



Company XYZ  
Anywhere, USA

Inspection Date:  
February 13, 2016

## **INSPECTION REPORT**

<b>Contact:</b> Joe Plant	<b>Tech:</b> MDI Tech
<b>Company:</b> Company XYZ	<b>MCA Testing:</b> Motor Rechecks

### **General:**

MCA data were collected on motors showing potential problems during the initial testing done on February 6-7, 2016. Data collected included: Resistance, Impedance, Inductance, Phase Angle and I/F (Current / Frequency). Data were collected on all 3 phases of the winding for comparative purposes. The MCA Tolerances in Table 1 below were used as a reference for assessing motor condition. The motors are listed in order of priority for action to be taken.

### **Inspection Findings:**

1. Anomalies still indicated in the Head Rig Band Mill Motor and Sharp Chain #2 Chip Head Motor. See Notes for specific action required.

### **Recommendations:**

1. Refer to the "Notes" section of each motor for specific action required.
2. Monitor motors every 6 months to establish on-going trends.

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## Three Phase Motor Troubleshooting Desk Guidebook

**Table 1: MCA Tolerances (Assembled Motor – All sizes)**

Test Result	Tolerance	Detail
Resistance (R)	<5% <sup>1</sup>	Used for detecting loose connections, broken wires, direct shorts and diff wire sizes
Impedance (Z) and Inductance (L)	Similar Patterns <sup>2</sup>	Changes to impedance that cause it's phase to phase pattern to appear different from inductance is normally the result in the change to the material condition of the insulation system. Used for detecting winding contamination, burned windings (overheated), very large phase unbalances or very poor rotor bar condition.
Phase Angle (Fi)	+/- 1 digit from average	Indicates a winding short: 74, 75, 76 OK; 74, 74, 76 suspect; 73, 73, 76 failed
I/F	+/- 2 digits from average	Indicates a winding short: -44, -45, -46 OK; -44, -46, -46 suspect; -42, -45, -45 failed
Insulation Resistance (MegOhm)	>5 MegOhm <sup>3</sup> >100 MegOhm <sup>4</sup>	Indicates poor insulation to ground (ie: ground fault)

When a motor does not have a rotor in place, such as in a motor repair shop with a stator only, the tolerances change:

**Table 2: MCA Tolerances (Disassembled Motor - All sizes)**

Test Result	Tolerance
Resistance (R)	<5%
Impedance (Z)	<3%
Inductance (Z)	<5%
Phase Angle (Fi)	+/- 0
I/F	+/- 0
Insulation Resistance (MegOhm)	> 5 MegOhms <sup>3</sup> / > 100 MegOhms <sup>4</sup>

### ***Fault Detected Procedure***

If a fault is detected when testing from an MCC or Disconnect, the next step is to take readings at the motor, itself. If the fault 'goes away', then a fault exists in the cable. If the fault does not 'go away', then the fault exists in the motor.

<sup>1</sup> Above 0.250 Ohms. Otherwise look for significant differences such as 0.080 Ohms, 0.082 Ohms and 0.400 Ohms would indicate a problem.

<sup>2</sup> A motor with an inductance of 10, 11, 12 (Low reading, medium reading, high reading) should have a similar pattern of impedance, such as 20, 23, 25 (Low, medium and high). If they are not similar, for instance if impedance showed as 20, 15, 19 (high, low, medium), on the same motor, a fault has been detected.

<sup>3</sup> For motors with a voltage rating less than 600 Volts

<sup>4</sup> For motors with a voltage rating greater than 600 Volts



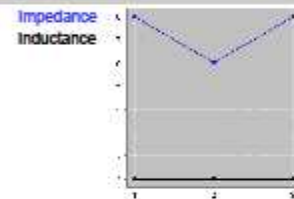
## Equipment Findings

Equipment	HeadRigBand	Type: 3PhaseAC	Phases 3	Tt: 6
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Name : HeadRig Band Mill  
 Model:  
 Manufacturer:  
 Serial No:  
 Frame:  
 Enclosure:  
 Size HP: 250.0      Size KW: 186.0      Amps: 305  
 RPM: 1200      Efficiency:  
 kVA Code:      Power Fact:      Voltage: 460  
 Ins. Class:      Service Fact:      Temp Rise:

### Baseline: 2016 02 06 - 13:45

	T1-T2	T1-T3	T2-T3	
Resistance:	0.017	0.022	0.027	23.80
Impedance:	8.0	6.0	8.0	18.18
Inductance:	1.0	1.0	1.0	0.00
Phase Angle:	63	59	62	4
I/F:	42	43	42	1



No insulation tested

**Findings**

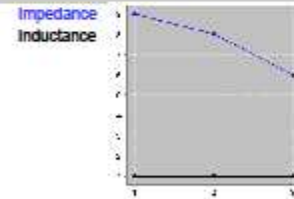
- Check for loose connections.
- Possible contaminated or overheated winding, evaluate Impedance and Inductance Pattern match.
- Shorted Winding.
- No insulation resistance tested.

**Notes**

Phase angle indicates a shorted winding. Recheck at motor. Replace if winding checks bad at motor.

### Compare to Test Date: 2016 02 13 - 13:53

	T1-T2	T1-T3	T2-T3	
Resistance:	0.020	0.018	0.018	7.55
Impedance:	9.0	8.0	6.0	21.74
Inductance:	1.0	1.0	1.0	0.00
Phase Angle:	63	62	59	4
I/F:	42	42	44	2



No insulation tested

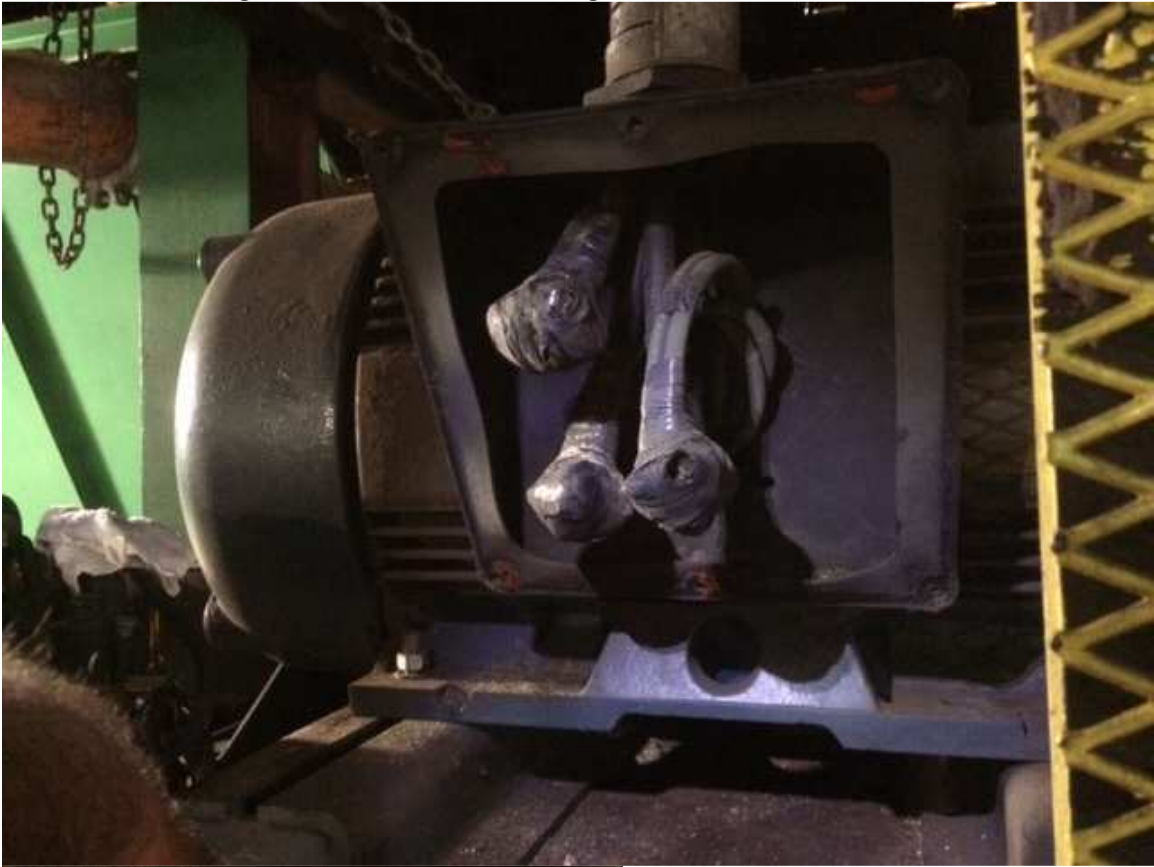
**Findings:**

- Check for loose connections.
- Possible contaminated or overheated winding, evaluate Impedance and Inductance Pattern match.
- Shorted Winding.
- No insulation resistance tested.

**Notes:**

Motor was tested 4 times with same result. Motor starter coil wires were removed from load side motor leads and motor was rechecked. Motor shaft was turned and rechecked. In each test the phase angle was 4-5 degrees off indicating a shorted winding. Schedule motor for inspection and recondition.

Photos of Head Rig Band Mill Motor Showing Shorted Motor Lead





## Equipment Findings

Equipment	SCChiphd2	Type: 3PhaseAC	Phases 3	Tt: 6
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Name : SharpchainChipHd2

Model:

Manufacturer:

Serial No:

Frame:

Enclosure:

Size HP:

Size KW:

Amps:

RPM:

Efficiency:

Voltage: 480

kVA Code:

Power Fact:

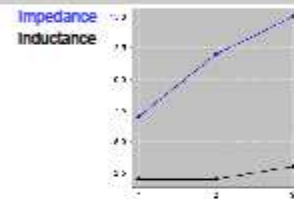
Temp Rise:

Ins. Class:

Service Fact:

### Baseline: 2016 02 06 - 15:45

	T1-T2	T1-T3	T2-T3	
Resistance:	0.035	0.040	0.047	15.76
Impedance:	7.0	12.0	15.0	38.24
Inductance:	2.0	2.0	3.0	28.57
Phase Angle:	68	68	69	1
I/F:	43	43	42	1



No insulation tested

Findings

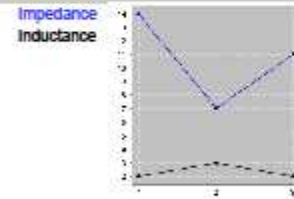
- Check for loose connections.
- Possible contaminated or overheated winding, evaluate Impedance and Inductance Pattern match.
- No insulation resistance tested.
- Recommend check at motor if tested from MCC.

Notes

Inductance and Impedance patterns do not match indicating a potential fault. Likely contaminated winding. Recheck at motor. Check for loose / dirty wire connections at MCC.

### Compare to Test Date: 2016 02 13 - 15:22

	T1-T2	T1-T3	T2-T3	
Resistance:	0.027	0.026	0.027	3.82
Impedance:	14.0	7.0	11.0	34.37
Inductance:	2.0	3.0	2.0	28.57
Phase Angle:	69	69	68	1
I/F:	42	42	43	1



No insulation tested

Findings:

- Check Resistance.
- Possible contaminated or overheated winding, evaluate Impedance and Inductance Pattern match.
- No insulation resistance tested.
- Recommend check at motor if tested from MCC.

Notes:

Tested motor at junction box close to motor. Inductance and Impedance patterns still do not match indicating a potential fault, possible contaminated or overheated winding. Recheck motor in 3 months. Clean and tighten wires and lugs at MCC (they were visibly dirty).



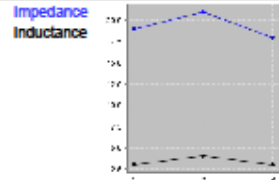
## Equipment Findings

Equipment	BuckMainHyd	Type: 3PhaseAC	Phases 3	Ti: 6
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Name : BucksawMainHyd  
 Model:  
 Manufacturer:  
 Serial No:  
 Frame:  
 Size HP: 200.0                      Enclosure:  
 Size KW: 149.0                      Amps: 235  
 RPM: 1785                              Efficiency:  
 Voltage: 480  
 kVA Code:                              Power Fact:  
 Temp Rise:  
 Ins. Class:                              Service Fact: 1.15

**Baseline: 2016 02 06 - 14:58**

	T1-T2	T1-T3	T2-T3	
Resistance:	0.011	0.013	0.018	30.09
Impedance:	19.0	21.0	18.0	8.62
Inductance:	3.0	4.0	3.0	20.00
Phase Angle:	68	67	68	1
I/F:	41	40	41	1



No insulation tested

Findings

- Check for loose connections.
- Possible contaminated or overheated winding, evaluate Impedance and Inductance Pattern match.
- No insulation resistance tested.
- Recommend check at motor if tested from MCC.

Notes

Inductance and Impedance patterns match. Check MCC wires for loose / dirty connections. Recheck in 6 months.

**Compare to Test Date: Not Selected**

	T1-T2	T1-T3	T2-T3
Resistance:			
Impedance:			
Inductance:			
Phase Angle:			
I/F:			

Findings:

Notes:





# Equipment Findings

Equipment: SawdustBlwr      Type: 3PhaseAC      Phases: 3      Ti: 6

Name : SawdustBlower

Model:

Manufacturer:

Serial No:

Frame:

Enclosure:

Size HP: 150.0

Size KW: 112.0

Amps: 171

RPM: 1785

Efficiency:

Voltage: 480

kVA Code:

Power Fact:

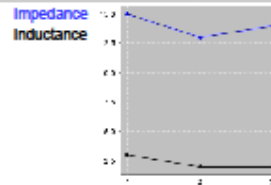
Temp Rise:

Ins. Class:

Service Fact: 1.15

### Baseline: 2016 02 06 - 14:31

	T1-T2	T1-T3	T2-T3	
Resistance:	0.044	0.043	0.043	1.02
Impedance:	15.0	13.0	14.0	7.14
Inductance:	3.0	2.0	2.0	28.57
Phase Angle:	89	89	89	0
I/F:	43	44	43	1



No insulation tested

Findings

- Possible contaminated or overheated winding, evaluate Impedance and Inductance Pattern match.
- No insulation resistance tested.
- Recommend check at motor if tested from MCC.

Notes

Impedance and Inductance patterns match. Good winding. Recheck in 6 months.

### Compare to Test Date: Not Selected

	T1-T2	T1-T3	T2-T3
Resistance:			
Impedance:			
Inductance:			
Phase Angle:			
I/F:			

Findings:

Notes: