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HTS superconducting magnetic energy storage (SMES) for waterborne applications

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The shift from fossil fuel to electric based propulsion in the waterborne transport sector has been sped up by recent policies aiming to reduce the sector emissions. This trend creates highly electrified vessels, with needs for energy storage systems (ESS) to satisfy the power demand affordably and to increase the on-board grid reliability and efficiency. Initial industry efforts have been put in the study and integration of high energy density ESS solutions, mainly electrochemical batteries. However, other innovative ESS, with different capabilities, have not been yet fully addressed. It is the case of Fast Response Energy Storage Systems (FRESS), such as Supercapacitors, Flywheels, or Superconducting Magnetic Energy Storage (SMES) devices. The EU granted project, POwer StoragE IN D OceaN (POSEIDON) will undertake the necessary activities for the marinization of the three mentioned FRESS. This study presents the design process followed in the POSEIDON project for the definition of an SMES suitable for maritime operation, which will be based in High Temperature Superconductors (HTS). The electromechanical model of the SMES will be presented starting with the tape modeling, and the calculation of the electromagnetic forces, including the screening currents. Finally, the electromechanical analysis, including the working point of the magnet and the stress analysis of the coil will be presented.

Topic

Applications in large instruments such as high-field magnets, medical magnets and accelerator magnets

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