DCShortCUT

MMA BREWSTER: RAPID & REPEATABLE 24V CROSS-CONNECTION TESTING

MMA Offshore, one of the largest marine service providers in the Asia Pacific region, and OneStep Power Solutions Inc., a US-based power system testing technology provider, recently completed a validation program aboard *MMA Brewster*, a DP2 vessel operating in the Timor Sea.

The program, which included the world-first deployment of OneStep Power's DCShortCUT, was designed to provide assurance of the vessel's capability to continue operations should a fault potentially occur on a distribution system supplied by two power supplies.

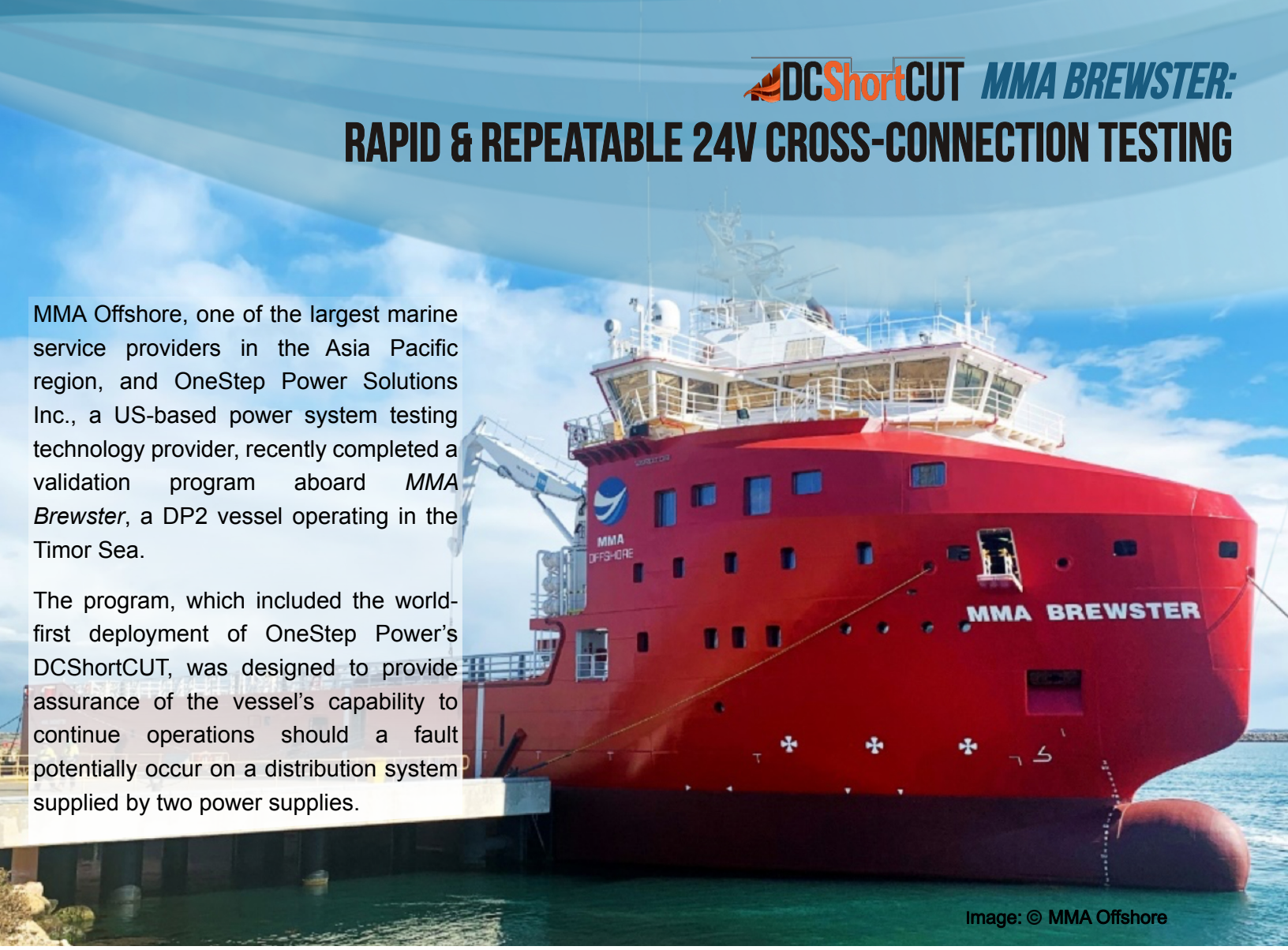
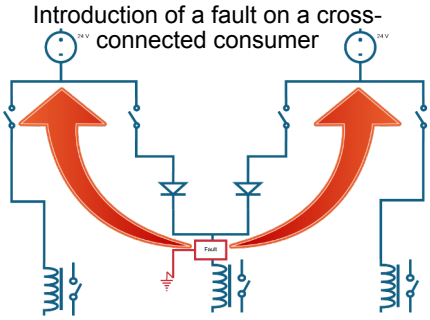


Image: © MMA Offshore

CHALLENGES

MMA Brewster is a 2016-built DP2 vessel from VARD. Along with an open bus configuration, the vessel operates with 12 x 24V DC cross-connected systems – a common industry configuration for Platform Supply Vessels. Similar types of 24V DC cross-connections have been identified by industry stakeholders whereby the control power redundancy design could potentially compromise the cross-connection fault propagation concept for a Dynamically Positioned Vessel.



A potential fault downstream of cross-connected power supplies could propagated and have an effect on both supplies. If the problem propagates through the power supplies to their source, all other consumers fed by the same source are also potentially at risk. As such, a fault on one set of supplies could potentially cause the loss of multiple sections of a vessel.

With the introduction of high reliability power supplies and electronic circuit protection devices, the risk of faults propagating through a DC cross-connection are able to be decreased. In the past, vessel owners such as MMA Offshore could not provide assurance to clients and stakeholders that the risk has been sufficiently mitigated through equipment selection and design.

ROBUST RELIABLE REPEATABLE

ONESTEP POWER

Solution

MMA Offshore contracted OneStep Power to perform a testing program to induce faults onto the cross-connected systems aboard *MMA Brewster*.

OneStep Power and MMA Offshore jointly developed a testing plan for all 12 cross-connections and performed the onsite test plan, including UPS failure testing.

The onsite test protocol was designed in a way to reduce the vessel's downtime during testing to a minimum level, in accordance with all key stakeholders.

The DCShortCUT and the ship's system were connected at multiple points to allow a variety of tests to be performed:

- Load Increase
- Overload
- Short Circuit
- Short to Ground / Earth Fault
- Variable over-voltage (max 120%)
- Loss of Power Supply

Results

The project proved DCShortCUT as a viable methodology for proving cross-connection fault tolerance, and after the acceptance of the test results by MMA's client, *MMA Brewster* continued operations with safe and proven cross-connected 24V power supplies.

Commenting on the positive outcomes of the testing program, OneStep Power's Founding Director, Sarah Whiteford, said: *"It was a pleasure working with MMA Offshore – they have such an agile and professional team. The vessel was in great condition, and the crew worked hard to support and understand the needs of the testing program."*

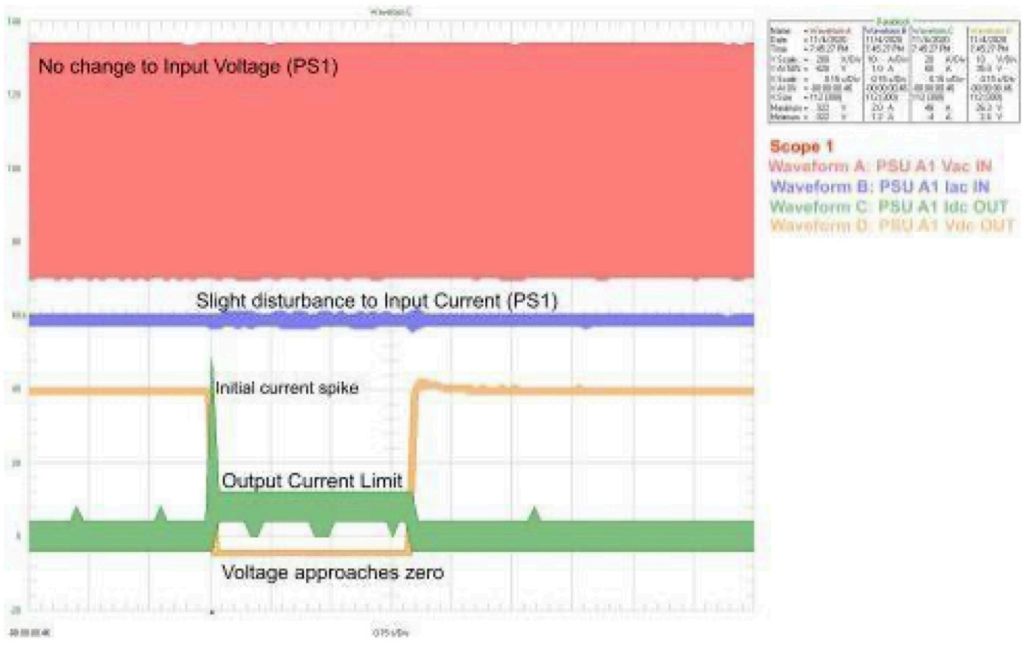
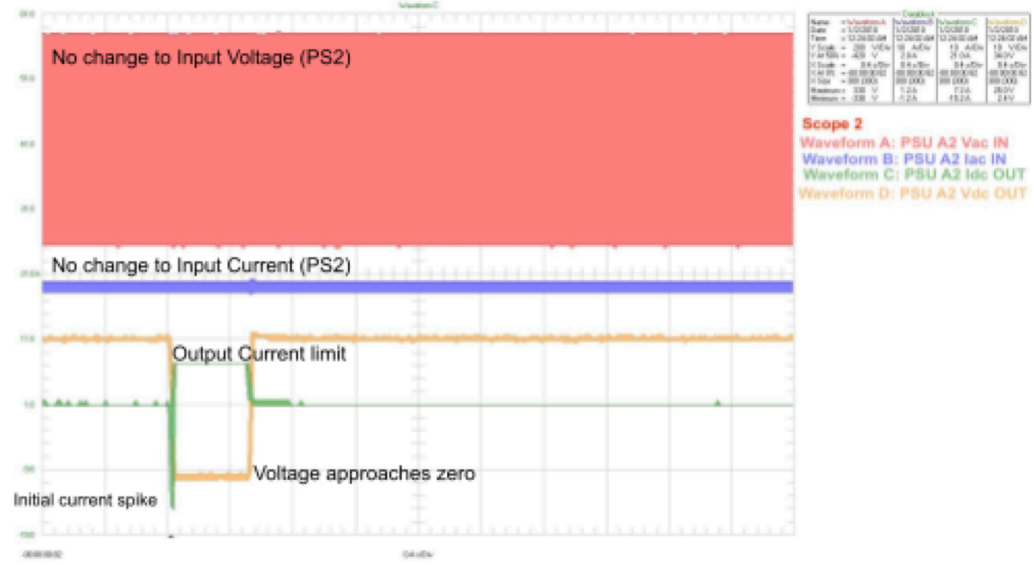
The MMA Offshore team also praised the collaborative efforts behind the testing program with Fleet Technical General Manager, Barry Jewson, commenting: *"Taking a collaborative approach throughout, we were pleased to work together with OneStep to ensure the compensating provisions met our client's requirements. OneStep's professionalism and thorough understanding of the requirement ensured our confidence in the process of system fault resilience testing, was accurate, robust, and through a series of procedures which presented low risk to the asset throughout. This testing has provided an alternative solution to the previous method of reducing fault propagation risk through an isolation strategy, thus eliminating the risk of associated human error."*

The results were graphed and presented in a report to MMA Offshore and their client.

Test result example: Short Circuit at Diode Module

Aim	Confirm behavior of Power Supplies subjected to short circuit
Criteria	High current draw from either or both supplies expected. No effect on AC voltage input to either PSU A1 or PS2.
Method	DCShortCUT applied a short circuit to the output of the Diode module by connecting positive and negative terminals.

Test result example: Short Circuit at Diode Module cont.

Test	 *Figure 1. Response of Short Circuit at Diode Module Output*  *Figure 2. Response of Short Circuit at Diode Module Output*
Result	Pass
Comment	DC output of PSU A1 and PSU A2 dropped to near zero, no notable disturbance on voltage supply. Loss of cabinet. No loss of equipment was recorded on the alarm list.