Marine & Offshore Electrical Power and Automation Engineering

CASE STUDY

mjr Power & Automation

MARCH 2017

Corystes Main Propulsion and Thruster Drive Upgrade



Successful upgrade and replacement of complete DC Variable Speed Drive and Propulsion Control Package

Built in 1988 Corystes, a Fisheries Research Vessel owned and operated by the Agri-Food and Biosciences Institute (ABFI) was powered by an obsolete DC Diesel Electric Main and Auxiliary Propulsion System originally delivered by Laurence Scott.

Lack of available spares and service resulted in increasing operational risks and the decision was made in 2016 to replace the system.

- **Full turnkey system replacement package**
- **Class approval from Lloyds Register of Shipping**
- **Delivered in 16 calendar weeks from order to successful sea trial**
- **On time to specification and budget**

MJR Power & Automation
85 Willows Court, Teesside Industrial Estate, Thornaby, Stockton-on-Tees, TS17 9PP, UK
Head Office +44 (0) 1642 762 151 | Aberdeen +44 (0) 1224 507 082

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Bidding against a strong international field of competition, MJR won the contract to replace the system due to its strong track record in power generation and propulsion systems for vessels of this type.

Delivery timescales were incredibly tight with the project having to be delivered in 16 calendar weeks (including the Christmas holiday period) from contract award to successful completion of sea trials including:

- Propulsion System Specification & Detailed Design
- Control System Specification & Detailed Design
- Class Approval by Lloyds Register of Shipping
- System Construction, Software Design, Commissioning, Complete Assembly, Hook Up & FAT with Client and Class in MJR's facilities prior to installation
- Disassembly, packing and shipping of the system to the ship
- Decommissioning and stripping out of the existing Propulsion Drive and Control Systems and preparation for installation of the replacement system
- Installation and integration of the new power electronics and hardware into the existing drive cubicle and switchboards
- Installation and integration of the new redundant PLC based control system to interface with the existing Propulsion Control Stations
- Commissioning, Harbour Trials and Sea Trials with Client and Class
- Handover and Training



ABB DCS880-s DC Drive

The propulsion system comprised two tandem 600 kW Main Propulsion Motors, one 450 kW thruster motor and four remote control stations with the replacement hardware supplied by our trusted partner ABB, utilising their DCT880 DC Drives **http://new.abb.com/drives/dc/dcs880-s** and their AC500 PLC **http://new.abb.com/plc/programmable-logic-controllers-plcs/ac500**



ABB AC500 PLC

For further details please contact:

paul.cairns@mjrcontrols.com or call +44 (0) 1642 762 151

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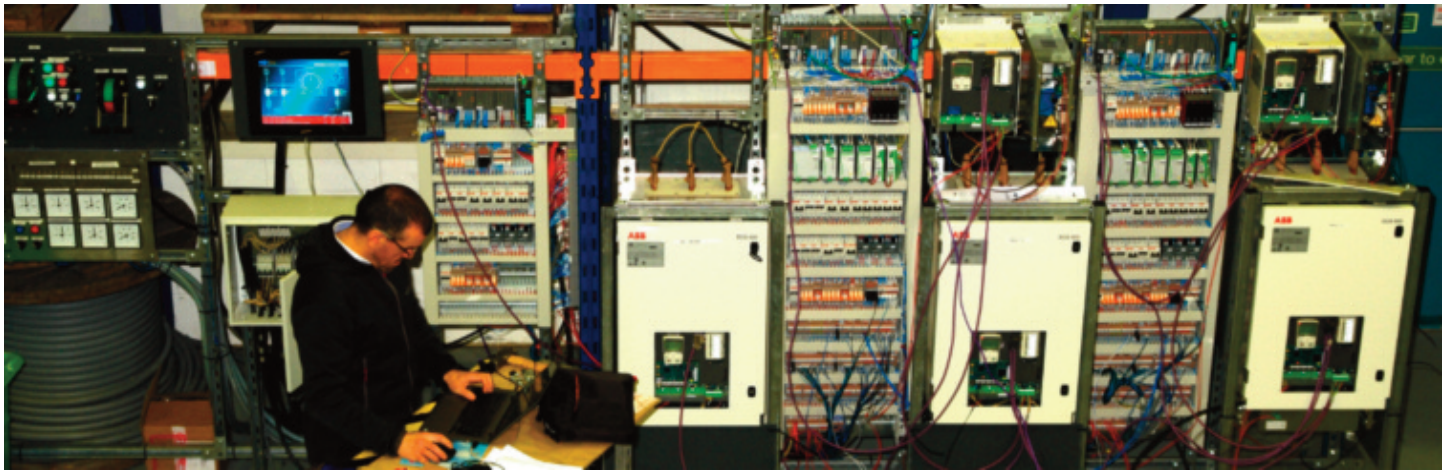
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Installation, commissioning and testing time on board was very limited, with the complete removal of the old system and installation and commissioning of the replacement system taking only two weeks from arrival of our team on board to successful sea trials. In order to de-risk the project and meet such an ambitious schedule the following steps were taken to minimise installation and commissioning time:

- Design and prebuild of the system into a series of modular replacement chassis plates designed to be a drop in replacement for the existing equipment. Including extensive use of 3D modelling
- Construction and hook up of the full system in MJR's facility including design and build of 'dummy' Propulsion Control Stations and other retained equipment and interfaces on the ship that the system had to interface to
- Extensive and careful testing of the complete system with the 'dummy' ship interface and test motors to ensure 'right first time' functionality
- Installation with MJR's in house team that has extensive experience in retrofitting complex systems to existing vessels under challenging conditions



Full system built onto temporary test frame and hooked up, undergoing testing

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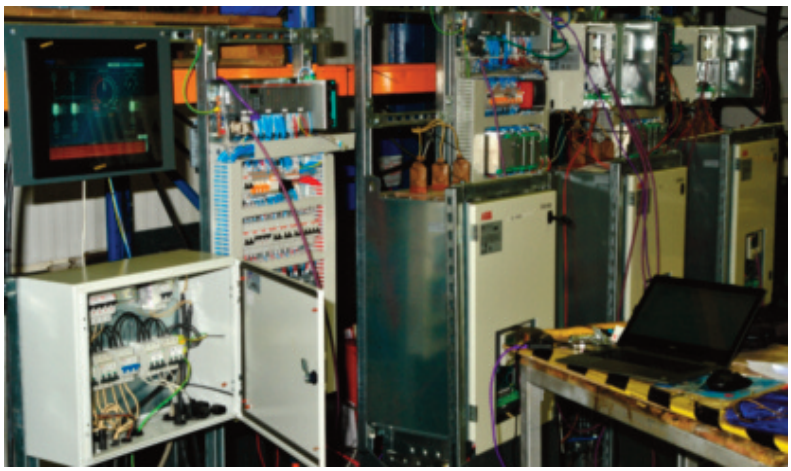
Prior to installation the system was exhaustively tested in MJR's facilities over several days including operational, degraded and failure modes in the presence of Client representatives and Class Surveyors. An intensive, fast track installation period then followed on board, resulting in successful sea trial and on time delivery and handover.

Benefits of the upgraded system include:

- **Simple intuitive operator interface with easy to read diagnostics making operation and fault finding much faster and simpler than with the original system**
- **Digital drives give vastly improved motor dynamic performance compared to the original analogue drives**
- **Fully supportable with spares and service available worldwide from MJR/ABB**



'Dummy' Manoeuvring Station



HMI & Propulsion Converters



Overview Screen



Drives Screen



Diagnostic Screen

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This project builds from similar MJR Propulsion & Power System upgrades previously undertaken, including:

- **Design & replacement of the Rotary/Static Excitation & Magnetic Amplifier system on the Ward Leonard DC Propulsion System of SV John Lethbridge with a fully electronic Field Excitation System**
- **Design & replacement of the Power Management and Generator Excitation System on the Main Propulsion Generators of the Portuguese Navy's Survey Vessel NRP Gago Coutinho**



NRP Gago Coutinho



SV John Lethbridge

Paul Cairns, Managing Director of MJR Power & Automation says:

"Retrofitting and integrating essential marine systems on this scale and complexity with such aggressive timescales requires many years of experience and lessons learned, as there is simply no margin for error. The successful delivery of this project on time and to budget when others said it couldn't be done cements MJR's reputation, together with ABB as the partners of choice for demanding marine projects."

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