CASE STUDY

THERMOGRAPHY

Sector: Marine / Port dredging.

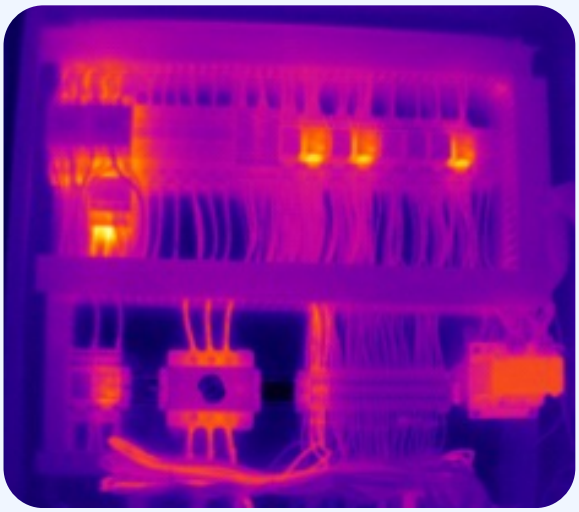
Asset: Pumping system and auxiliary power system of a suction dredger, focused on two critical subsystems:

- Low-voltage distribution board in the electrical room.
- Electric drive motor of the hydraulic unit associated with the auxiliary pumping system.

Initial situation: The crew reported an intermittent hot-insulation smell under high-load conditions, along with sporadic protective trips during start-up maneuvers of the hydraulic system. Conventional visual inspection showed no evident damage, so there was uncertainty as to whether the issue was an electrical connection anomaly, load imbalance, or a thermal problem associated with the motor.

The marine environment increased the risk: structural vibration, saline atmosphere, humidity, prolonged operating cycles, and limited availability to intervene on the equipment during the campaign. The main concern was a sudden failure of the power supply circuit or accelerated motor deterioration, resulting in loss of dredger vessel availability.

Work methodology:



A condition-based thermographic inspection was designed with a criticality-focused approach, taking advantage of the fact that thermography allows thermal radiation to be measured remotely and without contact, and that a temperature outside the normal range is a clear sign of a change in condition.

- Inspection planning: definition of critical assets, minimum load conditions for capture, and safe access routes in the electrical room and engine room.
- Thermal and visual image acquisition: in-operation inspection of the low-voltage board, power terminals, contactors, protective devices, and the housing of the hydraulic motor. Radiometric images were used to compare phases, equivalent connections, and like-for-like components.
- Comparative analysis: evaluation of thermal differentials between phases and similar points. A localized hot spot was identified at an output connection of the main contactor, with an estimated maximum temperature of 118 °C, compared with equivalent connections between 62 and 68 °C. An area of abnormal heating was also observed on the motor coupling-side bearing, approximately 18 °C above the opposite side.

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- Technical diagnosis: the thermal signature was consistent with high contact resistance at an electrical terminal, probably promoted by loosening, oxidation, and the saline environment. In the motor, the thermal pattern suggested mechanical friction and early-stage lubrication degradation, with insufficient evidence to conclude severe winding damage.
- Intervention recommendation: tightening and remediation of connections, cleaning and reconditioning of the affected electrical point, torque verification, phase-load review, and planned corrective maintenance of the motor, including bearing inspection and controlled relubrication.

Conclusions: Thermography made it possible to locate an anomaly that was not conclusive through conventional visual inspection: a high electrical resistance point in the board and abnormal thermal behavior in the hydraulic unit motor. The decision was not merely to “detect heat,” but to prioritize an intervention based on the thermal pattern, the asset criticality, and the dredger vessel’s operational risk.

Thanks to early detection, the crew and maintenance personnel were able to schedule the correction during a controlled window, preventing progression toward a major electrical failure, contactor damage, or loss of hydraulic system availability during the campaign. This case shows the value of thermography as a frontline technique in condition-based maintenance, especially in marine environments where humidity, salinity, and variable load accelerate the deterioration of connections and electromechanical components.

Impact indicators:

- Auxiliary hydraulic system functional failure avoided: estimated.
- Reduction of the electrical hot spot: from 118 °C to 64–70 °C.
- Reduction of the motor thermal differential: from 18 °C to 6–8 °C.
- Unplanned shutdown avoided: estimated 8 to 16 hours.
- Potential savings due to avoided unavailability, mobilization, and emergency corrective work: estimated USD 12,000 to USD 28,000.

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