

CASE STUDY:

Loose Power Connections



The Company

A major automotive manufacturer, located in North America, with four manufacturing plants, utilizes MCA™ (Motor Circuit Analysis™) to keep their operations running.

The Application

A conveyor motor was tested during an annual inspection that operated in the part transfer line. If left operational, without the corrections found conducting predictive maintenance inspections, as coordinated through the Routes feature of the MCA™ Professional Software; the manufacture estimates a loss \$90,000 in expenses related to unscheduled downtime.

The Discovery

Annual testing for the plant was conducted during a scheduled shut down. Using the automated routes mode of the & MCA™ Software. A routing plan for testing was created on the PC by the maintenance manager and then uploaded to the ALL-TEST PRO 7™ instrument. This route provides an organized plan for the tech's to follow for an initial quick preliminary deenergized testing of a group of motors conducted at the motor controller. After completing their annual route testing the data was uploaded to the MCA™ Software.

An initial review of the MCA™ software report titled “equipment to review,” identified all machines that were in alarm. The report noted an unbalance in resistance and phase angle for a particular conveyor motor (see Figure 1).

Individual Analysis - MAP

Equipment: L1_INP_A1P2 Type: 3PhaseAC TE12

Name: Connection:Empty

Manufacturer: Motor Type:

Model:

Serial No:

Size HP: Amps: Ins. Class:

Size KW: Volt: Enclosure:

Efficiency: Power Factor: Frame:

Temp Rise: Service Fact:

RPM: KVA Code:

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	32	21	13		
Resistance (Ohm)	BAD 4.49	0.554	5.89	BAD 34.8	
Impedance (Ohm)	45.9	54.0	63.3	36.7	
Inductance (mH)	72.2	86.0	132	36.7	
Phase Angle (°)	BAD 71.9	83.8	73.5	7.32	
1/F (%)	OK	-42.8	-42.3	-43.1	0.454
Stator					
Rotor					
Insulation (MOhm)	OK	>5000		TUVS 183	
Contamination(%)	OK	1.69%		Ref Value	
Capacitance (nF)		4.35		Frequency 100	

Findings: Check for loose connections.
Shorted Stator Winding. Repeat the test to confirm.
Recommend performing rotor compensated winding test. See manual for details.
Recommend check at motor if tested from MCC.
Insulation Test Voltage: 500V
Instrument: AT701566
Calibration: 20191015-11:25

Notes:



Figure 1 Initial Report from MCC

The resistance unbalance indicated a possible loose connection. The phase angle unbalance indicates a developing phase to phase short. Based on the findings' recommendations provided by the MCA™ analysis report (see Figure 2), the tech tested directly at the motor conduit box. The tech found no visible issues upon his initial inspection of the wiring. Next, the tech proceeded to unwire the motor from the building supply wiring and retested the motor wiring only. This test indicated an "OK" condition for resistance and phase angle on the screen of the ALL-TEST PRO 7™ testing device.

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Figure 2 Findings from MCA™ individual analysis.

The Solution

The tech determined that the issue could have been a loose wiring connection issue in the motor conduit box. To confirm this theory, the tech reconnected the building supply wiring to the motor properly and retested at the motor disconnect. Again, this test indicated an "OK" condition for resistance and phase angle on the screen of the ALL-TEST PRO 7™ testing device. This confirmed the wiring connection at the motor conduit box was this issue and was corrected by rewiring the building supply connections. Figure 3 below is the uploaded MCA™ analysis report of the successful test at the disconnect. This test shows the motor resistance and phase angle are in a balanced condition and registering an "OK" operating condition.

Individual Analysis - MAP

Equipment: I1_INP_AIP2	Type: 3PhaseAC	Ts: T12
Name:	Motor Type:	Connection: Empty
Manufacturer:		
Model:		
Serial No.:		
Size HP:	Amps:	Ins. Class:
Size KW:	Volt:	Enclosure:
Efficiency:	Power Factor:	Frame:
Temp Rise:	Service Fact:	
RPM:	kVA Code:	

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		32	21	13	
Resistance (Ohm)	OK	5.89	5.88	5.89	0.0422
Impedance (Ohm)		104	88.0	82.1	13.5
Inductance (mH)		105	140	130	13.5
Phase Angle (°)	OK	73.7	73.5	74.6	0.665
I / F (%)	OK	-42.2	-42.8	-43.0	0.449

Stator				
Rotor				
Insulation (MOhm)	OK	>5000		TVS Ref Value 274
Contamination(%)	OK	1.66%		Frequency 100
Capacitance (nF)		4.35		

Findings: Recommend check at motor if tested from MCC.
 Insulation Test Voltage: 500V
 Instrument:AT701066
 Calibration:20191015-11:25

Notes:

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Lessons Learned

This MCA™ user confirmed that by conducting PdM testing using the ALL-TEST PRO 7™ deenergized testing device with the support of the Routes feature within MCA™ Enterprise Software, the motor issues were found and resolved before the motor was energized and the manufacturing process reinitiated. The described findings prevented a loss of production and damage to the conveyor, conveyor motor and danger to the operators. This MCA™ user estimates a cost savings of \$90,000 by the avoidance of a potential issuing occurring during normal operation. This cost savings estimate was based on production losses, additional labor, asset & disposal costs. Some considerations that were not known at the time of the cost estimate was spare motor and lead time which may have increased the potential loss.

MCA™ initial motor testing takes about 3 minutes per motor. Testing times can decrease further with the use of additional MCA™ features such as testing using TVS™ values to locate changes in the motor. Having a TVS value provides a cradle to grave analysis based on an initial baseline test compared to future testing creating a trending TVS value. This TVS trending value is reviewable on both the MCA™ Software and reference feature on the ALL-TEST PRO 7™, **see Tech Tip**. Additionally, the MCA™ Software allows managers to designate routes that are easily downloaded to the instrument for based route testing data capture. Once the route testing is completed data is uploaded to the MCA™ software where it can be shared, printed, analyzed, and used for trending. Additionally, a “equipment to review,” report can be generated providing you with a list of motors that require review due to poor conditions found in initial route testing. This report will include supporting “findings” recommendations of the potential issues with them as shown in the situation above. In the above case study, the customer is using MCA™ Enterprise software that is utilized for the four plant locations with one shared database. Routine testing such as this annual testing done by the above auto manufacturer increases plant and staff safety while avoiding shutdowns and delays with throughput.

About ALL-TEST Pro

ALL-TEST Pro delivers on the promise of true motor maintenance and troubleshooting, 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.

ALL-TEST Pro

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