Contribution ID: **424** Type: **Poster presentation (105min)**

Study of the thermo-syphon cooling system with a vessel in the sea states

Tuesday 8 July 2014 14:15 (1h 45m)

A thermosyphon application is considered to be a choice to cool down superconducting rotating machines. The thermosyphon cooling system by using neon gas in the temperature range of 25 K to 40 K has been tested in laboratories, since it possesses advantages of large capacity of heat transport, less complicated construction, and smaller volume. Applying the
thermosyphon cooling system to HTS rotating machine in the ship propulsion system, we need to study the effect of both pitching and rolling motions caused by the sea states on the cooling performance such as stability and allowable thermal load.
In this study, we equipped the "SHIOJI MARU", a 425 ton vessel with the thermo-syphon cooling system. Great attention has been paid to the heat load, which is applied to the evaporator, under the influence of the pitching and rolling of the vessel. The gradual and rapid heat loading tests have been conducted. In addition, we investigated the effect of the neon quantity on the cooling performance at sea. These on-board testing results for cooling with the thermosyphon are comparatively discussed with those obtained in the laboratories. The pitching and rolling of the ship encouraged heat exchange. The obtained result is caused by an increased thermal exchange on the surface originating from the ship motions.
1)B. Felder, M. Miki, K. Tsuzuki, N. Shinohara, H. Hayakawa, and M. Izumi,
"A 100-W grade closed-cycle thermosyphon cooling system used in HTS rotating machines", in AIP Conf. Proc., vol. 1434, pp. 417–424 (2012).
2)R. Sato, B. Felder, M. Miki, K. Tsuzuki, H. Hayakawa, and M. Izumi
"Helium-Neon Gas Mixture Thermosyphon Cooling and Stability for Large Scale HTS Synchronous Motors" ,IEEE Trans. appl. Supercond., vol. 23, no. 3, 5200704 (2013).

Primary author: Mr YAMAGUCHI, Kota (Tokyo University of Marine Science and Technology)

Co-authors: Dr UMEMOTO, Katsuya (Kawasaki Heavy Industries, Ltd.); Mr YAMAGATA, Kotohiro (Tokyo University of Marine Science and Technology); Dr YOKOYAMA, Minoru (Kawasaki Heavy Industries, Ltd.); Prof. IZUMI, Mitsuru (Tokyo University of Marine Science and Technology); Mr MIKI, Motohiro (Tokyo University of Marine Science and Technology); Mr SATO, Ryo (Tokyo University of Marine Science and Technology); Mr IKEDA, Tatsuya (Tokyo University of Marine Science and Technology); Mr MURASE, Youhei (Kawasaki Heavy Industries, Ltd.)

Presenter: Mr YAMAGUCHI, Kota (Tokyo University of Marine Science and Technology)

Session Classification: Tue-Af-Posters Session 1.3

Track Classification: C-11: Cryogenics for power applications and transportation