

Harmonic Mitigation in VFD Used for Seawater Cooling System Pumps Onboard Ship.



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Abstract:

In the maritime industry, engine room cooling sea water pumps used on tanker vessels are generally oversized (32oC to 38oC) during design stage and constantly operate at maximum flow. The process, however, requires maximum capacities only for a very short time period during the operating cycle, resulting in more power consumption and constant energy loss. This will increase fuel consumption and give rise to emission of GHG from international shipping. This paper deals with effective use of Variable Frequency Drives that can achieve reduced flow by adjusting the speed of pumps according to process requirements in order to optimize the energy efficiency of the vessel & to reduce GHG emission. However, the operation of VFD introduces harmonic distortion of voltage and current, which can cause serious problems. This may result in overheating and destruction of power factor correction capacitors as it has caused catastrophic failure of capacitor in aft harmonic filter room on passenger cruise ship RMS Queen Mary-II. So, the shipboard system is also designed to comply with marine harmonic standards i.e. as per IEEE-519 standard the Total Harmonic Distortion must be below 5%.