when investing in equipment is still the quality of the machines and their ability to be integrated into highly automated manufacturing cells that produce high-quality parts in short cycle times and at a high production rate. Nevertheless, the energy efficiency of machines is currently gaining in importance, since the terms „cost-effective“ and „efficient“ production are becoming linked to an increasing extent.

In order for processors to produce cost-effectively, machine manufacturers are required to develop equipment that uses resources efficiently. The starting point for making energy consumption in production transparent is to set up a local energy monitoring system in the plant. A local energy monitoring system is not enough, however, to compare the energy utilization of machines from different manufacturers. In order to have meaningful comparisons, there must be standard indices. The concept of energy efficiency classes employed for household appliances is increasingly becoming an investment criterion for industrial machinery and equipment. This trend is also reflected in the development activities of injection molding machine manufacturers and was evident at the last K Show in Düsseldorf, Germany (Fig. 1).

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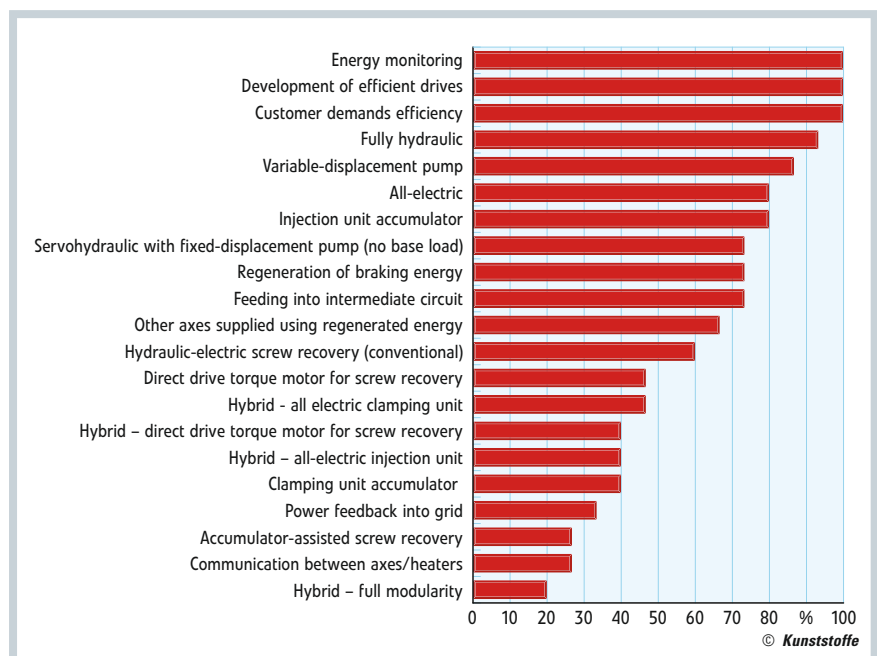


Fig. 1. A survey conducted among well-known injection molding machine manufacturers yielded the „hit list“ of development activities, sorted by importance, shown here (source: IPE)

## The Objective: To Compare Different Manufacturers' Equipment

In June 2009, the European Committee of Plastics and Rubber Machinery Manufacturers (Euromap) published Euromap 60 as the standard for energy

Information format for Euromap 60 indices:

- 0.4 kWh/kg; 5.1 kW; 15.5 s; 0.99; II
- Specific energy consumption [kWh/kg]
- Average power consumption [kW]
- Cycle time [s]
- cos phi [-]
- Set cycle (I-III)

Table 1. Example of key consumption figures

comparisons of injection molding machines. Numerous well-known machinery manufacturers who are members of the Euromap committee have accepted this guideline, which is also available online ([www.euromap.org/files/EUROMAP\\_60.pdf](http://www.euromap.org/files/EUROMAP_60.pdf)). This standardized method for measuring energy values is intended to help users compare machines with one another. Two years after its having been promulgated seems a good time to see whether the standard has been accepted.

The standard establishes machine parameters for three defined overall cycles (thin-walled, engineering and thick-walled parts) in order to provide a basis

for comparison of specific energy utilization. The eight-page document describes the measurement setup and the values to be measured, and ultimately specifies the energy indices (Table 1). The Institute for Product Engineering at the University of Duisburg-Essen, Germany, asked 14 machine manufacturers the following questions during the K2010:

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- How do the companies use Euromap 60?
  - What response do they get from customers?
  - What points do they have to criticize?
- The machinery manufacturers included companies from Germany, Austria, Switzerland, Italy, France, Japan and China that are active internationally.

## „Are You Familiar with Euromap 60?“

Only two companies answered this introductory question in the negative. All others answered this question with yes, with the respondents indicating different degrees of familiarity. The companies answering in the negative explained their lack of familiarity with not having been asked about it by customers and to their

company's own strategy. In contrast to the situation at their competitors, the subject of energy was not one of their own priorities.

The remaining 12 machinery manufacturers provided more interesting and in-depth information. After an extended tour of the exhibitors' booths, they were queried about the purpose and advertising aspects of this standard. While energy efficiency was highlighted with an index at most exhibits, the relation to the Euromap Standard was seldom mentioned.

One manufacturer, Engel Austria GmbH, even went so far as to advertise „Lower energy consumption or your money back“ without reference to Euromap 60 indices. A basis for comparison was not provided, but upon request a multitude of Euromap 60 values for a va-



## i Five Questions for ...

**Thorsten Kühmann**, managing director of the Association of Plastics and Rubber Machinery in the VDMA and general secretary of Euromap, about the pros and cons of Euromap 60

**Kunststoffe:** Whoever has been following the technical discussion must be viewing Euromap 60 as premature.

Why was the Standard issued in 2009 in this form and at this point in time?

**Kühmann:** At the moment, energy efficiency is an item on the political agenda in Europe and around the world.

Even the current 12th five-year plan in China has elevated energy efficiency to an important objective. In Europe, the target is to reduce energy consumption by 20 percent by 2020 on the basis of the ecological design guideline.

Euromap 60 is the first attempt in the world to describe measurement methods for the energy consumption of injection molding machines. The benefit is obvious: energy plays an increasingly important role and the establishment of agreed-upon measurement methods creates trust in the market. Industry can appear behind a united front.

**Kunststoffe:** How do you explain the critical attitude of companies who even helped to draw up the Standard?

**Kühmann:** The European manufacturers of injection molding machines are

basically in agreement that this important subject can only be addressed by a group and individual solutions do not help substantially. Euromap 60 makes it possible to put the debate about energy savings and the potential associated with energy savings on an objective footing. During the two years of its existence, well-known manufacturers of injection molding machines in Europe have been able to gain experience with Euromap 60. Assessments have covered a wide range, from acceptance as is to the need for revision. Actually, the result is not surprising, since until now no standardized energy measurements have been performed and the energy consumption for different machine types and product applications have varied accordingly.

**Kunststoffe:** Can you understand the criticism?

**Kühmann:** Yes, of course – Euromap 60 was the first attempt to measure the energy consumption of injection molding machines.

**Kunststoffe:** What do you see as a way out of the current dilemma?

**Kühmann:** Euromap 60 is contributing to the establishment of a transparent measurement of the specific energy consumption of injection molding machines. Nevertheless, Euromap will subject the measurement standard to a critical reevaluation on the basis of



these responses and additional knowledge, and consider a revision.

**Kunststoffe:** What additional knowledge do you mean?

**Kühmann:** Euromap has commissioned a study to carefully investigate energy consumption and the potential for energy efficiency. Manufacturers of plastic and rubber machinery, primarily in Germany and Italy, have been canvassed in the course of this study. In addition, assessments from several processing companies have been incorporated. I think that this study will provide the basis for the way forward.

Interview: Clemens Doriat, editor



**Thomas Brettlich, Sumitomo (SHI) Demag:** „Comparing values for different injection molding machines is possible only under very specific conditions.“

riety of equipment types were readily available. Only two companies used Euromap 60 indices in their advertising: the data were presented in stickers on the machines for everyone to see. Even manufacturers who did not publish indices had

Degrees of freedom in Euromap 60

- Screw and screw diameter
- Size of injection unit
- MFR of the material

**Table 2. Dangers of the comparison**

apparently measured a variety of different equipment types in accordance with Euromap 60 before the exhibition. How-



**Dr. Thomas Walther, Arburg:** „The energy efficiency and performance of injection molding machines depend to a large degree on the particular drive technology and machine features.“

ever, these were divulged only if requested and most of the time the request for the values was denied. One has to wonder why so few manufacturers are willing to publicize their data.

**A Variety of Opinions**

Four opinions of large injection molding machine manufacturers will be used to illustrate the different attitudes with respect to Euromap 60.

„We have conducted numerous investigations with respect to Euromap 60 and support the attempt to make the subject of energy efficiency more transparent. Unfortunately, comparing values for different injection molding machines is possible only under very specific conditions. Since information based on Euromap 60 is not adequate on its own for comparison purposes, we consider it one of our tasks to provide extensive information on the subject of efficiency“, stated Thomas Brettlich, manager of technology development at Sumitomo (SHI) Demag Plastics Machinery GmbH.

Peter Pokorny, manager of applications technology at Engel Austria GmbH provided a positive response: „Euromap 60 is a fantastic tool for comparing the energy consumption of an injection molding machine as long as the results are interpreted correctly. A classification such as that used for household appliances, however, is currently not possible.“

This positive attitude with respect to the standard was by far not shared by all machinery manufacturers: „The energy efficiency and performance of injection molding machines depend to a large degree on the particular drive technology and machine features, for which there are numerous possible combinations. Considering only a single brochure value per machine cannot provide the results that customers and machinery manufacturers would like to see in terms of a comparison. Realistic comparison values are best obtained by conducting tests with a customer’s mold“, according to Dr. Thomas Walther, manager of applications technology at Arburg GmbH + Co KG.

The statement of Dr. Reinhard Schiffrers, project manager – advanced development/energy at KraussMaffei Technologies GmbH, points out the degrees of freedom (Table 2) that Euromap 60 does not define: „The Euromap 60 Standard provides a good basis for assessing the energy efficiency of injection molding machines. However, when making a con-



**Peter Pokorny, Engel Austria:** „Euromap 60 is a fantastic tool for comparing the energy consumption of an injection molding machine as long as the results are interpreted correctly.“

crete comparison, one must remain aware that the wrong equivalent machines are possibly being compared because of the degrees of freedom that exist.“

In discussions, the major points of the standard criticized circulated around the „degrees of freedom“ still present in the parameter specifications for the measurement cycles. A frequently heard opinion was that the results were not transparent and could be compared by a customer only with difficulty, because, for instance, no screw diameter was specified. The measurement cycles were indeed pointed in the right direction, but



**Dr. Reinhard Schiffrers, KraussMaffei:** „When making a concrete comparison, one must remain aware that the wrong equivalent machines are possibly being compared because of the degrees of freedom that exist.“

the overall conditions made it too easy to make the values appear better than they really are. For this reason, it was necessary to be very careful when discussing measurement values. How confusing the situation is was evident from the variety of self-defined cycles for establishing the specific energy consumption found at many booths.

### Requests for Revision

The preliminary conclusion about the Euromap 60 standard is that the customer does not yet have the ability to compare suppliers on the basis of Euromap 60. The „energy bet“ is often accepted; however, a standard basis for comparisons has not yet been established in the form of a standard.

The discussion about the standard has picked up, and machinery manufacturers have formulated specific points of criticism and requests for a revision. Companies in German-speaking countries have warmly welcomed the discussion about experiences in dealing with the Standard. Germany is represented in the Euromap committee by the Association of German Machinery and Equipment Manufacturers (Verband Deutscher Maschinen- und Anlagenbauer – VDMA). The VDMA must address the criticisms of machinery manufacturers when it comes to a revision of the Euromap 60 standard. In a brief interview (see box p. 23) with Thorsten Kühmann, managing director of the Association of Plastics and Rubber Machinery in the VDMA, it was clear that the Association already recognizes the

need for a revision. The annual general meeting on June 9 and 10 in Mainz, Germany, may well show how much consensus can be found between a general categorization and an assessment based on close-to-process conditions. ■

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