

How to Utilize Current Measurements to Improve Safety and Optimize DP Control Systems

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Abstract

Use of thruster current measurements, is an obvious way to improve safety and optimize DP Control Systems, but is rarely used by the Industry today. The interface is simple, no expensive HW is required and the measurements are reliable.

By introducing current measurements (or other load signals), DP Control Systems will be able to discriminate between set-point and feedback failure and can provide better decision support to the Operator. Traditionally, the DP system has a RPM/Pitch set-point signal and a RPM/Pitch feedback signal. If we have a failure in one of these signals, the DP-system cannot decide if it is the set-point or the feedback that's wrong. With a current measurement from the thruster motor, it can. The system can then give a clear message to the Operator; "Feedback failure" or "Set-point failure" on Thruster X. Without a current measurement, the system can only give a "Set-point/Feedback difference" alarm, and leave it up to the Operator to find out if it is one or the other. Alarms related to set-point or feedback of a thruster can lead to dangerous situations in short time, and we need to provide the Operator with clear and precise information. The system could switch to estimated feedback by itself, if the feedback signal was faulty or even automatically disable the thruster if the set-point loop was faulty.

By better calculations of torque and power, the control system will be able to handle thruster ventilation, reduce fluctuation in thrust and power production and provide a better thruster model. This will lead to less wear and tear and less fuel consumption.

Especially bow thrusters are exposed to thruster ventilations in rough sea. With the traditionally instrumentation today (RPM/Pitch set-point and feedback), the DP-system "does not realize" that the thruster is partly working in air instead of water. When the thruster is ventilating, the RPM may increase, but the thruster current decrease. Since the thruster current will decrease, the thruster model in the DP-system will calculate the force from the thruster to be higher than it actually is. What the DP system could do, if it knew that one thruster is ventilating (by reading thruster current), it could for example reallocate thrust from the one that is ventilating to one that is not exposed to ventilation.

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