Dynamic Positioning Committee
Marine Technology Society

Session – Green Initiatives

Title: **Demonstrating the Benefits of Advanced Power Systems and Energy Storage for DP Vessels**

Authors: John Olav John Olav Lindtjørn, Frank Wendt, Børre Gundersen and Jan Fredrik Hansen, *ABB AS*

Abstract

Recent advances in shipboard power systems affords designers of marine electrical power systems unprecedented opportunities to improve safety, efficiency and functionality.
With the introduction of the IEC 61850 communication standard in marine power systems new opportunities for increasing the operational performance of DP drilling vessels have been made possible by introducing enhanced features like:

- Block based protection functions.
- Ultra-fast load reduction schemes.
- Enhanced engine and generator protection functions integrated in the main power switchboards.

The first closed-ring DP drilling vessels based on this new comprehensive protection platform have now been commissioned and results confirm predictions in [1] and [2]. In practice, this means that time critical protection requirements relating to balance of power and black-out prevention, short-circuit protection and power-plant monitoring; are handled within the confines of the switchboard and main consumers, yielding a very quick and fault tolerant power system – even in the absence of overriding systems like the PMS.
Complementing, and arguably rivalling this protection platform in potency; energy storage and more advanced power electronic converter systems are making an entry into shipboard power systems. If strategically integrated, these systems can dramatically improve the main power system's fault-tolerance and performance, whilst at the same time reducing main engines' fuel consumption and running hours. Improved fault tolerance and performance can be achieved through a combination of:

- Using energy storage to bridge power and energy demand during excessive power demand or main engine failures
- Reducing or eliminating black-out recovery times by keeping sections of the power system energized during outages.
- Supply critical consumers like propulsion and drilling drives with dedicated energy storage units to both act as an energy buffer for quick load transients and provide an enhanced ride-through capability for these loads.

By improving the system in these ways, it becomes possible to run the power system with fewer engines online, thereby increasing their partial loading which in turn improves specific fuel oil consumption and reduces low-load induced maintenance costs. Running fewer engines also reduces accumulated running hours of the power plant.

This paper will include sea-trial measurements for one drillship, demonstrating the effectiveness of the new protection platform, including:

- Ultra-fast load reduction on generator trip and
- Fault handling by ABBs Diesel Generator Monitoring system on AVR sensor failure.

Further; results from laboratory tests will be used to illustrate the inherent potential in energy storage, including considerations like

- Energy storage systems as spinning reserve and
- The effect on a power system's efficiency and performance if power fluctuations are absorbed using an energy storage system

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In conclusion, the marriage between a comprehensive and flexible protection platform and one or more energy storage systems has the potential to revolutionize what we will come to expect from diesel electric power systems.

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