Big Heart Pet Brands, Line #8 Test Results

May 19, 2015

Introduction

Topeka Electric Motor Repair, Inc. (TEMR) was asked to come to Big Heart Pet Brands on 05-19-15 to resolve problems on production line metal detectors. The metal detectors were not able to maintain user settings, and setting off false signaling. Metal detector line problems were corrected by installing the CoolBLUE® and NaLA® cores onto the incoming power to the control cabinet, and on two of the VFD's in the control cabinet.

Test performed with the Fluke 190-204 meter and a Rogowski coil for measuring the High Frequency current.

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Photo 1

Control Panel and Metal Detector

Since installing CoolBLUE® and NaLA® cores on Line #8 metal detector, Big Heart Pet is now able use the metal detector at its higher sensitivity levels, with complete stability. Sensitivity range is from 0-199. The unit is now running at a sensitivity level of approximately 159.

Photo 2 is in run mode on the Fluke 190 scope meter. This reading was taken with the Rogowski coil on L1-L2-L3 at the bottom of the master disconnect of control cabinet. Disconnect is rated at 100 amp.

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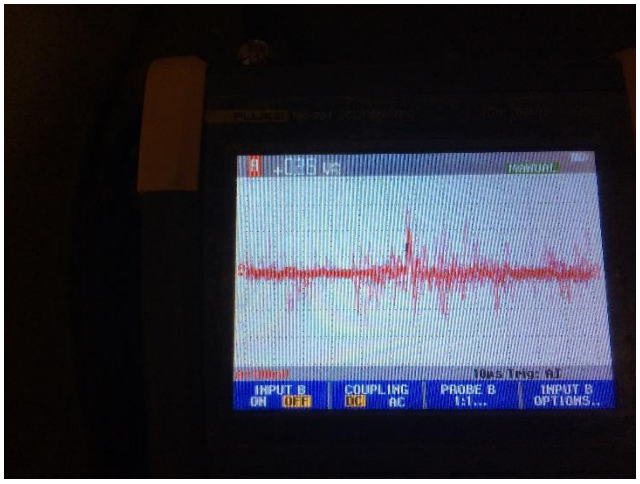
Photo 2



Fluke 190 Scope Meter

The Fluke 190 Scope Meter (***Photo 2***) shows an excessive amount of High Frequency noise. All of this high frequency noise, high frequency current, is generated by the VFD's and transmitted throughout the plant. The VFD's are powering the electric motors to perform a certain job in the plant.

The High Frequency current/noise generated from the VFD's find a path to the electric motor, passed through the bearings in the motor, back through the ground wire, and then recirculated back through the plant.

All of this High Frequency current/noise then ends up back on the line side of the control cabinets, electric motors, VFD's etc.

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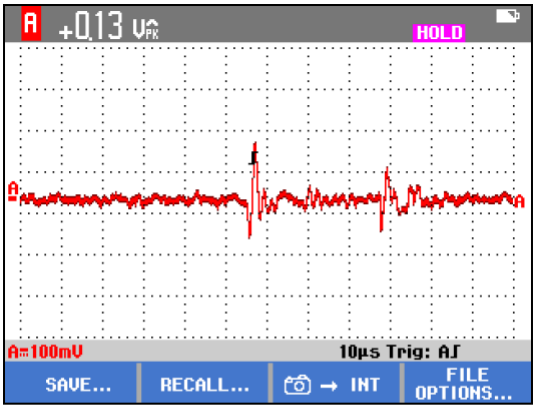
Figure 1



readings were taken at the bottom of the disconnect,with no coolBlue or Nala cores installed.
.13~.05=2.6 amps of high frequency current.
line#8 metal dectector
05/19/15 09:04:35 test#31

In ***Figure 1***, the meter was put on hold to show how much High Frequency current was on the L1-L2-L3 at the bottom of disconnect. The Rogowski coil is used to capture the readings.

The conversion for the Rogowski coil is: Volts divided by .05 = amps

Figure 1 shows that there are .13 volts peak.

Rogowski conversion: .13 volt divided by .05 = 2.6 amps of current.

Note that this current is flowing on the incoming power to the control cabinet, L1-L2-L3. All of the VFD's, controls for the metal detector, etc., are all seeing this issue. This issue will affect the output power of the VFD.

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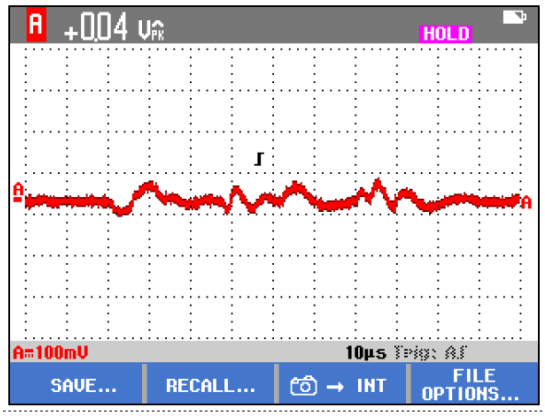
Figure 2



readings were taken at the bottom of the disconnect, with coolBlue and Nala cores installed.
.04~.05=.8 amps of high frequency current.
line #8 metal dectector
05/19/15 09:12:11 test # 32

Figure 2 shows the readings after the CoolBLUE® and the NaLA® cores were installed on the L1-L2-L3 below disconnect. Cores installed help clean up incoming power.

Rogowski conversion: .04 divided by .05 = .8 amps of current.

By removing the High Frequency current/noise, the metal detectors were able to maintain a setting and resolved the false readings.

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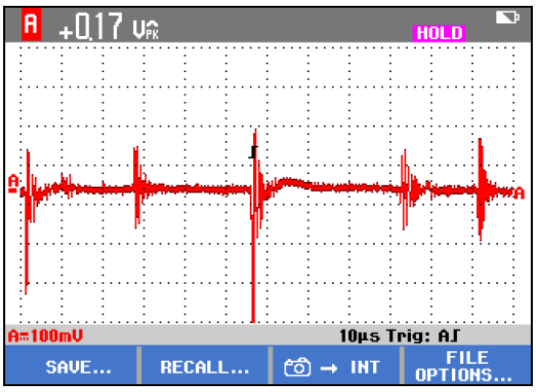
Figure 3



M8038
readings were taken on T1-T2-T3 at
the bottom of the VFD. with no
coolBlue or Nalas installed.
.17~.05=3.4 amps of current flowing
through the bearings.
line #8 metal detector
05/19/15 09:16:50 test # 33

Readings were then taken on T1-T2-T3 on the wires between the VFD and the electric motor.

Rogowski conversion: .17 divided by .05 = 3.4 amps of current

3.4 amps of High Frequency current passing through the bearings in the motor. This High Frequency current is also being sent back to earth ground via shaft, bearing, motor case, to ground.

With the use of shaft grounding brushes, this same current is still being sent to earth ground. It was just redirected from passing through the motor bearings, to being passed through the shaft grounding brush to ground.

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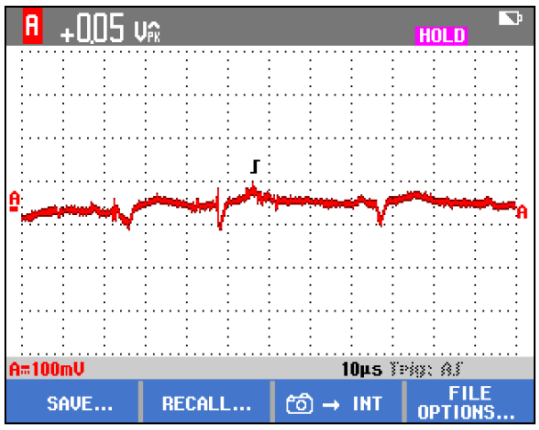
Figure 4



M8083
reading taken on T1-T2-T3 with
coolBlue and Nala cores installed.
.05~.05= 1 amp of current flowing
through the motor bearings.
05/19/15 09:43:28 test # 34

Figure 4 shows the decrease in the High Frequency current after the CoolBLUE® and NaLA® cores were installed on T1-T2-T3.

Rogowski conversion: .05 divided by .05 = 1 amp of current

1 amp of current is being passed through the bearings in the motor, and then through the earth ground wire.

This is a decrease of 70% in High Frequency current.

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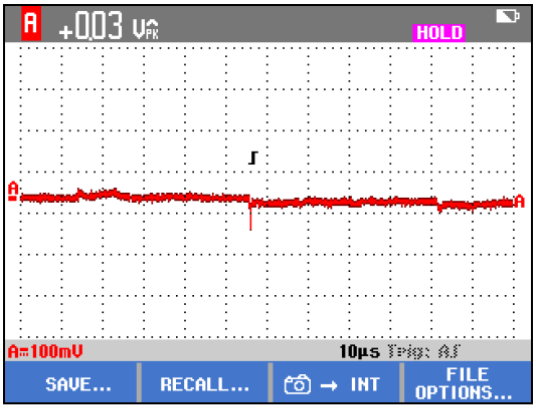
Figure 5



M8083
reading taken on the ground wire.
coolBlue and Nala cores intalled on
T1-T2-T3
.03~.05 = .6 amps on the ground wire
05/19/15 09:46:11 test #35

Finally, ***Figure 5*** shows the amount of High Frequency current on the ground wire between the VFD and the electric motor.

Rogowski conversion: .03 divided by .05 = .6 amps of current

0.6 amps of current on the ground wire.

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Final Evaluation

With the increasing use of VFD controlled systems, the problem with the high frequency current being generated from the VFD IGBT's are going to become more prevalent. More issues will be found with metal detectors, sensors, meters, gauges, electric motor bearings, conveyor bearings, etc.

By using the grounding brushes, there has been no correction to remove the High Frequency current (also called frequency noise or Sigma currents). They will still be present in the system, and causing problems. By redirecting the high frequency current to the ground wire, you have created issues seen in this test, and many more performed by TEMR.

The possibility, and likelihood is, that VFD induced currents have turned all of these manufacturing plants in to a big capacitor waiting to discharge, to damage the motor bearings, wreak havoc on sensors, meters, pick up sensors, etc.