Design of Securing Mechanism for Power Converter in Navy Integrated Power and Energy Corridor

by

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Abstract

Future US Navy ships will need an updated electrical distribution system to solve two impending challenges. The first challenge is the increase in electrical generation and demand. The second challenge is that the loads will be more dynamic with more complex load profiles (e.g., pulses for energy weapons). A next-generation electrical system, Power Electronic Power Distribution System (PEPDS), is being developed to solve these challenges. It is a power/energy management and distribution system operating in the Medium Voltage AC/DC range that can convert power from AC and DC sources as required by the load using a power conversion module. The power conversion module for this system is known as the integrated Power Electronic Building Block (iPEBB). However, with this new electrical distribution system designed to be put on a ship, the components must be adequately secured. Currently, there is no established way to anchor the novel iPEBB. This thesis modeled a securing mechanism using a hinge design to provide the securing force. It was evaluated based on the structural integrity, bending, and shear stresses. Additionally, the material encompassing the iPEBB is investigated to determine the properties integral to its design. The model produced shows a practical path to secure the iPEBB without additional involvement from other support systems. While this design is functional, it may not be optimal. This thesis lays the foundation for additional study for more advantageous securing mechanism designs for the iPEBB.

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