CIGRE Study Committee A1

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP[1]

WG N° A1.62	**Name of Convenor:** Fritz Neumayer (AT) **E-mail address**: Fritz.Neumayer@andritz.com
Strategic Directions #[2]: 2	**Technical Issues #[3]: 10**
The WG applies to distribution networks[4]: Yes	
Potential Benefit of WG work #[6]: 5	
Title of the Group: Thrust Bearings for Hydropower - A Survey of Known Problems and Root Causes	

Scope, deliverables and proposed time schedule of the Group:

Background:

Except for very small machines, the thrust bearings of hydroelectric units are hydrodynamic oil film tilting pad bearings. The utilization of a fluid film has several advantages such as low friction and almost no wear during continuous operation, the ability to remove the friction losses, and good damping. Even though oil has higher viscosity than, for example, water, the fluid film is very small in relation to the machines' dimensions. Design features such as hydraulic or spring supports of the pads, which allow uniform load distribution and tilting, serve to maintain a stable oil film. White metal or plastic coatings on the pad improve the sliding in temporary absence of a fluid film and are sufficient to avoid wear or destruction of the parts.

Such a component combines a multitude of physical effects such as fluid dynamics, tribology, heat conduction, heat convection, and solid body mechanics including thermo-mechanics. Failures in the design of these complex systems may lead to failures causing major outages.

Scope:

This working group shall refer to the typical designs of thrust bearings in vertical and horizontal hydroelectric units, being fluid film tilting pad bearings. Typically, such bearings include a radial journal part, forming a combined bearing.

The technical brochure will include bearings with plastic-coated pads, but shall be limited to mineral or synthetic oil. Even though only hydrodynamic bearings will be treated, possible problems with the high-pressure static support system will be included in the brochure. For units without the high-pressure injection system, the rules applied during start will be investigated as will the procedures to be applied (such as jacking) before start up after longer standstills.

Problems of the bearings related to auxiliary, control and protection systems will also be investigated.

A survey will be developed asking utilities, owners and manufacturers about:

- All sorts of problems with thrust bearings of above mentioned type and auxiliary systems directly related to these thrust bearings.
- Allowable parameters such as
    - Temperatures, Pressures, Oil Parameters, Geometric Values

- Operating conditions (static and dynamic)
- Oil Quality

- Root causes of the problems including design, operation and oil quality

Deliverables:

☒ Technical Brochure and Executive summary in Electra

☒ Electra report

☒ Tutorial[5]

Time Schedule: start: January 2018 **Final Report**: December 2020

• TOR submittal to CIGRE	March 2018
• TOR approval	April 2018
• Forming the WG team	June 2018
• Draft questionnaire	September 2018
• Comments by WG experts	January 2019
• Final questionnaire / Start of survey	March 2019
• Survey answers	June 2019
• Clarification of questions to survey	August 2019
• Draft report	December 2019
• Comments by WG experts	February 2020
• Draft Technical Brochure	May 2020
• TB approval by SC-A1 members	August 2020
• Tutorial – CIGRE Session Paris	August 2020
• Final Technical Brochure	October 2020
• Electra publication	December 2020

Approval by Technical Council Chairman:

Date: 17/04/2018

Notes: [1] or Joint Working Group (JWG), [2] See attached Table 2, [3]See attached Table 1, [4] Delete as appropriate, [5] Presentation of the work done by the WG, [6] See attached table 3

Table 1: Technical Issues of the TC project "Network of the Future" (cf. Electra 256 June 2011)

1	Active Distribution Networks resulting in bidirectional flows
2	The application of advanced metering and resulting massive need for exchange of information.
3	The growth in the application of HVDC and power electronics at all voltage levels and its impact on power quality, system control, and system security, and standardisation.
4	The need for the development and massive installation of energy storage systems, and the impact this can have on the power system development and operation.
5	New concepts for system operation and control to take account of active customer interactions and different generation types.
6	New concepts for protection to respond to the developing grid and different characteristics of generation.
7	New concepts in planning to take into account increasing environmental constraints, and new technology solutions for active and reactive power flow control.
8	New tools for system technical performance assessment, because of new Customer, Generator and Network characteristics.
9	Increase of right of way capacity and use of overhead, underground and subsea infrastructure, and its consequence on the technical performance and reliability of the network.
10	An increasing need for keeping Stakeholders aware of the technical and commercial consequences and keeping them engaged during the development of the network of the future.

Table 2: Strategic directions of the TC (ref. Electra 249 April 2010)

1	The electrical power system of the future
2	Making the best use of the existing system
3	Focus on the environment and sustainability
4	Preparation of material readable for non-technical audience

Table 3: Potential benefit of work

1	Commercial, business or economic benefit for industry or the community can be identified as a direct result of this work
2	Existing or future high interest in the work from a wide range of stakeholders
3	Work is likely to contribute to new or revised industry standards or with other long term interest for the Electric Power Industry
4	State-of-the-art or innovative solutions or new technical direction
5	Guide or survey related to existing techniques. Or an update on past work or previous Technical Brochures
6	Work likely to have a safety or environmental benefit