



Study Committee A1- Electrical Rotating Machines
Advisory Group A1-06
Large Motors
Tuesday, 24 August 2010
Palais des Congrès, Paris, Room 351
11:45 to 12:45

Attendees: 62 from 23 countries.

1) Introduction:

The one in Paris has been the first meeting of AG A1.06 after Sidney.

Please note that the previous meeting in Sidney had been run perfectly well by Oscar Martinez, Secretary of the Study Committee, replacing the A1-06 Convener: many thanks to Oscar again for the precious work!

For the benefit of Newcomers it has been underlined, once again, that the group is focused on motors with more than 800 kW and 1000 V for power stations, and the motors for industrial applications are out of scope.

As usual, this group meets once per year, in combination with the Study Committee A1 annual meetings.

Work is done by National Experts through questionnaires or guide-lines. Each questionnaire is run by one or more Experts, and communication held via e-mail.

2) Historical Works:

Again for the benefit of Newcomers the list of historical has been presented:

“Variable speed drives experience”, Electra 1998

“Practices and specifications for the rewinding or the refurbishing of large electric motors”, Electra 2002

“Motor condition monitoring”, Electra 2002

“Survey of practices and specifications of auxiliary motors of power stations”, Electra 2002

“High-efficiency motors”, Web 2005

“Experience in VPI machines to-date”, Web 2005

“Update of ASDs part1; technology aspects”, Web 2005

“Update of ASDs part 2; applications”, Web 2005

“Soft-start”, Web 2005

“Motors for nuclear applications” released for publishing in 2006, Web in 2009

“Perception of large motors” report ready to be published in 2007, Web in 2009

“Power Station Large Motors Requirements in the Field of Standards “(WG A1.08), Electra July-August 2010

Some important conclusions about the previous questionnaires are:

- The enthusiasm for ASDs in the field of energy seems lower now than in the past and than expected too

- Service of motors and relating matters are still of some interest
- Motors in power stations are mainly considered commodities and the most important parameters become availability/and reliability
- New developments are not foreseen at the moment (no breakthrough)
- Special designs (i.e. high-efficiency motors and magnetic wedges motors) are more related to small-sizes
- Data about motor failure are usually available only c/o Users

and in the case of the last questionnaire of the list, i.e. the one on Standards (see the number of August of Electra):

- Impressive list of different standards used
- In some cases the national standards are more stringent than the international ones
- Standards are generally not suitable for adapting to different specific applications; other important inadequacies are related to repair, testing, monitoring and diagnostics activities
- There are areas for International Bodies for improving and harmonizing actual standards.

3) Update and discussions about active works:

- a. Guide of Methods of Determining the Condition of Stator Winding Insulation and their Effectiveness (WG A1.17), run by S. Rodriguez (SP).

The status of the WG has been updated by the Convener during the meeting in Paris.
The latest version of the program is as follows:

1. TOR approved the 11 December 2008
2. Agenda with Contents and Index, vers 0, June 2009
3. Vers. 1 of the draft of the above document, August 2009 (see the attachment)
4. Final assessment, Paris 2010
5. Draft version of the guide for comments, December 2010
6. Comments on the document , end of February 2011
7. Final version of the guide (TB format) ready for approval, meeting in China 2011
8. Technical brochure, October 2011
9. Tutorial, November 2011

During Sydney meeting 2009 the WG had been divided into three Task Forces :

- **TF1.- WINDING MANUFACTURING PROCESS**

Factory Quality Test and Requirements.
Brief description about Modern insulation systems
Brief description about materials used.

- **TF2.- STATOR WINDING INSULATION TYPICAL DEFECTS.**

Description of each possible insulation winding defect.

What Insulation systems or machine operation is more prone to suffer each case.

TF3.- METHODS FOR DETERMINING THE CONDITION OF STATOR WINDING

Testing Techniques theory.

In-situ Testing methodology.

Effectiveness of each testing Technique.

b. Extending Life of Large Motors in Nuclear Power (WG A1.18) , run by M. R. Siniscalchi (BR).

The status of the WG will be updated and commented by the Convener, Márcio Rezende Siniscalchi:

1. TOR approved the 12 January 2009
2. Draft questionnaire Vers. 1 circulated in the middle of January 2009
3. Draft questionnaire Vers. 2 circulated in the middle of February
4. Additional comments received at the end of February 2009 and then incorporated
5. Questionnaire discussed in September 2009, during Sidney meeting
6. Final version of questionnaire circulated in middle of October 2009
7. Draft report ready by the end of spring 2010
8. Discussion draft report in Paris 2010 (see the attachment)
9. Final version of the report in December 2010

Answer have been received from 16 Responders for a total of 13 countries. Six out of 13 countries have declared they have no live nuclear application in their own countries. The first part of the questionnaire is focused on the number and the features of the investigated motors and on the inspection and repair policies of different companies. The second part of the questionnaire is devoted to monitoring methodologies and tools.

Some conclusions:

- Reactor coolant pumps use on-line monitoring
- Some companies perform verification of rotor broken bars by on-line systems
- Resin rich and global VPI insulations have no differences in reliability
- Care must be taken if old windings are removed using “burn out ovens” (degradation of core lamination insulation)
- After 30 years , insulation systems start to lose their long term reliability
- Rotor bars and slip rings usually last up to 50 if starting abuses do not occur.

On the SC A1 Chairman’s request, it will be verified the possibility of using Cigrè TB format for this document.

A remark from the floor has been that the questionnaire covers large motors, but in Nuclear P.S.s', small motors may be critical too.

c. Motor Failure Survey (WG A1.19), run by V.Skundric (RS).

The status of the WG has been updated by the Convener during the meeting in Paris. The latest version of the program is as follows (best assessment):

1. TOR new version of the questionnaire approved the 11 December of 2008
2. Draft report for the meeting in Paris, August 2010
3. Final report for approval by the end of December 2010
4. Report ready for publication, March 2011

The report prepared for Paris is based on the answers coming from 4 countries only. Three countries (Brazil, Japan and Serbia) answered all the questions of the questionnaire in the usual way: 323 motors covered for a total capacity of 16.410 MW and 7 power plants.

France, through EDF, supplied data for 3511 motors aggregated according to Company's criteria instead of Cigrè Questionnaire structure.

The majority of the investigated motors refer to Coal Mills, Pumps and Fans, but no electronic speed regulation is provided.

As a rule, failure records are kept by the Power Plants.

There is the possibility of getting new data from Germany Experts. The time limit for new data is the end of November. If this does not happen the final report will be based on the data collected so far.

4) **New topics**

A new questionnaire has been suggested on **Condition monitoring of large motors (monitoring, diagnostic, prognostic, etc.)**. The questionnaire will be run by Nico Smit (RSA). The questionnaire, whose report was published by Electra in February 2002, will be the base for the new questionnaire (see the attachment). A draft version of the TOR has been prepared and it has been submitted to AG A1-06 Experts.

SC A1 is in favour of the new activity.

Deliverables and time schedule (proposal):

- Scheme of the guide and summary of each chapter _ December 2010
- Draft for comments _ August 2011
- Final Document (TB format) _ December 2011
- Tutorial_ March 2012

Following the SP indications, another questionnaire has been proposed: **"ASDs' and high-efficiency applications in Power Plants"**.

The draft of the TOR has been presented:

Deliverables and time schedule :

- Draft questionnaire ready for the middle of September 2010
- Revised questionnaire ready for the end of October 2010
- Answers from Experts by the end of February 2011
- Draft report by the end of May 2011
- Final report for the meeting in China 2011.

Waiting for the official approval by TC of the TORs of the two new questionnaires, a draft version of the questionnaire on “ ASDs’ and high-efficiency applications in Power Plants” will be distributed through AG A1-06 Experts in order to get comments and suggestions. The unusual procedure will be useful in order to save time.

No further matters have been discussed and the meeting has closed at 12.45.

Next meeting will take place in China in 2011.

Enzo Tortello
Convenor of AG A1.06 Large Motors and Drives
Ansaldo Energia
enzo.tortello@aen.ansaldo.it