

MSc Assignment

Development of Hybrid Aqueous Linear Bearing for Offshore Applications



Motion Compensated Pile Gripper (MCPG) presents a vital device for successful windmill installation while the vessel is floating. As the name indicates, the device compensates for the vessel's motion via linear rolling and sliding bearing system (support guides). Currently such open system bearings are all-steel and bronze-steel bearings lubricated with grease. Due to the nature of the contact and being exposed to the offshore environment there is a high demand for re-greasing, and thus using enormous amount of grease. In addition, some of grease also ends up in sea water, thus polluting the ocean. Therefore, there is a high demand to make such bearings more environmentally friendly and to minimize carbon footprint by eliminating the need for using (mineral) grease. Hybrid bearings (steel-ceramic contact) offer many advantages over all-steel bearings, especially when operating under reduced lubrication conditions (low speeds, high loads). Furthermore, hybrid bearing can operate grease-free e.g., completely dry at very low speeds or even under water lubrication if properly designed.

Approach To understand the optimal hybrid linear bearing tribology a detailed investigation is required including a literature review on (hybrid) rolling and sliding contact, challenges, and requirements, followed by experimental investigation at University of Twente. Laboratory level tests will be performed on a contact level under dry and (sea) water conditions. Friction, wear, and corrosion of contacting surfaces will be evaluated and analyzed using various techniques. In addition, the underlying physical principles will be investigated through tribological and metallurgical examinations.

Research group & Company

The **Surface Technology and Tribology** (STT) group will organize the research with a focus on surfaces and interfaces in an engineering context, as well as degradation mechanisms occurring at these surfaces and interfaces. The researcher will closely collaborate with **Huisman Equipment BV**, Schiedam, the Netherlands. Huisman will provide required support, knowledge, and materials for successful completion of this investigation as well as provide support for researcher's future career. In addition, company visits and work at Huisman is possible.

Tasks:

- Perform literature review on (hybrid) bearings.
- Tribology of ceramic-steel contact under (sea) water.
- Select suitable testing devices and methods.
- Perform tribological tests and post-test analyses.
- Investigate the underlying physical principles.
- Discussing the results and writing a scientific report.

**Contact:**

PE Tribology R&D and Guest Researcher at UT Dr. Aleks Vrček, email: avrcek@huisman-nl.com
Prof.dr.ir. M.B. de Rooij: m.b.derooij@utwente.nl