PEER-REVIEWED PAPER

The contribution of the European Union's Ecodesign and Energy Labelling Directives to industrial energy efficiency

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Keywords

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Abstract

While the scope of the European Union's Ecodesign Directive (2009/125/EC) has included industrial products since the adoption of the first version of the Directive in 2005, the Energy Labelling Directive (2010/30/EU) was extended to cover such products only during its last recast in 2010. The Ecodesign implementing measure on electric motors has already proved its worth in bringing substantial energy savings across sectors, including in industry. However, the saving potential at product level usually appears dwarfed when compared to potential improvements at system level. The developers of implementing measures have had to deal with the urge to extend the scope boundary to the installations in which the products operate.

While the two Directives do not explicitly exclude installations from being targeted by implementing measures and delegated acts, there are no dedicated provisions either on how the measures and acts are supposed to tackle the specificities of installations when it comes to defining the practical details of applying the requirements (e.g. market surveillance). There is also little experience with Energy Labelling of industrial products, and many doubt that such labelling would be useful at all, considering the professional nature of all actors involved in the process of selecting industrial products for purchase.

The authors of this paper are European Commission officials who have worked directly on Ecodesign/Labelling of industrial products. They analyse the experience gathered so far with respect to products such as motors, transformers and lighting, in an attempt to describe the practice and the challenges in the application of the two framework Directives to industrial products.

DISCLAIMER

Even though the authors are policy officers of the European Commission who have contributed to the drafting of the Ecodesign and Energy Labelling Directives and of their implementing measures and delegated acts, the contents of this article do not represent the views of the Commission and should not be considered as guidance in the interpretation of the acts discussed.

Introduction

The energy efficiency of industrial processes is increasingly in the centre of attention as one of the areas with unexploited improvement potential. To tap this potential, existing mechanisms such as Emission Trading[1] and the Directive on Industrial Emissions[2] may be usefully complemented by new types of regulatory intervention under other legislative frameworks, in order to address the remaining market failures that prevent further improvement from taking place (e. g. split incentives, potential for minor but multiple savings becoming significant

1. Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, Official Journal of the European Union, L 275, 25.10.2003, p. 32–46.

2. Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control), Official Journal of the European Union, L 334, 17.12.2010, p. 17–119.

only when applied Europe-wide). In this context, it could be relevant to examine the way the Ecodesign[3] and Energy Labelling[4] Directives have tackled products used in industrial processes. The purpose of this article is to review existing practice in the application of the two directives (including their implementing measures and delegated acts) to industrial products.

We will first clarify some terminological and scoping aspects. The presentation of the Ecodesign and Energy Labelling Directives and their relevant implementing measures and delegated acts will be followed by an analysis of the key challenges faced so far in their application to industrial products.

RELEVANT DEFINITIONS AND SCOPE OF THE WORK

The two Directives and their implementing measures and delegated acts do not define what an industrial product is. For the purposes of limiting the scope of our investigation, we will therefore need to specify what we mean by the term. Indeed, there is potential confusion as regards its use, as it is sometimes applied to any product that is manufactured by industry (as opposed to products resulting from e.g. agricultural activities). This is not the meaning we intend to apply here. By "industrial products", we mean products that are intended for use in workplaces where the equipment or materials handled are such that average citizens are not expected to be familiar or get into contact with them. This includes factories, construction sites and public infrastructure such as electricity generation/transmission or water management, but excludes office buildings, shops (but not their warehouses), hospitals, schools, cultural institutions etc.

The products in question may be used directly in the industrial process (e.g. furnaces or electric motors), or they may simply ensure the necessary conditions for the process (such as the lighting or the ventilation specific to factory buildings). We however exclude the energy using products intended for use in areas not directly linked to the industrial process (e.g. offices, canteens etc.).

Sometimes the product is fit for use in several settings, including non-industrial ones, and the manufacturer does not know where it will end up installed. Under the New Approach[5], products have to comply from the moment of the placing on the market by the manufacturer, so in case of ambiguity on the intended use, Ecodesign measures can only be technology-based and not application based. Normally, they cannot require that the same product complies with requirement X if installed in application Y, but with requirement X_{bis} if installed in application Z. Logically, in this article we will discuss requirements applicable to the entire technology.

Although at the time of drafting, implementing measures for several industrial products are being discussed with Member States, stakeholders and other Commission services, we will analyse only those measures that are already published in the Official Journal, or are in a final stage of adoption in which they are unlikely to change further (they have been agreed by the Regulatory Committee of Member States).

The Ecodesign and Energy Labelling Directives

The Ecodesign Directive was first proposed in 2005 with a scope restricted to energy using products. Since the beginning, the Directive had the dual purpose of improving the environmental performance of products by setting minimum requirements, on energy efficiency in particular, while facilitating their free movement in the Internal Market.

The Ecodesign Directive is a framework Directive and it is actually implemented through product specific Regulations (39 today), setting out minimum mandatory requirements related to their environmental performance. It can be considered a New Approach Directive, where the application of harmonised standards provides presumption of conformity with the requirements laid out in the Regulations.

The Directive included an original set of products to be considered for Regulations, where a high potential for cost-effective reduction of greenhouse gas emissions was present. Otherwise, preparatory work under this Directive is organised through so called working plans, spanning an indicative period of 3 years. The main criterion for products to be included in a working plan is their energy saving potential, together with the improvement potential in other environmental aspects. In this respect, no differentiation is made between household products and non-household products.

In 2009, the scope of the Directive was extended to energy-related products and consequently, the working plan for the period 2012–2014 included for the first time such products, namely windows, thermal insulation products and indoor electricity cables.

The Energy Labelling Directive was introduced in 1992. It requires manufacturers and retailers to provide information to the consumers about a product's use of resources (in particular energy) in the form of a standard-looking energy label (in its basic form, on an A–G scale). Here too, the obligation exists only for those products that are targeted by specific measures under the Framework Directive (13 today). Until 2010, its scope was restricted to household products. By influencing consumer choice and by creating a healthy competition among manufacturers, it managed to exercise a strong positive impact on the energy efficiency of most of the targeted appliances, for example refrigerators, washing machines and dishwashers. Other parameters than energy efficiency are usually also shown in the label, relating to the performance of the product or to the use of other resources. The 1992 Directive was recast in 2010, when its scope was extended to all energy-related products (including non-household ones). At the same time, the earlier language-dependent labels started to be replaced by language-free ones in new and amended product-specific measures, in an effort to ease the administrative burden and facilitate the free circulation of the targeted products. The next review of the Directive is foreseen in 2014, which is a welcome step, because a solution needs to be found to maintain a meaningful label for those appliances where all of the models available on the market have improved to be in the top classes of the label. Indeed, the temporary solution introduced in 2010 consists of adding

3. Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of Ecodesign requirements for energy-related products, Official Journal of the European Union, L 285, 31.10.2009, p. 10–35.

4. Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products, Official Journal of the European Union, L 153, 18.6.2010, p. 1–12.

5. Council Resolution of 7 May 1985 on a new approach to technical harmonization and standards, Official Journal of the European Union, C 136, 4.6.1985, p. 1–9.

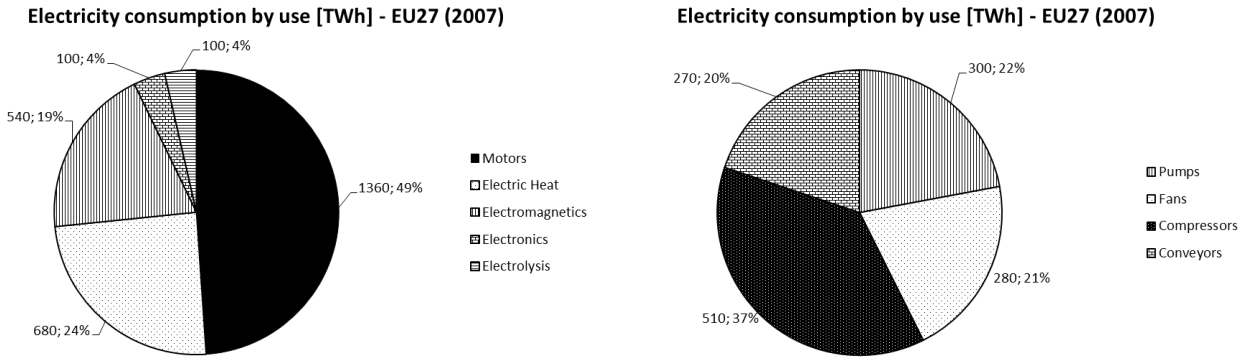

Figure 1. Distribution of the total electricity consumption by use in Europe in 2007.

up to three "+" signs to the letter A to create three better classes on top of A, but in the case of some appliances (such as refrigerators), all available models are already in the extra classes.

Implementing measures and delegated acts on industrial products

MOTOR DRIVEN SYSTEMS

Motor driven systems are estimated to have used 15,660 TWh worldwide in 2006[6]. In the case of the EU and for the year 2007 the total electricity use of electric motors accounted for 1,360 TWh in 2007[7], representing 49 % of the total electricity demand in the EU for that year. This electricity use is distributed between energy used in pumps, fans, compressors and conveyors.

Figure 1 shows the distribution of the total electricity consumption by use in Europe in 2007, on the left the total electricity consumption per use and the share this consumption represents of the total is shown, the right side of the graphic shows the electricity consumption on electric motors per specific use, again including total electricity consumption and share of the total electric motor electricity consumption. The data is based on the findings of the study that led to the publication of the Methodology for Ecodesign of Energy related Products (MEErP).

Taking these numbers into account, it is just natural that most major economies have taken steps aimed at increasing the energy efficiency of motor driven systems, the EU being no exception regarding this global effort.

Several implementing measures under the Ecodesign Directive were adopted in order to increase the energy efficiency of these products, namely for:

- electric motors[8]
- standalone circulators and glandless circulators[9]
- fans driven by motors with an electric input power between 125 W and 500 kW[10]
- water pumps.[11]

Regulation 640/2009 covers electric motors with a rated output between 0.75 and 375 kW. These motors represent 67.6 % of the total electricity demand of electric motors. This measure takes a step in the direction of a better integration and control of the motor by setting requirements that can be met by using an IE3 motor according to international standard IEC 60034-30 or an IE2 motor combined with a variable speed drive (VSD), which is a device that adjusts the speed and torque provided by the motor to the system needs. Information about this requirement shall also be provided in the rating plate of the motor once the requirements have entered into force. This Impact Assessment[12] supporting this measure estimated the electricity savings achieved at 135 TWh per year by 2020.

A further preparatory study covering motors with a rated output from 120 W up to 1 MW, as well as medium voltage motors and several specific motor types excluded from the original Regulation is being developed at the moment and its final outcome will be available in 2014. The scope of this study has been aligned with the new version of the international standard used for calculating the energy efficiency of electric motors. Although the final results of the study will only be available in the coming months, according to the preliminary analysis made so far savings of around 20 TWh per year could be achieved if requirements were to be set for motors between 120 W and 1 MW[13].

6. Walking the torque. Proposed work plan for energy-efficiency policy opportunities for electric motor-driven systems, Hugh Falkner and Shane Holt. International Energy Agency, 2011.

7. Methodology for Ecodesign of Energy related Products (MEErP), prepared for the European Commission DG Enterprise and Industry, by Van Holsteijn en Kemna, Brussels/Delft, 2011.

8. Commission Regulation (EC) No 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, Official Journal of the European Union, L 191, 23.7.2009, p. 26–34; amended by: Commission Regulation (EU) No 4/2014 of 6 January 2014, Official Journal of the European Union, L 2, 7.1.2014, p. 1–2.

9. Commission Regulation (EC) No 641/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to Ecodesign requirements for glandless standalone circulators and glandless circulators integrated in products, Official Journal of the European Union, L 191, 23.7.2009, p. 35–41; amended by: Commission Regulation (EU) No 622/2012 of 11 July 2012, Official Journal of the European Union, L 180, 12.7.2012, p. 4–8.

10. Commission Regulation (EU) No 327/2011 of 30 March 2011 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to Ecodesign requirements for fans driven by motors with an electric input power between 125 W and 500 kW, Official Journal of the European Union, L 90, 6.4.2011, p. 8–21.

11. Commission Regulation (EU) No 547/2012 of 25 June 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to Ecodesign requirements for water pumps, Official Journal of the European Union, L 165, 26.6.2012, p. 28–36.

12. SEC(2009) 1013 final.

13. www.eco-motors-drives.eu

Circulators are pumps designed for use in heating systems or in secondary circuits of cooling distribution systems. Circulators with a rated hydraulic output power up to 2.5 kW are covered by the existing Regulation. This Regulation is estimated to save 23 TWh of electricity in the year 2020. In order to better reflect the real life operation of the circulator, this Regulation sets requirements to circulators based on their Energy Efficiency Index (EEI), which is calculated taking into account different flow rates for the circulator. The power consumption for these different flow rates is weighted for calculating the EEI.

The existing Regulation on fans covers fans using a motor with an electric input between 125 W and 500 kW and differentiates between different types of fans for setting its minimum requirements which are set based on the energy efficiency of the fan to be determined according to the relevant standards. According to the accompanying Impact Assessment[14] this Regulation will save around 34 TWh of electricity per year by 2020.

Water pumps with a maximum shaft power of 150 kW are covered by the existing Regulation which sets its requirements based on the "Minimum Efficiency Index" (MEI) that needs to be calculated for the best efficiency point, part load and over load. The estimated electricity savings of this Regulation are 3.3 TWh in the year 2020.

In addition, two preparatory studies are expected to be finished during 2014 covering waste water pumps and specific pumps types not covered by the existing Regulation.

Compressors have not been directly addressed by any implementing measure under the Ecodesign or the Energy Labelling Directives so far, nevertheless, a preparatory study on this product group is being carried out at the moment.

Regarding the preparatory studies on pumps and compressors, final data on the estimated savings of potential measures are not yet available.

DISTRIBUTION TRANSFORMERS

The population of distribution transformers in Europe is estimated to be around 3.6 million units, increasing to almost 4.7 million in 2025. This estimated growth in stock may be partially explained because of the proliferation of distributed generation facilities, which need to be connected to the main distribution grid. On average, in recent years, about 140,000 distribution transformers (Medium Voltage/Low Voltage) have been sold annually in Europe and over 50,000 units for industrial use. Most MV/LV distribution transformers are liquid-immersed. For industry applications, oil-immersed transformers represent around 80 % of the market. The average rating of power transformers is about 100 MVA. The main European industry players for transformers are big international groups like ABB, Siemens, Areva, Schneider Electric, and some large/medium size companies like Cotradis, Efacec, Pauwels, SGB/Smit, Transfix and Ormazabal.

The environmental impact assessment carried out in the preparatory study showed that the use phase is by far the lifecycle stage with the highest impact, in terms of energy consumption, water consumption, greenhouse gases emissions and acidification. The large majority of transformers are recycled at the end of their lifecycle. There also exists a market for refurbished transformers. The end-of-life phase may have impacts due to the disposal of mineral oil.

Energy consumption during the use phase was found to be, by far, the most significant impact and therefore the Ecodesign Regulation focused on improving energy efficiency. The use of an Energy Labelling scheme was considered during the impact assessment. Due to the professional nature of the market for transformers and the lack of support from stakeholders, the labelling option was finally discarded and efforts were concentrated on the Ecodesign Regulation.

The main market deficiency identified during the impact assessment was the relative emphasis on initial purchasing costs by some market players, to the detriment of lifecycle cost considerations. This is related to the fact that, in many Member States, the cost of electricity distribution losses is partially borne by the final user. This represents a substantial energy saving potential which could be tapped into by setting minimum efficiency requirements.

Therefore, the Ecodesign Regulation on transformers introduces minimum energy efficiency requirements for medium and large power transformers. The main difficulties associated with setting minimum efficiency requirements were related to the different utilisation rates (so called load factors) of transformers in different applications and configurations. For large power units, the lack of standardisation in their manufacturing posed additional problems, most units constituting bespoke products. Intense stakeholder consultation was necessary to achieve a formulation of energy efficiency that enjoyed wide acceptance.

The expression of the minimum efficiency requirements in the Regulation depends of the rated power of the transformer. For medium power transformers with a rated power of up to 3,150 kVA[15], minimum requirements consist of maximum allowable levels of load and no load losses. For medium power transformers above 3,150 kVA and for large power transformers, minimum requirements consist of minimum values of the Peak Efficiency Index (PEI). The formulation of the PEI was conducted by a group of stakeholders (manufacturers, utilities, environmental NGOs) led by CENELEC[16] and the European Commission. In both cases, the minimum requirements are relatively modest for Tier 1 in 2015 and become more ambitious for Tier 2 in 2021. The harmonized standards which have been prepared by CENELEC in support of the Regulation elaborate on the use of the PEI to measure the energy efficiency of transformers.

According to the calculations made during the impact assessment and reflected in the recital of the draft Regulation, a cost-effective improvement potential through more efficient design of transformers has been estimated to about 16.2 TWh per year in 2025, which corresponds to 3.7 Mt of CO_2 emissions. It is to be expected that this regulatory push for more efficient designs supports the competitiveness of the transformers' industry.

INDUSTRIAL LIGHTING

Although there is no Ecodesign or Energy Labelling act specifically dedicated to industrial lighting products, all of the lighting regulations in place have some provisions affecting industrial lighting.

14. SEC(2011) 384 final.

15. Kilovolt-ampere.

16. European Committee for Electrotechnical Standardisation.

Fluorescent lamps, high-intensity discharge lamps and related accessories

In 2005, year of the launch of the related preparatory studies, the non-household market of lamps consisted almost exclusively of fluorescent lamps, high-intensity discharge lamps and related accessories (1,579 million lighting points in EU-25, of which 79 million high-intensity discharge lamps, and 1,500 million fluorescent lamps).[17] It was never estimated how much of this stock was present on industrial sites, but it is clear that all of the lamps used on such sites were fluorescent or high-intensity discharge. Due to its large scope, in short we will refer to the measure as the "non-household lighting regulation".[18]

The regulation is estimated to reduce by up to 15 % the electricity consumption of this equipment in the EU, which is assumed to rise to 260 TWh per year by 2020 without legislation. The savings are equal to 38 TWh (roughly the electricity consumption of Romania) and would lead to approximately 15 Mt CO_2 emission reduction per year.

Requirements for all fluorescent lamps, high-intensity discharge lamps and related accessories

The regulation improves the environmental impact of non-household lighting products through setting minimum levels on energy efficiency and certain performance parameters related to additional environmental aspects.

The measure sets Ecodesign requirements applicable to all fluorescent lamps without integrated ballast, to all high-intensity discharge lamps, and to ballasts and luminaires used with such lamps.

The following aspects are addressed by requirements:

- Lamps:
  - energy efficiency
  - lamp lumen maintenance factor (speed of losing light because of aging)
  - lamp survival factor (lifetime)
  - product information.
- Ballasts:
  - energy efficiency
  - no-load consumption (standby)
  - product information.
- Luminaires:
  - product information
  - compatibility with lamps and ballasts.

In the case of lamps, the requirements allow a phasing out of the least efficient high-pressure mercury vapour lamps and of the halophosphate fluorescent lamps. Ultimately magnetic ballasts will be phased out, so that only efficient electronic ballasts will remain on the market (and logically only lamps and luminaires operating on electronic ballasts). The information requirements for ballasts include an energy efficiency categorisation where the "class" of the product is to be indicated on the appliance itself, on its rating plate. This merely involves the display of an alphanumerical code (e.g. "A1" or "B2"), not the display of a full label.

For luminaires, the requirements set at this stage are of preventive nature (by phasing out certain luminaires soon, they allow the gradual phase-out of inefficient lamp and ballast types used in those luminaires as replacement parts).

The different requirements are distributed and/or gradually reinforced in four stages (2010, 2012, 2015 and 2017). A review of the measure is foreseen in 2014.

Benchmarks for products used in public street lighting and office lighting

These non-binding benchmarks aim at further improving the environmental impact of non-household lighting products meant to be installed in public street and office lighting. Installation rules adopted at local or national level can make use of those benchmarks.

Some identified Ecodesign improvements for products used for office and public street lighting applications are not appropriate for the same product when used in other applications. Benchmarks on these products are given on the one hand on the same aspects as the requirements applicable to all non-household products, but set at more ambitious levels. On the other hand, benchmarks on the following additional aspects are introduced for *luminaires*:

- luminaire maintenance factor (how fast the optical system gets dirty and affects lighting performance)
- compatibility with intelligent control systems (presence detection, light responsive dimming etc.).

For public street lighting luminaires only:

- ingress protection rating of the optical system (protection against water and dust)
- light distribution requirements (determining how much light can be lost to the sky, thereby reducing light pollution).

Later Ecodesign and Energy Labelling regulations on lighting products

The 2007 preparatory study on domestic lighting resulted in two Ecodesign measures on lighting technologies typically used in non-industrial settings (household light bulbs[19] and

17. Commission Staff Working Document, Accompanying document to the Commission Regulation implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to Ecodesign requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps, and repealing Directive 2000/55/EC of the European Parliament and of the Council, Full Impact Assessment, C(2009)1891 SEC(2009)325, published at: http://ec.europa.eu/smart-regulation/impact/ia_carried_out/docs/ia_2009/sec_2009_0324_en.pdf, p. 39.

18. Commission Regulation (EC) No 245/2009 of 18 March 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to Ecodesign requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps, and repealing Directive 2000/55/EC of the European Parliament and of the Council, Official Journal of the European Union, L 76, 24.3.2009, p. 17–44.

19. Commission Regulation (EC) No 244/2009 of 18 March 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to Ecodesign requirements for non-directional household lamps, Official Journal

directional lamps[20]).The latter regulation includes sector-independent quality requirements also for light-emitting diode (LED) lamps, including for the ones meant for industrial lighting systems.

In 2012 the Commission services topped the three lighting Ecodesign implementing measures with an Energy Labelling delegated act[21] that replaced the previous 1998 directive on the Energy Labelling of household lamps.[22] Quite significantly, the restriction of scope to household products was removed in this delegated act, making it the first Energy Labelling act applying to non-household products. As a result, all the lamp technologies covered by Ecodesign are also covered by Labelling, regardless of application.

There are provisions on how to display the label so as to take into account the business to business nature of the transactions involved with professional and industrial lighting. The label does not need to accompany each product when they are not placed on display in shops, rather sold in bulk on the basis of catalogues. However, the label class needs to be mentioned not just when the product is presented in catalogues and websites, but also when any sort of tailor-made offer is made in response to an order.

The Regulation also introduces the notion of "final owner", as opposed to "end-user". Indeed, with professional lighting (as with all industrial products) it is almost the rule that the person using the product is not the one making the purchasing decision. It is the final owner that Energy Labelling should try to influence if we want to promote the more efficient technologies.

The rapid emergence of LEDs as the technology of the future in all sectors of lighting makes it clear that they are increasingly able to replace other technologies. They will certainly constitute one of the main aspects taken into account during the 2015 revision of the lighting measures.

REGULATIONS IN PREPARATION ON OTHER INDUSTRIAL PRODUCTS

In addition to the already existing or almost adopted regulations discussed above, the Commission has launched work on a number of other industrial products, on which implementing measures and/or delegated acts might be adopted in the forthcoming years. They are the following product groups:

- non-household washing machines, driers and dishwashers
- electric motors not covered by the existing Regulation
- industrial pumps
- industrial compressors
- non-residential ventilation
- professional refrigeration products
- industrial furnaces and ovens
- machine tools.

Up-to-date information about the status of the preparatory work can be found on the website of Directorate-General for Enterprise and Industry[23] and of Directorate-General for Energy[24] of the European Commission.

Challenges of applying ED and ELD to industrial products

SCOPE AND MINIMUM REQUIREMENTS (PRODUCT, SYSTEM)

Setting minimum requirements at system level presents a series of difficulties, but the additional saving potential compared to merely product-level requirements is huge. In the motors regulation, the simple requirement to link motors with variable speed drives resulted in a substantial increase in the improvement potential. According to the accompanying Impact Assessment, electricity savings of the most stringent option (all motors to reach IE3 efficiency level from 2015) would have been 64 TWh per year in 2020. By including the requirement of using a VSD in combination with certain motors, savings increased to 135 TWh per year in 2020, even maintaining IE2 motors in the market. Indeed, at product level, the requirements can only be the lowest common denominator so as to ensure that products remain available for all applications. Requirements set at system level can in principle be more targeted and therefore more ambitious, as the intended application and its characteristics are better known.

One of the main barriers to system-level requirements lies in the moment of application of the requirements. Implementing measures under the Energy Labelling and Ecodesign Directives apply in most cases when the product is "placed on the market", meaning that their application to a complete system where different manufacturers or suppliers provide different components is very complicated. There is also a risk of overlap with other regulatory instruments targeting the system in question.

The electric motors regulation got around the problem by requiring that low-efficiency motors can only be sold if accompanied by a variable speed drive. This is far from being a system-level requirement, but clearly has impacts beyond the product-level. Another typical work-around has been to tailor-make the product-level requirements for the intended application. Unfortunately, the intended application is not always possible to foresee at the moment of placing on the market. This difficulty was mirrored in the scope changes of early work on the non-household lighting products regulation (one of the first regulations to be adopted under Ecodesign in 2009). Article 16 of the Ecodesign Directive (2005/32/EC) designated "lighting in both the domestic and tertiary sectors" as priority product groups to be tackled in Ecodesign implementing measures. The Commission services decided to translate this request

of the European Union, L 76, 24.3.2009, p. 3–16, amended by: Commission Regulation (EC) No 859/2009 of 18 September 2009 amending Regulation (EC) No 244/2009 as regards the Ecodesign requirements on ultraviolet radiation of non-directional household lamps, Official Journal of the European Union, L 247, 19.9.2009, p. 3–5.

20. Commission Regulation (EU) No 1194/2012 of 12 December 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to Ecodesign requirements for directional lamps, light emitting diode lamps and related equipment, Official Journal of the European Union, L 342, 14.12.2012, p. 1–22.

21. Commission Delegated Regulation (EU) No 874/2012 of 12 July 2012 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of electrical lamps and luminaires, Official Journal of the European Union, L 258, 26.9.2012, p. 1–20.

22. Commission Directive 98/11/EC of 27 January 1998 implementing Council Directive 92/75/EEC with regard to energy labelling of household lamps, Official Journal of the European Union, L 71, 10.3.1998, p. 1–8.

23. http://ec.europa.eu/enterprise/policies/sustainable-business/Ecodesign/product-groups/index_en.htm

24. http://ec.europa.eu/energy/efficiency/Ecodesign/eco_design_en.htm

into three product groups, office, street and domestic lighting, on which separate preparatory studies were launched in 2005 (for the first two) and 2007 (for the third). When stakeholder discussions started in the Ecodesign Consultation Forum on the outcomes of the first two studies in 2007, it became obvious that the initial designation of the product groups based on applications (office and street lighting) was problematic due to the impossibility for the manufacturer to always foresee in which setting his product will be installed. The scope was therefore readjusted to cover the technologies typically used in street and office lighting, that is fluorescent lamps and high-intensity discharge lamps, regardless of application. This meant that the scope was enlarged to (among others) industrial lighting, which predominantly used these two technologies at the time. In spite of the two preparatory studies, a single implementing measure accompanied by a single impact assessment was adopted by the Commission in the end.

The application-dependent benchmarks in its Annexes VII and VIII of the regulation can be considered as an attempt to define levels of environmental performance that are dependent on the context in which the product is installed. The idea was that the benchmarks would be used by public authorities and other purchasing bodies when preparing specifications for procurement. Later, the provisions of these annexes were actually "recycled" in the Commission's Green Public Procurement criteria for street lighting and office lighting.

Implementing measures can also apply when the product is "put into service", if compliance at "placing on the market" cannot be checked. From a legal point of view, it is in theory possible to develop legislation that applies when the product is used for the first time, and some Regulations, such as Regulation 640/2009 on electric motors or Regulation 327/2011 on fans, already include the possibility of checking compliance when the product is put into service.

ECODESIGN REQUIREMENTS NOT FINE-TUNED FOR NATIONAL MARKET CONDITIONS

Industrial products, often embedded in complex manufacturing system or distribution networks, pose additional challenges over household products also from other respects. For instance, the fact that most transformers are integrated in electricity transmission and distribution networks, whose owners operate in markets regulated at national level, posed additional difficulties in the Ecodesign process. First, the very notion of least lifecycle cost, crucial in setting minimum requirements, was difficult to handle as electricity prices and discount rates, key parameters for transformers, can vary substantially across Member States. Second, the economic modelling underpinning the analysis could not possibly capture all the specificities related to the operation of transformers in real life (e.g., retrofitting issues in listed buildings, transport and installation challenges, integration of renewable sources, etc. …). All this required additional caution in setting minimum efficiency requirements, so as not to impose costs on final users which were not economically justified.

ELIGIBILITY (INDICATIVE 200,000 UNITS SOLD EVERY YEAR)

Contrary to what occurs in mass product markets, EU annual sales of some industrial products which fall under the scope of the Ecodesign Directive may be in the range of a few hundred thousand units or even tens of thousands of units. In this case, the indicative criteria set out in Article 15 of the Directive need adequate interpretation. The practice in existing implementing measures shows that it has been sufficient if the total energy saving potential of the product market in question is significant, as well as the scope for achieving improvements in energy efficiency and possibly in other environmental impacts related to the specific product.

CONFORMITY ASSESSMENT AND MARKET SURVEILLANCE

The verification of compliance with Ecodesign requirements in certain industrial products may get complicated after they have been put into service. The conditions set out in standards for measuring certain parameters may not be met when products are already in operation, or the testing may simply impose additional costs on users, which may be difficult to justify. This is for instance the case with medium and large power transformers. In those cases, verification may need to be done based on a combination of self-declarations of conformity and testing at manufacturer's premises, before products are put into service. For this reason some actors are advocating the use of third party certification by the manufacturers for conformity assessment.

Traditionally, conformity assessment in Ecodesign Regulations has been based on self-declarations by economic operators responsible for placing products on the market or putting them into service. However, there is a debate in the Ecodesign community on the need to introduce third-party verification of conformity with minimum requirements in Ecodesign regulations. The forthcoming review of the Energy Labelling and Ecodesign Directives offers the possibility to explore the pros and cons of third-party verification versus self-declaration and make those choices that will facilitate an effective enforcement of Regulations.

METHOD OF PRODUCT INFORMATION

In the case of fluorescent lamp ballasts, it was the Ecodesign implementing measure that introduced the product information requirement of providing the efficiency class of the ballast on its rating plate. So why would we need separate labelling acts at all for industrial products, if information provision to the "consumer" is not channelled via brick-and-mortar shops where energy labels could be displayed? What use is there in having label classes for industrial products, since buyers are professionals who know how to rate the energy efficiency of a product, on the basis of other product information?

The advantage brought by establishing label classes is objective comparability across the EU, and also against the best products (benchmarking). Besides, contrarily to the Ecodesign Directive, the Energy Labelling Directive allows the setting of requirements not only on the manufacturer, but on the distributor as well, who in a business-to-business context can be required to indicate the label class on any form of financial offer they make about a particular product. The delegated act on the Energy Labelling of lamps introduces such requirement, requiring the display of the full label only when the product is on display in a shop, or in a web catalogue destined at end-users. Indeed, a difference between household and industrial products needs to be recognised also in the target of product information: it is not the end user, but the final owner (see discussion above, under the Energy Labelling of lighting).

Conclusions

The EU's Ecodesign and Energy Labelling directives helpfully complement other legislation in improving the energy efficiency of industrial installations, through requirements set at the product level. Implementing measures and delegated acts also affect products installed in applications that are improved by system-level legislation or policies. Through the measures on motor driven systems and distribution transformers alone, it is estimated that 211 TWh of electricity will be saved yearly by 2020 in industry, which in itself would represent 12 % of the EU's 2020 energy saving target (assuming a primary energy factor of 2.5). However, this figure is derived from the individual impact assessments of the product measures, and does not take into account overlaps with other applicable legislation, and possible rebound effects. The savings that can be attributed to these regulations in particular are therefore much lower probably.

The setting of Ecodesign and Energy Labelling requirements for industrial products is not without difficulties:

1. Regulations have been introducing innovative solutions to reach beyond the product level and impose requirements on the environment in which the product operates. However, these attempts still fall far from introducing real requirements at the system level, which would have the biggest saving potential. The forthcoming review of the two framework directives will certainly examine how far they can extend towards systems before they start to overlap with other applicable EU legislation or run into practical difficulties.
2. The indicative nature of the criterion of 200,000 units sold per year before a product can be targeted by requirements had to be exploited for some industrial product groups that are placed on the market in substantially lower quantities per year.
3. There have been question marks also about the conformity assessment by manufacturers and Member State market surveillance of industrial products, especially the ones which are made-to-order and/or assembled on location, in terms of ensuring standard measurement conditions and no undue costs/disruption to the users of the products. Practice will show which of the solutions outlined in the implementing regulations are viable (such as surveillance carried out at the manufacturer's premises).
4. Although the previous review of the Energy Labelling directive has extended the scope to all products, few delegated acts have made use of the opportunity to start labelling industrial products. In spite of general doubts about the feasibility and use of their labelling, the delegated act on lamps requires the display of the label class of lamps sold in a business-to-business context. It remains to be seen whether these provisions will have a measurable impact on the popularity of more efficient industrial lighting.

All in all, at this stage, the Ecodesign and Energy Labelling of industrial products are still very much in development, where existing framework rules are elaborated further through the practice of implementation (legislation and application), and new rules may be created soon through the review of the related framework directives.