

EUP PREPARATORY STUDY LOT 11
MOTORS (SUB-STUDY)
MINUTES THIRD STAKEHOLDER MEETING

Venue: EC, Brussels
Wednesday 2 May 2007

List of Participants:

Justin Brock, AEA Energy & Environment
Hugh Falkner, AEA Energy & Environment
Anibal de Almeida, University of Coimbra
Peter Radgen, Fraunhofer ISI
Julia Oberschmidt, Fruanhoffer ISI
Bill Cory, Independent Consultant
Ismo Gronroos-Saikkala, European Commission
Kerstin Lichtenvort, European Commission
Johannes Anschutz, Grbhardt Ventilatoren
Conrad U. Bruner, AB International
Alain Buisson, Leroy-Somer
Thomas Damm, VDMA
Dan Hopkins, Flaktwoods
Neil Jones, Flaktwoods
Alberto Pirovano, Soler&Palau
Bernhard Sattler, ZVEI
Hans-Paul Siderius, Senter Novem
Uwe Sigloch, ebmpapst
Heikki Stenberg, Flaktwoods
Philippe Thiery, Leroy Somer

These minutes record the main issues and outcomes discussed at this third stakeholder meeting. The agenda of this meeting was posted on the study web-site in advance of this meeting, and an e-mail sent to all registered stakeholders to alert them to these web-site updates. The discussion and questions raised were based on the contents of the third report also posted on this web-site in advance of the meeting.

<http://www.ecomotors.org/files/EuP%20Lot%2011%20Motors%20Interim%20report%20March2007.pdf>

Key Decisions and Actions

The first stages of the study, regarding product definition, categorisation, test and efficiency standards are considered essentially completed, although new information can be added as it becomes available.

The preliminary analysis of existing products (BaseCase and BAT) was presented showing the LCC, for different number of operating hours (2000 to 8000) and assuming a load factor of 60%, derived from a previous large scale European study. It was

suggested to extend the number of operating hours in the lower range to show the cross-over points for the different power levels.

In order to perform the preliminary analysis of existing products (BaseCase and BAT) some assumptions were made regarding:

A- Motor prices

** Star/EFF1 prices are typically 20-30% above EFF2 motors price.

*** Star Premium prices are typically 40-60% above EFF2 motors price.

A 40% discount over list price is in all motors assumed, based on information from a limited number of manufacturers. A wider source of information (e.g. CEMEP) is desirable

Action: Stakeholders, including manufacturers

Are there further reactions on the base case motor prices and assumptions proposed in the report?

B- Repair and maintenance

A value of 2,5 repairs is assumed for BaseCase motors over 5 kW and of 2 repairs for BAT motors over 5 kW. Energy-efficient motors have lower losses, running cooler, leading to longer lifetime. The number of repairs was considered independent of the motors lifetime and the number of operating hours. The Mean Time Between Failure is influenced by several factors, including the number of operating hours, the load factor, the bearing load, the number and frequency of starts, and the environmental conditions. Typically in industrial applications, motors which operate a smaller number of hours are used in a more frequent start-stop cycle, which somehow balances the reduced wear of the lower number of operating hours.

Replacement windings and bearings were considered in the BoM as 2.5 times the weight of the original corresponding parts for the BaseCase and 2 times the weight of the original corresponding parts for the BAT

Action: Stakeholders, including manufacturers

Are there additional comments on these assumptions?

Best Available Technologies (BAT)

State-of-the-art at product level:

- Two levels of High Efficiency Induction Motors were considered for analysis:
 - ** Star/EFF1 and
 - ***Star/Premium

Although ***Star/Premium motors are the BAT, because of the EU market conditions it also seems desirable to consider ** Star/EFF1 motors and an intermediate efficiency level.

Whereas in North America NEMA Premium motors are easily available, in Europe ***Star/Premium 50 Hz motors are not yet available for all power levels. Due to this market situation it was decided to analyse ***Star/Premium types of motors as BAT and also to analyse ** Star/EFF1 levels, showing all the relevant aspects.

- Brushless DC Motors
This type of motor is not yet a standard product, but it is already manufactured in large quantities and presents a large potential for efficiency improvement, particularly in the low power range.

Action: Stakeholders, including manufacturers

Stakeholders are requested to provide BoMs for BLDC motors (1.1 kW and 11 kW).

Stakeholders are requested to provide efficiency curves for BLDC motors.

What are the sales numbers for BLDC motors?

What are their typical lifetime and prices (1.1 kW and 11 kW)?

State of the art at component level (prototype, test and field trial level).

- Copper rotors
Copper rotors are a recent development for low and medium power motors. Copper rotors affect not only the efficiency but also the BoMs (and materials cost), power density, rotor inertia, and the starting torque. Therefore copper rotors appear as a design option with trade-off effects which need to be carefully considered.

Action: Stakeholders, including manufacturers

Stakeholders are requested to provide BoMs for **Star/EFF1 or ***Star/Premium copper rotor motors (1,1 and 11 kW).

Stakeholders are requested to provide efficiency values (50% and 100% load) for these motors.

What are the sales numbers for copper rotor motors for different power levels?

What are their typical prices of **Star/EFF1 or ***Star/Premium copper rotor motors (1.1 kW and 11 kW)?

System analysis for Integrated VSD Application

The study will also include a section on integrated induction motor-VSD for Variable load applications (e.g. Pumps, Fans and Compressors).

For completeness of assessment, it was decided that 110 kW motors with VSD (although not integrated) will also be analysed.

Action: Stakeholders, including manufacturers

Stakeholders are requested to provide BoMs for integrated motor-VSD.

Stakeholders are requested to provide efficiency curves for integrated motor-VSD.

What are the sales numbers for integrated motor-VSD by power level?

What is their typical lifetime and prices?

Which typical load profiles to use for analysis?

(Note fan and pump studies may provide some load profiles)

Best Not Available Technologies (BNAT)

Proposed technologies for analysis:

- Line-start permanent magnet motors as commodity products
- Switched reluctance motors as commodity products
- High Temperature Superconducting motors

Action: Stakeholders, including manufacturers

Are any other technologies proposed to be considered as BNAT?

Scenario, policy, impact and sensitivity analysis

While this project is explicitly not about defining policies, it will look at the impact of any changes in behaviour that might result from any EC legislation or voluntary actions, as well as changes in key influencing factors (e.g. number of operating hours, load factor, electricity prices, material prices).

Action: Stakeholders, including manufacturers

For sensitivity analysis the impact of several parameters will be analysed:

- number of operating hours -1000-8500 hours
- load factor – 25-100%
- electricity prices – 0.05-0.10 €/kWh
- price of motors (proxy for material prices 100-200% of 2007 prices)

Which other scenarios or conditions are proposed to be considered?