NAME OF THE PROJECT:
Doubly Fed Induction Machine as a Propulsion Motor in Tugboats to Improve Fuel Efficiency

SPONSOR OF THE PROJECT:
Ministry of Shipping, New Delhi

PROJECT CODE:
SRIC, IIT Roorkee: MSR-912-WRC

RESEARCH COLLABORATOR:
Indian Maritime University, Visakhapatnam

YEAR OF COMPLETION:
2019

INVESTIGATED BY:
Hydropower Simulation Lab.
Water Resources Development and Management Dept.
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ABSTRACT OF THE WORK:
Based on the knowledge gained from the applications of doubly fed induction machines in hydro, this project has developed a simple optimization technique for scheduling available power sources of a diesel-electric tugboat (diesel engine generators (DEG) and batteries) to meet its load demand with an objective to minimize fuel consumption. For this study, a diesel-electric tugboat system of 1.1 MW capacity with two types of generating systems is considered: (i) fixed speed generating unit (2x550 kW fixed speed DEG employing synchronous generators), and (ii) variable speed generating unit (1x1.1 MW variable speed DEG employing doubly fed induction generator (DFIG)). From the test results, it is observed that the variable speed-generating unit offers a fuel saving of 29.86% in comparison with diesel-mechanical propelled system and 2.9% in comparison with fixed speed diesel-electric system. A practical constraint on start/stop of generators is also considered while conduction of this research. Experimental validation is performed through a 2.2 kW laboratory prototype.

PUBLICATIONS:
2. B Anil Kumar, M Chandrasekar, Thanga Raj Chelliah, U S Ramesh, "Coordinated Control of Electric Tugboats Considering Inductive Power Transfer for better Fuel Efficiency," to be submitted to IEEE Trans. Industry Applications. [Preliminary version of this paper was presented at IEEE PEDES, IIT Madras, Dec. 2018].
3. M. Chandrasekar, B Anil Kumar, Thanga Raj Chelliah, "Optimal Sizing of Diesel Generators in Marine Propulsion Systems", to be submitted to IEEE Trans. Transportation Electrification. [Preliminary version of this paper was presented at International Transportation Electrification Conference, Pune, 13-15 December 2017]