Energy Using Product (EuP) Directive Preparatory Study

Lot 11: Circulators In Buildings

First Stakeholder Meeting

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1 Product Definition, standards and legislation - 1.1.1 Product classification

Circulator: *an inline pump used to re-circulate heating or cooling media within a closed circuit*

- Applications:
  - Household & small commercial:
    - Central heating systems
    - Hot water systems
    - Under floor or wall heating systems
    - Thermal solar heating systems
    - Heat pump systems
  - Large commercial central heating systems or district heating systems
  - Air conditioning and cooling applications

1 Product Definition, standards and legislation - 1.1.1 Product classification

- Boundary between ‘pumps’ & ‘circulators’
- Technology type
  - *Centrifugal, glandless, combined motor & pump*
- Heating & cooling applications
  - *Limited market data for cooling apps*
- Size range
- Stand alone or integrated (into boilers)
- Other classification systems

1 Product Definition, standards and legislation - 1.1.1 Product classification

Recommended Criteria

- Rated 2500W and below (for each pump head on twin pumps)
- Centrifugal type
- Wet running (glandless)
- Integrated unit (pump and motor)
- For heating applications

Most popular size range: P1 = 60W-65W

1.1.2 Definition of Primary Functional Parameters

Flow (m^3/h) and Pressure (m)

Inlet dia & max head (closed valve) or flow & range of operating head

Power consumption (P1)

1.1.3 Definition of Secondary Functional Parameters

Pump volume.
Pump weight.
Position and size of fixing holes.
Bearing arrangements.
Noise.
Expected lifetime of the pump.
Seal arrangements.
Net Positive Suction Head
Minimum clearances required.
Efficiency.
Material
Motor type
Control type

1.2 Inputs on relevant harmonised standards for performance testing/energy use/health and safety

1.2.1 Testing

EN 1151-1:2006

- circulation pumps
- <200W
- heating applications

This standard permits a wide tolerance in operating head. There are no tolerances specified for the measurement of operating pressure, flow rate, or motor input power.

Consequently catalogue data will be inaccurate

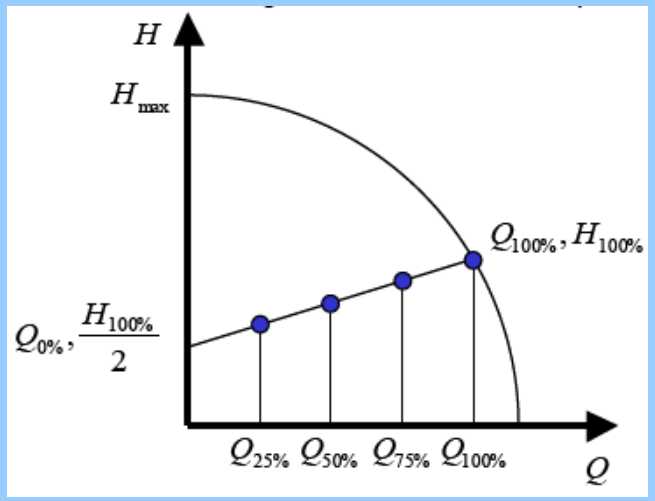
What about circulators > 200W ? (EN ISO 9906-1999?)

The wide efficiency tolerances could make efficiency classification difficult

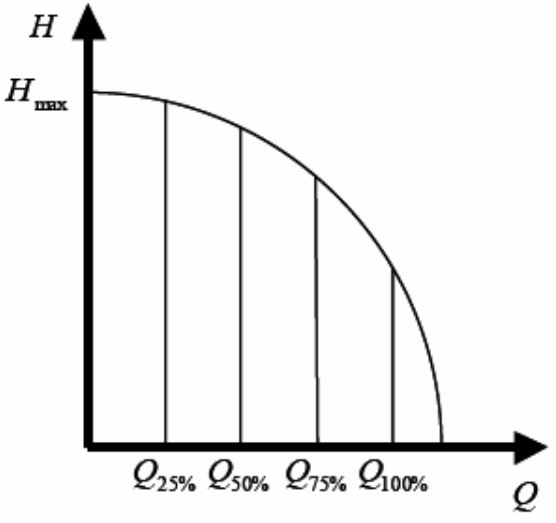
1.2.2 Harmonised Standards – energy use

Europump classification scheme for circulators

- uses German ‘Blue angel’ load profile



Flow [%]	Time [%]
100	6
75	15
50	35
25	44



1.3 Existing relevant environmental legislation inside and outside EU, existing self regulation

- Energy Performance of Building Directive (EPBD) – *regular mandatory inspection of boilers and air conditioning systems in buildings*
- Electromagnetic Compatibility Directive (EMC)
- Machinery Directive 89/332/EEC
- Waste Electrical and Electronic Directive (WEEE)
- Restriction on the Use of certain Hazardous Substances in Electrical & Electronic Equipment (RoHS)
- Low Voltage Directive (LVD)
- ISO EN 809:1998 (**Common safety requirements**) is the most relevant document for general mechanical construction.

Energy related

- Europump Circulator classification & voluntary labelling scheme

2 Economics and Market

– 2.1 Macro data on EU trade, production and apparent consumption

The Primary Data for all preparatory studies is Eurostats

There are known inaccuracies related to the Eurostats database, but it is still the primary source of statistics for all studies.

We have also received data from Europump which provides a "cleaned up" source of data, although we recognise that this is still subject to uncertainties

SAVE II study

Once we understand what the definitions of products are in both sets of data, we will "adopt" one as standard.

We will also reference the SAVE II study data.

Europump & Eurostats data lacks granularity, Europump preferred

We must always refer back to Eurostats as the ultimate source.

Eurostats – Net EC Consumption (1998)

DECLARANT / PRCCODE 29122417 Glandless impeller pumps for heating systems and warm water supply	PRODUCTION, 1998, UNITS	IMPORTS, 1998, UNITS	EXPORTS, 1998, UNITS	NET ANNUAL CONSUMPTION, 1998
France	5,274,054	580,902	4,607,107	1,247,849
Netherlands		410,072	12,698	397,374
Germany	905,063	2,634,527	1,484,211	2,055,379
Italy	178,587	1,950,736	267,085	1,862,238
United Kingdom	-	281,640	940,779	659,139
Ireland		62,323	176,200	113,877
Denmark	2,717,683	51,575	2,540,621	228,637
Greece	-	193,532	11,883	181,649
Portugal	-	17,586	-	17,586
Spain	1,709	379,867	30,558	351,018
Belgium	-	225,574	1,174	224,400
Luxemburg	-	-	-	-
Iceland	-	-	-	-
Norway	-	-	-	-
Sweden	75,552	205,108	10,148	270,512
Finland	-	9,859	4,473	5,386
Austria	-	220,887	6,782	214,105
Estonia				
Latvia				
Lituania				
Poland				
Czech Republic				
Slovakia				
Hungary				
Romania				
Bulgaria				
Slovenia				
Croatia				
TOTAL	9,152,648	7,224,188	10,093,719	**6,283,117**

Europump – EC Sales data (2006 estimate)
Heating Circulators

Segment	Number	Average Input kW (Annual running hours)	Total linked GWh
Heating Circulators	14,000,000	0.15 (3,000)	6,300

NB We originally received 1998 data, but Europump has now supplied this 2006 data, which is their current best estimate. We are reviewing the assumptions behind this

Europump – EC Sales data (2006 estimate) for circulators

	Production	Delta France	Delta Belgium	Delta N.L.	Delta Italy	Delta GB	Delta DK	Selta South	Selta Sca	Delta Austria	Germany	Market	Considered
Heating circulators	10 000 000	-4 000 000	350 000	600 000	1 700 000	-350 000	-1 500 000	620 000	250 000	250 000	2 700 000	10 620 000	14 000 000

Selection of Circulators for this study

Need to establish typical operating parameters

Suggest:
Circulators with P1 <90W (P1 = 65W most likely)
Flow = 1.7m3/hr
Head = 3m

Other parameters:

Motor type -
Control type -
Port sizes -

2.1 Micro market data on prices, sales, installed products, established for reference years in the past (1990), present (most recent) and future (2010 – 2020, stock model calculations).

- We will request typical selling prices for basecase reference models and past and future projections.
- Stock is obtained from consultation with suppliers and recognised data sources

2.2 Market trends in product features and key parameters (eg energy use, product weight) of best products.

Labelling scheme taking effect:

- Variable speed circulators increasing.
- Higher efficiency motors (permanent magnets).
- Better hydraulic design.

- Trend towards incorporating into boilers.

This is not exhaustive – what important factors are missed out?

What references do we have to support the above statements?

Implementing measures should refer to the function, not the features. We therefore cannot explicitly support a particular feature – rather have to set eco-levels at a level that indirectly support it.

2.3 Consumer expenditure: Rates, tariffs, prices, multiplier product costs/consumer prices.

- We have requested EC electricity price projections.
- What are the non-energy running costs?

E.g. spares, maintenance time and associated travel.

What about the cost of downtime?

Later we will do scenario analysis of different electricity prices.

3 Consumer Analysis and Local Infrastructure

3.1 Real load efficiency (vs. nominal)

Mostly operating to the left of the BEP – hence actual real life efficiency below BEP.

- Installers configure to max speed setting
- TRV's cause variable flow demand

3.2 – 3.4 System characteristics

Taking account of the factors that cause a circulator to work below BEP, we are suggesting that the average circulator is working 10-20% below BEP.

3.5 Environmental affects on circulator energy consumption

- Regional climatic influences, running hrs Etc.

3.6 Scope for consumer influence on circulator energy consumption

- Depends on how circulator is controlled

3.7 Affects of fuel mix on energy consumption (CO_2 impact) by circulators

- Primary fuel sources will affect CO_2 impact of circulators with different efficiencies.

3.8 Temperature/timer settings

Programmable running times / temperature settings for the heating system

3.9 Dosage of aux. inputs during use

Most circulators are maintenance free.

3.10 Economical Product Life

13 years

3.11 End-of-Life actual behaviour (present fractions to recycling, re-use, disposal, etc) Product Life (=in practice)

- Ask for suggestions from stakeholders on lifetimes.
- Which are repaired, which replaced?

How many circulators are replaced when the boiler is replaced?

What happens to old circulators when they are replaced?

3.12 Best Practice in Sustainable product use

Correct circulator selection

Correct configuration

Appropriate controls

Appropriate timer settings

Proper system design

3.13 Local infrastructure (energy, water, telecom, physical distribution, etc)

- (System configuration and controls)

Next steps in the Ecoimpact methodology
5 Definition of Basecase*

- *Selection of average EU representative model or construction of average EU model characteristics from several important product-subcategories in the product group.*

- *Definition of STANDARD BASECASE, i.e. the environmental impact, functionality and Life Cycle Costs for a reference year measured according to harmonised test standards (that would also be used for compliance testing.)*

- *Definition of REAL-LIFE BASECASE, i.e. the (estimated) environmental impact, functionality and Life Cycle Costs in real life for a reference year with actual consumer behaviour and ambient conditions.*

* Step 4 is Technical analysis of existing products, but this step is merged into others at this stage

Summary of data needed to run the model

Production Phase

- Bill of Materials (BOMs), including packaging
- Manufacturing processes
- Proportion of scrap raw materials produced
- Volume and weight of the packaged product

Distribution Phase

- Volume and weight of the packaged product.

In Use Phase

- Product lifetime
- Lifetime energy Consumption according to both test standards and the real-life situation.
- Decline in efficiency over time
- Repairs (parts, cost and eco-impact of personnel involved, eco-impact of affected production processes)
- Any product specific direct emissions

End of life phase

- Proportions close-loop recycled, re-used, sent to landfill

6 Technical Analysis Best Available Technology (BAT)

- *State of the art in applied research of the product (prototype level)*
- *State of the art at component level (prototype, test and field trial level)*
- *State of the art of best existing production technology globally (extra-EU)*

For Discussion….

7 Improvement Potential

- *Identification of design options:*
- *Their monetary costs (extra production cost*multiplier = end-use price increase) and – if any – benefits (lower operating expense)*
- *Their environmental benefits and – if any – adverse environmental trade-offs.*
- *Ranking of options according to Life Cycle Costs/Payback Period and identification of point of LLCC, with its environmental improvement potential.*
- *Assessment of (cluster of) options with the highest absolute environmental saving potential: the so-called Best Available Technology BAT, with its environmental improvement potential.*

The critical thing is to focus on the differences between the different design options.

8 Scenario, Policy, Impact and Sensitivity Analysis

- *Policy and scenario analyses: Assessment of what is "significant", "appropriate", etc. and what policy measures are appropriate, what would be the gain over "business as usual" etc. We need to be careful to only specify the effects of different options, not enter into discussion about what might be desirable.*
- *Impact analysis industry and consumers: investment level, appropriate timing (in line with platform change) – a critical point for manufacturers*
- *Sensitivity analysis; test of the robustness of the "significant environmental aspects", varying base assumptions. What factors really matter?*

We will also need to consider the impact in different countries – in general terms pump use is so diverse that it is not practical to differentiate impact in different countries. However, for some specific types there are trends which we will explore once the final choice of pumps has been made, (eg submersible well pumps, apartment circulators).