Annex 2

Working document on possible ecodesign requirements for single stage end suction, vertical multistage and submersible multistage pumps

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Subject matter

This working document pursuant to Directive 2005/32/EC establishes eco-design requirements related to circulators. The Lot 11 preparatory study shows that energy in use phase is the only significant environmental aspects. Ecodesign parameters referred to in Annex I, Part 1 of Directive 2005/32/EC, are not considered as significant.

Definitions

Electric pumps are considered as EuPs within the meaning of Article 2.1 of Directive 2005/32/EC. For the purposes of this working document the following definition shall apply:

'Electric pumps', hereafter called pumps, means pumps used for clean water duty with specifications as follows:

1. Single stage end suction water pumps in three categories:

- end suction own bearing (ESOB);
- end suction close coupled (ESCC);
- end suction close coupled in-line (ESCCi)

with characteristics as follows:

- operating temperature between -10 and +120°C;
- single suction, single impeller;
- all efficiencies based on full (untrimmed) impeller.

The parameters of speed n, flow rate Q_{BEP} and total dynamic head H_{BEP} are used to calculate the specific speed ns, is calculated according to the formula:

$$n_s = n \cdot \frac{\sqrt{Q_{BEP}}}{H_{BEP}^{\frac{3}{4}}}$$

Limits: QBEP min = 6 m³/h, ns min = 6 rpm,
ns max = 80 rpm, P max = 150 kW
H max = 90 m at 1450 rpm,
H max = 140 m at 2900 rpm

2. Vertical multistage (MS) water pumps with characteristics as follows:

- operating temperature between -10 and +120°C;
- vertical multistage pumps in in-line and ring section design;
- 2900 rpm pumps only;
- efficiency is measured and judged on the basis of a 3 stage pump.

Limits: QBEP ≤ 100 m³/h, n = 2900 rpm

3. Submersible multistage (MSS) pumps with nominal size 4” and 6”.

Ecodesign requirements

Products falling under the definitions of paragraph "Definitions" above in this document shall meet the ecodesign requirements set out in Annex I.

Measurement and calculation method

The efficiency of the pump shall be tested as described in Annex II and in accordance with EN ISO 9906-1999 class 2.

Information requirements for components and sub-assemblies

No information requirements on manufacturers of components and sub-assemblies of pumps are proposed. The Lot 11 preparatory study and stakeholders identified several system and installation related requirements that could be useful but not possible or efficient to be addressed with ecodesing requirements.

Conformity assessment

A conformity assessment shall be carried out according to Article 8(2), and Annex IV (Internal design control) or Annex V (Management system for assessing conformity) of Directive 2005/32/EC.

Market surveillance

When performing the market surveillance checks referred to in Directive 2005/32/EC, Article 3 (2), Member State authorities shall apply the verification procedure set out in Annex II of this working document.

Benchmarks

The benchmarks for best products in terms of energy efficiency are the C 80% values, as indicated in Annex I.

Review

A review of the foreseen implementing measure shall be presented to the Consultation Forum depending on technological progress and not later than 5 years after its entry into force with the objective of aiming at minimum energy performance requirements in line with least life cycle cost levels.

Annex I: Ecodesign requirements

Electric pumps shall meet the ecodesign requirements set out in this Annex.

a) First staged minimum energy efficiency requirement

One year after the proposed implementing measure comes into force, the C = 10% value will apply for the measurement of energy efficiency of a pump. Values of C for each type of pump are shown in table 1.

Table 1: Values for pump energy efficiency levels

	Quantity cut-off									
	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%
C (ESOB 1450)	134.38	132.58	131.70	130.68	129.35	128.07	126.97	126.10	124.85	122.94
C (ESOB 2900)	137.28	135.60	134.54	133.43	131.61	130.27	129.18	128.12	127.06	125.34
C (ESCC 1450)	134.39	132.74	132.07	131.20	129.77	128.46	127.38	126.57	125.46	124.07
C (ESCC 2900)	137.32	135.93	134.86	133.82	132.23	130.77	129.86	128.80	127.75	126.54
C (ESCCI 1450)	138.13	136.67	135.40	134.60	133.44	132.30	131.00	130.32	128.98	127.30
C (ESCCI 2900)	141.71	139.45	137.73	136.53	134.91	133.69	132.65	131.34	129.83	128.14
C (MS 1450)	134.83	134.45	133.89	132.97	132.40	130.38	130.04	127.22	125.48	123.93
C (MS 2900)	139.52	138.19	136.95	135.41	134.89	133.95	133.43	131.87	130.37	127.75
C (MSS 2900)	137.08	134.31	132.89	132.43	130.94	128.79	127.27	125.22	123.84	122.05

b) Second staged minimum energy efficiency requirement

Four years after the proposed implementing measure comes into force, the C=40% cut-off values indicated in Table 1 will apply for the measurement of energy efficiency of a pump.

c) Product information requirement

One year after the proposed implementing measure comes into force, labelling of the top 20% efficiency pumps must be proposed as a basis for a one-level 'best in class' efficiency label based on the corresponding C values.

d) Benchmark for best products

The benchmark for best product in terms of energy efficiency is the C=80% values.

Annex II: Measurement and calculation procedure

The efficiency of the pump shall be tested as described in this Annex and in accordance with EN ISO 9906-1999 class 2.

The mathematical description of the efficiency levels is based on the following equation[1]:

$$\eta_{BOT} = -11.48\,x^2 - 0.85\,y^2 - 0.38\,xy + 88.59\,x + 13.46\,y - C$$

with
$x = \ln(n_s)$ with n_s in $[min^{-1}]$
$y = \ln(Q)$ with Q in $[m^3/h]$

[1] The equation is valid for quantity cut-offs from 5% to 80%. The mathematical scope of the equation is $6 < n_s < 120$ $[min^{-1}]$ and $2 < Q < 1000$ $[m^3/h]$. The plausibility has to be checked according to the cut-off criterion.

Explanatory Notes

This working document is meant to contribute to achieving the requirements of Article 16.2 of Directive 2005/32/EC in relation to pumps. The proposed ecodesing requirements are set out based on the recommendations of the preparatory study.

Form of the implementing measure

The intention is to give to the implementing measure the form of a directly applicable decision or regulation.

Definitions

For pumps covered by this working document, the definitions are restricted to commonly agreed technical parameters.

Scope

The scope of the working document includes electric pumps used for clean water duty, as specified above.

On top of the proposed eco-design requirements the Commission recommends complementary measures to be taken at national, regional and local authorities: in their public procurement procedures, they would be encouraged to require for circulators the minimum energy efficiency values of the second introduction already from the beginning of this measure.

Exclusions

Excluded from the working document are pumps, which may have special features to cope with the following operating requirements:

- fluids with particularly high or low temperatures;
- aggressive fluids, such as acid, flammable or explosive;
- matter to be pumped that needs careful handling, e.g food processing;
- precision measurement of fluids;
- pumping of fluids with high solids content, such as waste water treatment.

Ecodesing requirements

The Lot 11 preparatory study shows that energy consumption in the use-phase completely dominates the life-cycle impact of pumps. Accordingly, the working document sets only ecodesign requirements and benchmarks in form of minimum energy efficiency requirements.

The Lot 11 preparatory study has shown that the proposed minimum energy efficiency requirements up to 70 % cut-off levels lead to considerable reduction in least life cycle cost to the consumer across all pump types covered by this working document. The study also shows that there are no technical barriers to achieving these efficiency levels. The preparatory study

shows that setting minimum energy efficiency requirements at 40% cut-off rate is claimed to cost the industry some 400 MEUR for re-designing pumps and to put in to production the necessary new designs. This is why the requirements are introduced in 2 stages, which will allow the industry to adapt.

The Lot 11 preparatory study did not identify any need to regulate, or make recommendations on, engineering or end-of-life treatment practices, nor were these recommendations made by stakeholders.

No ecodesing requirements are set on noise levels as rotating electric machines are regulated by the IEC 60034-9 standard, which specifies maximum A-weighted sound power levels (*L*WA) for airborne noise emitted by rotating electrical machines and as a pump of the types covered in this working document operating under optimum conditions should be less noisy than its motor.

The preparatory study shows that installation and maintenance are of major importance for the efficiency of a pump system and must be taken into account when defining and installing the system. No installation requirements are identified for the pump itself.

Pumps are mainly built with materials that are recyclable and that have a very high value (e.g. steel, aluminium, copper). Therefore the majority of pump materials are recycled at the end-of-life.

Energy labelling

The scope of the Energy Labelling Directive 92/75/EEC does not allow setting labelling schemes on pumps. The Directive is under revision and the scope could be broadened to include pumps. However, the magnitude of allowed tolerances under the current ISO 9906 class 2 test standard compared to the observed spread of efficiencies for each type of pump mean that comparable multi-level efficiency labelling schemes are inappropriate.

In principle, a requirement for the display of the energy efficiency level could be useful to be requested on the name plate and on the documentation of the product. However, it would be misleading in the case of pumps, as the actual efficiency of the pump depends on the actual impeller diameter and the duty for which the pump is purchased; the actual duty could be different to the pump duty. Instead, a labelling of top 20% efficiency pumps could be proposed as a basis for a 'one-level best in class' efficiency label.

Benchmarks

Given that the preparatory study identifies energy consumption in use as the only significant environmental impact the benchmark for best product is set in terms of energy efficiency.

Measurement methods

Efficiency and losses shall be tested in accordance with the Annex II in accordance with EN ISO 9906-1999 class 2.

Market structure of the products covered

The commodity pump market is led by a few multinational companies, who have worldwide manufacturing facilities, but with a trend towards production in regions with lower cost of labour. Production in Europe is cost effective for higher-priced commodity pumps. The proposed requirements will help the European industry to focus on this segment of pumps.

Impact on other EU legislation

No impact of the proposed requirements has been identified on other EU legislation. The proposed encodesign requirements will support the objective of the Energy Performance of Buildings Directive 2002/91/EC (EPBD) in helping to increase the efficiency of the building's heating and warm water system.

Voluntary agreements

There are no directly relevant voluntary agreements on water pumps within the scope of the study. There is a Europump/SAVE pump efficiency selection guide that gives procurement advice on the efficiency of end suction close coupled and own bearing pumps.

International dimension

There are two pump efficiency schemes in the world; a voluntary certification pump efficiency scheme in Korea and a mandatory national standard of recommended efficiencies in China, which aim at stopping imports of low efficiency pumps. The proposed requirements will help the EU to reach the same objective.