

Development and Construction of an HTS Rotor for Ship Propulsion Application

W. Nick¹, M. Frank, P. Kummeth, J. J. Rabbers, M. Wilke and K. Schleicher

Siemens AG, CT PS 3, Günther-Scharowsky-Str. 1, D-91050 Erlangen, Germany

¹E-Mail: wolfgang.nick@siemens.com

Abstract - A low-speed high-torque HTS machine is being developed at Siemens on the basis of previous steps (400kW demonstrator, 4MVA generator). The goal of the programme is to utilize the characteristic advantages offered by electrical machines with HTS-excited rotor, such as efficiency, compact size, and dynamic performance. To be able to address future markets, requirements from ship classification as well as potential customers have to be met. Electromagnetic design cannot be focused on nominal operation only, but has to deal with failure modes like short circuit too. Utilization of superconductor requires to consider margins taking into account that the windings have to operate reliably not only in “clean” laboratory conditions, but in rough environment with the stator connected to a power converter. Extensive quality control is needed to ensure homogenous performance (current capacity, electrical insulation, dimensions) for the large quantity of HTS (45 km). The next step was to set up and operate a small-scale “industrial” manufacturing process to produce HTS windings in a reproducible way, including tests at operating conditions. A HTS rotor includes many more components compared to a conventional one, so tough geometric tolerances must be met to ensure robust performance of the system. All this gives a challenging task, which will be concluded by cold testing of the rotor in a test facility. Then the rotor will be delivered for assembly to the stator. In following machine tests the performance of the innovative HTS drive system will be demonstrated.

IEEE/CSC & ESAS EUROPEAN SUPERCONDUCTIVITY NEWS FORUM (ESNF), No. 11, January 2010
Published in *Journal of Physics Conf. Series (SuST)* 234, 032040 (2010)