

CASE STUDY:

Off shore Oil Rig Protects its People and Equipment Using the ALL-TEST PRO 5™



Offshore drilling is a high stakes business, and one where safety is a high priority. At any given time, there could be between 110 and 180 people on board an offshore oil rig. Great effort is made by the entire crew – managers, drillers, subsea engineers, electricians, mechanics, and maintenance personnel – to adhere to safety guidelines. Unfortunately, electrical equipment can still breakdown and create a risk for explosions. When one offshore oil rig drilling in the Gulf of Mexico experienced a motor system failure, the electrical supervisor on board contacted ALL-TEST Pro within 24 hours so they could understand the root cause of the problem.

The electrical supervisor stated that the Wye contactor had flashed over. Fortunately, no one was injured from the minor flash event. The maintenance crew discussed two possibilities: either it had been a failure in the contactor or it had been a failure in the motor that had caused the motor system to fail. Their suspicion was that the problem had been the contactor and not the motor, but they did not have the proper tools to confirm their thoughts. Previously, they had been in talks with Shane Franklin from ALL-TEST Pro about the ALL-TEST PRO 5™, a hand-held motor circuit analyzer. They decided it would be the perfect piece of test equipment to help them confirm their suspicions.

The maintenance crew needed to protect themselves and everyone else on board the offshore oil rig. If there really was a problem with the motor that had caused a failure in the starter, then replacing the starter wouldn't solve the problem. They would still be at risk of another flash over with potential danger to the crew and possible extensive damage to a very expensive motor system. It was critical for the maintenance crew to determine the underlying cause of the failure to ensure both equipment reliability and peoples' safety.

Instead of purchasing the AT5™, the electrical supervisor decided to rent the AT5™ de-energized motor testing instrument from Intellirent, a DFW area-based company that rents out a variety of electrical test equipment across the United States. Within 48 hours, Intellirent had the AT5™ delivered out to the offshore oil rig. The maintenance crew was able to perform tests and then generate and share the test reports with Aaron Schnelle, who provided technical support from ALL-TEST Pro through close email and telephone contact. "Their particular 1000-horsepower motor was a six lead motor, which requires more expertise to test," explains Schnelle, "but the technician on board was highly qualified and performed the tests quite easily. It was just a matter of walking them through the test procedure and results."



Test Results for the Crane Motor

20150918-14:30:56						
		32	21	13		
Resistance (Ohm)	OK	0.014	0.014	0.015	1.03	
Impedance (Ohm)		6.78	8.43	8.13	12.9	
Inductance (mH)		2.70	3.35	3.24	12.9	
Phase Angle (°)	OK	82.3	81.6	81.8	0.402	
I/F (%)	OK	-44.8	-44.6	-44.6	0.139	
Stator						
Rotor						
Insulation (MOhm)	OK	>999		Test Value	6.59	Ref Value
Contamination (%)						
Capacitance (nF)	OK	1.84%		Frequency	400	Direct Test at Motor

The results of the motor testing showed the following: DC winding resistances were all well balanced; Winding AC Impedance were following the Inductance; Phase Angle and I/F% test results were all well balanced; "Stator" & "Rotor" result rows are empty because a dynamic test had not been performed on the 1000-hp motor.

The maintenance technician used the AT5™ motor circuit analyzer to evaluate the health of the crane motor in a de-energized state. Running the tests at the motor junction box and control box in both the delta and wye configurations, the technician performed the following tests:

- a DC resistance test on the motor windings
- an insulation to ground test
- an inductance test
- an impedance test
- a phase angle test
- a current frequency response test
- a capacitance test
- a dissipation factor test

Testing revealed that the windings and connections for this 3-phase motor were in good condition. A static test was performed using the AT5™ for this 1000-hp motor, which includes testing between the motor winding phases. Phase to phase measurements were then compared and simple rules were used to determine the condition of the motor connections and windings. Additionally, the insulation to ground test and dissipation factor test were used to evaluate the condition between phase and ground.

If the test results show some variation between the windings, it is a sign there is a problem with the motor. In this case, the test results showed that all three windings were in the same condition; therefore, the technician was able to conclude that the motor was healthy.

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		32	21	13		
Resistance (Ohm)	OK	0.005	0.005	0.004	1.91	
Impedance (Ohm)		2.49	2.96	2.37	13.6	
Inductance (mH)		0.993	1.18	0.945	13.6	
Phase Angle (°)	OK	83.3	82.4	83.7	0.738	
I/F (%)	OK	-45.7	-44.4	-46.5	1.16	
Stator						
Rotor						
Insulation (MOhm)	OK	>999		Test Value	2.12	Ref Value
Contamination (%)						
Capacitance (nF)	OK	1.82%		Frequency	400	Direct Test at Motor

Correcting the Issue with Confidence

The technician completed the motor tests with in minutes, and after speaking with Aaron Schnelle about the test results, it was confirmed that the crane motor was in good condition and had not caused the contactor to fail. "From our findings, it appears that the motor is healthy and the issue was with the contactor," expressed the electrical supervisor.

Once their findings were confirmed, they began sourcing the replacement contactor. The motor system was back in operation eleven days after the initial flash event. If they had the AT5™ on hand prior to that event, the maintenance crew would have saved many days by immediately being able to determine the root cause of the failure. They would have also saved a great deal of downtime costs if they could have gotten the system back online more quickly.

Once the new contactor was finally delivered, the maintenance crew was able to install the new part. They started up the motor successfully and everything operated as intended. "It saved some time, that we didn't have to change out the motor," declares the electrical supervisor. "Using the AT5™ gave us the added confidence that the actions we were taking were the right ones," he continues. "I really appreciate Shane and Aaron's input during this situation."

After this experience, the electrical supervisor purchased the ALL-TEST PRO 5™, which he now believes is "an incredibly valuable piece of test equipment". This compact hand-held unit helped the off shore drilling company not only protect their investment in equipment, but more importantly, it enabled them to protect their people from another possible event.

About ALL-TEST Pro, LLC.

ALL-TEST Pro delivers on the promise of true motor maintenance and trouble shooting, with innovative diagnostic tools, software, and support that enable you to keep your business running. We ensure the reliability of motors in the field and help to maximize the productivity of maintenance teams everywhere, backing every ALL-TEST Pro product with unmatched motor testing expertise.



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