2024 ELGI Academic Award

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The ELGI Board and Awards Committee selected the following Paper & Presentation for the ELGI Academic Award

Neutron imaging technique for understanding of urea type grease fluidity inside bearings –

presented by

Kazumi Sakai

Eneos

Japan

All the presentations were evaluated on several criteria that covered

- Content of the Paper
- Quality of the Presentation
- Embodied the Spirit of Originality & Technological Innovations

On behalf of this committee and the ELGI board we would like congratulate Kazumi Sakai on this worthy achievement.

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Kazumi SAKAI, Ph.D. has worked for ENEOS Corporation, Japan. He is currently a Senior Researcher of Grease R&D Group, Lubricants R&D Department and responsible for research of grease lubrication and novel analytical methods for grease. He received a master's degree in applied chemistry from Tokyo Institute of Technology in Japan in 2007. He had received a Ph.D. Degree in Mechanical Engineering from Brno University of Technology in the Czech Republic by using the company overseas program (2015-2017).

Neutron imaging technique for understanding of urea type grease fluidity inside bearings

Grease fluidity has a great influence on bearing performance such as bearing torque represented by channelling and churning states. In order to understand grease fluidity in more detail, the visualisation of grease inside a bearing is essential and neutron imaging technology is one of the effective methods. The technology is based on a characteristic that a neutron passes through heavy elements and interacts to light elements. In other words, neutron can identify lubricants with light elements inside the bearing with heavy elements.

In this study, three types of urea greases with different thickeners were investigated. Each grease showed different bearing torque tendencies. After bearing rotations, neutron radiography and computed tomography (CT) measurements of the greases distributed in the bearings were performed by using RADEN in the Materials and Life Science Experimental Facility (MLF) of the Japan Proton Accelerator Research Complex (J-PARC). CT images demonstrate grease distribution inside bearings. Image analysis for CT images revealed grease adhesion to bearing balls correlates to bearing torque results, in other words, less adhesion of grease to bearing balls contributes to reducing bearing torque, conversely, the remarkable adhesion of grease causes higher shear resistance for bearing ball rotations. The neutron imaging technology has successfully verified the common hypothesis by the direct observation of grease distribution inside bearings