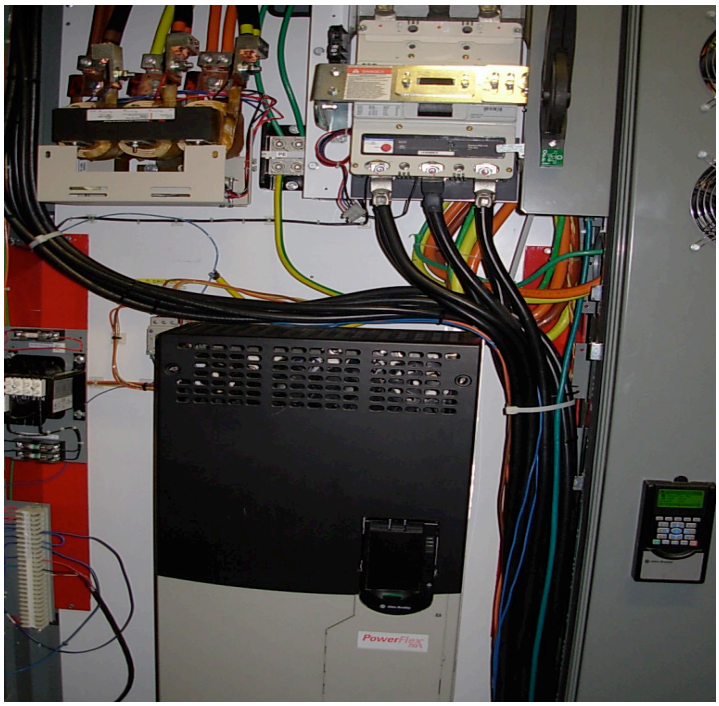
REVISED

06-01-2015

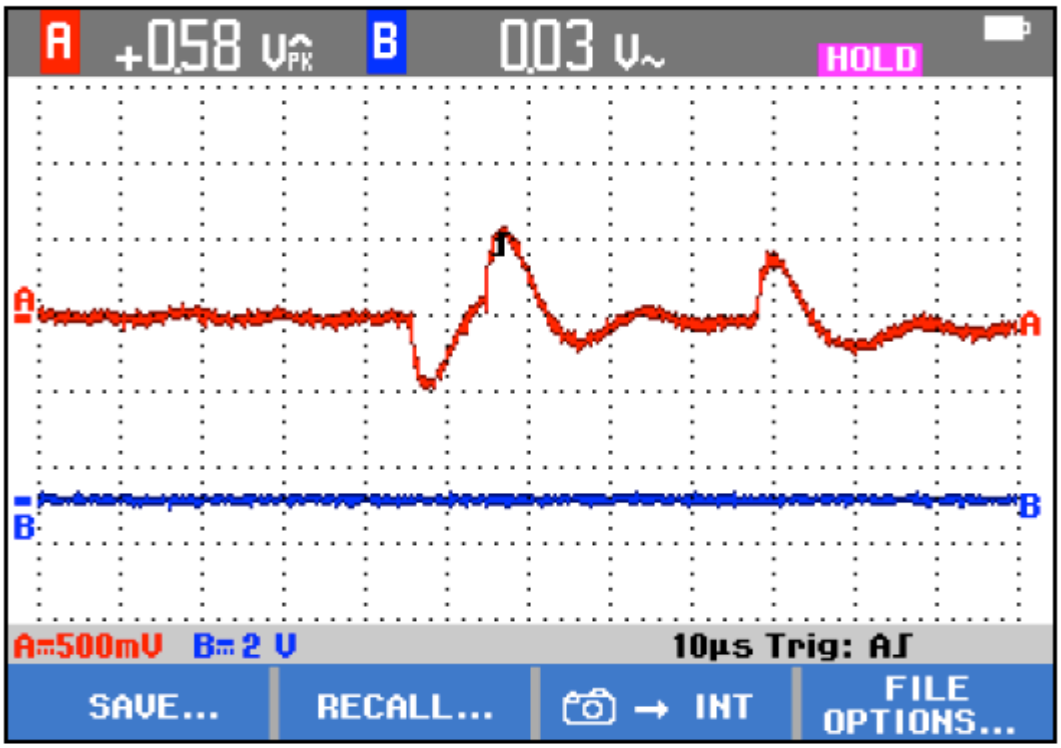
Topeka Electric Motor Repair Inc.
605 sw lane st. Topeka,Ks. 66606
1-785-233-4750

These readings were taken at the Mars Chocolate plant in Topeka,Ks 05-12-13
Machine # MA-TOP-CHO-CP1-L1Q-CNO2 conche # 2.

TEMR was asked to check the Common mode currents on the machine. The machine had TCI series line filters installed. model# V1000KLC. The VFD is a Allen Bradley Power flex model# 755.
Readings were taken on T1-T2-T3 common mode leads and the ground wires.
There were no CoolBlue or Nala cores installed for these readings.



Picture of the vfd and the filter



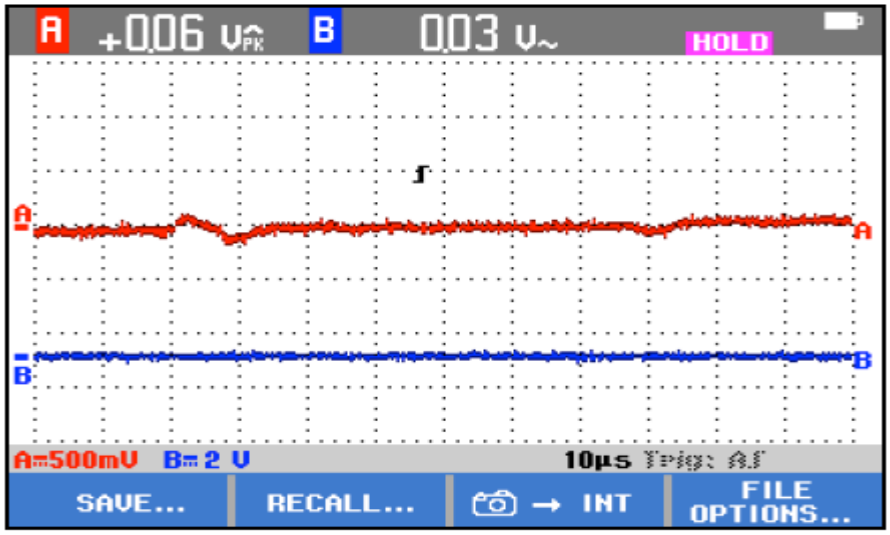
MA-TOP-CP1-L1Q-CNO2 conche #2
readings taken on T1-T2-T3 after
TCI line filter. all 6 leads.
.58 div by .05 = 11.6 amps
05-12-15 12:22:15

no coolblue or nala

This chart shows the amount of voltage that was read with the Rowgowski coil. The Rowgowski coil is used to measure the High Frequency Currents on the common mode leads and the ground wire. The conversion rate for the Rowgowski coil from voltage to amperage is: volts divided by .05 = amperage. There were no CoolBlue or Nala cores installed on this machine when the readings were taken. There is a Series line filter installed between the VFD and the motor. This reading was taken AFTER the line filter.

The motor on the unit has a 6322 drive end bearing and a 6316 op dive bearing. The 6316 bearing has a 28.4 mm diameter ball.

The voltage reading in the chart is .58 vac. divided by .05 = 11.6 amps. What this is showing us, is how much current is traveling through the bearing. Every bearing can handle a small amount of current because of the insulation value in the grease that is in the bearing. The formula for the current on the bearing is Amperage/mm squared. This will give you the amperage density of the bearing.



MA-TOP-CHO-CP1_L1Q-CNO2 conche#2
readings taken on ground wire
.06 div by .05 = 1.2 amps
05-12-15 12:24:13

no coolblue or nala

This charts shows the Rogowski coil was installed on the ground wire, from the VFD to the motor. There is 1.2 amps of current on the ground wire.

The current that is on the ground wire can cause many problems through the plant, unexplained shut downs, faulty readings on sensors, etc.

Summary of test: The summary of the readings is that with the line filters in place, there was enough drop in the High Frequency current for the bearing to safely run. The filters also help with the voltage spikes, this in turn will help protect the winding insulation. The op drive bearing is a 6316, it has a 28.4 mm diameter ball. Amperage/mm squared is the formula to figure the amperage density of the bearing. The bearing can run with 13.0 amps of current. The filters had brought the reading to 11.6 amps of current the bearing is seeing.

REVISED: 06-10-2015 Summary of TEST: Clarifying the above Summary. Yes the in-line filters did remove 1.4 amps of current that the bearings were seeing. And yes, the insulation properties of the grease is able to absorb that much current, it is on the high end of the threshold. That is with no contaminants in the grease. As shown in the follow up of the test, after the CoolBlue and Nala cores were installed, the current was brought down to 2.4 amps of current that the bearings are seeing. With this lower amperage the bearings are seeing, the bearing will have more longevity, against bearing issues related to High Frequency Currents generated by the VFD's. The lower you can get the Amperage that the bearings are seeing the better the life span of the bearings.

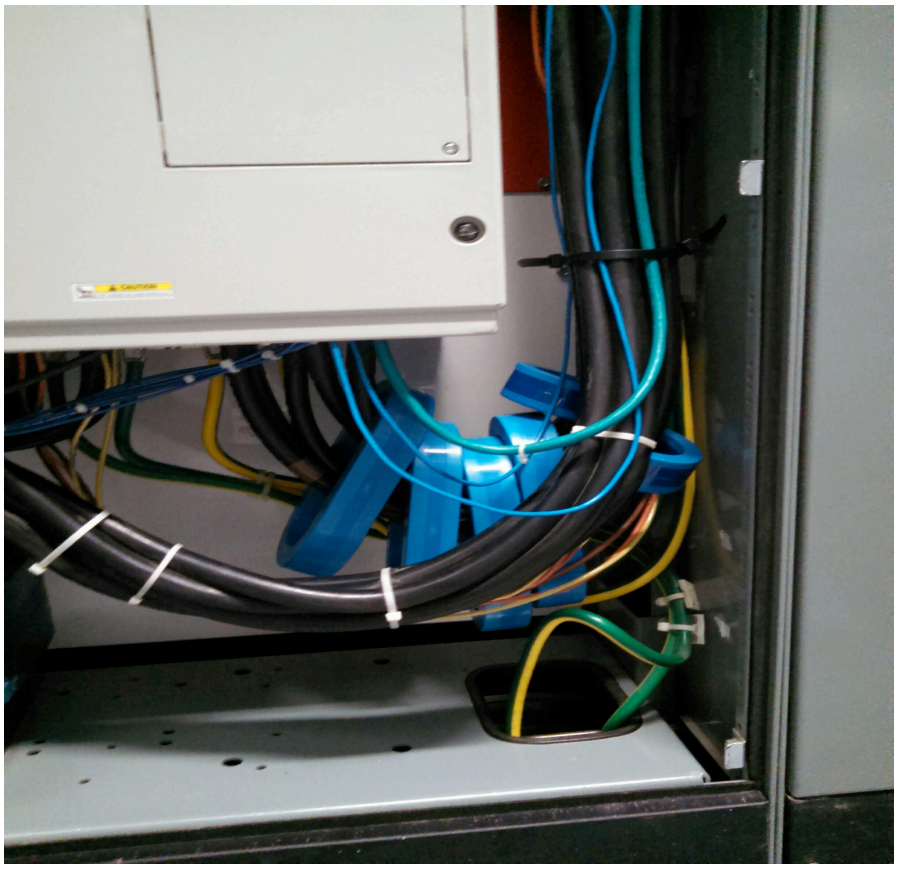
Remember the lower the current the better longevity the bearing will have. With the CoolBlue and Nala cores the reading could be cut in half, or better. We have to look at the costs of the cores vs. the cost of the filters to determine the benefits. The lower the amperage that the bearings are seeing will lower the cost of the motor repair, because of the longevity of the bearings.

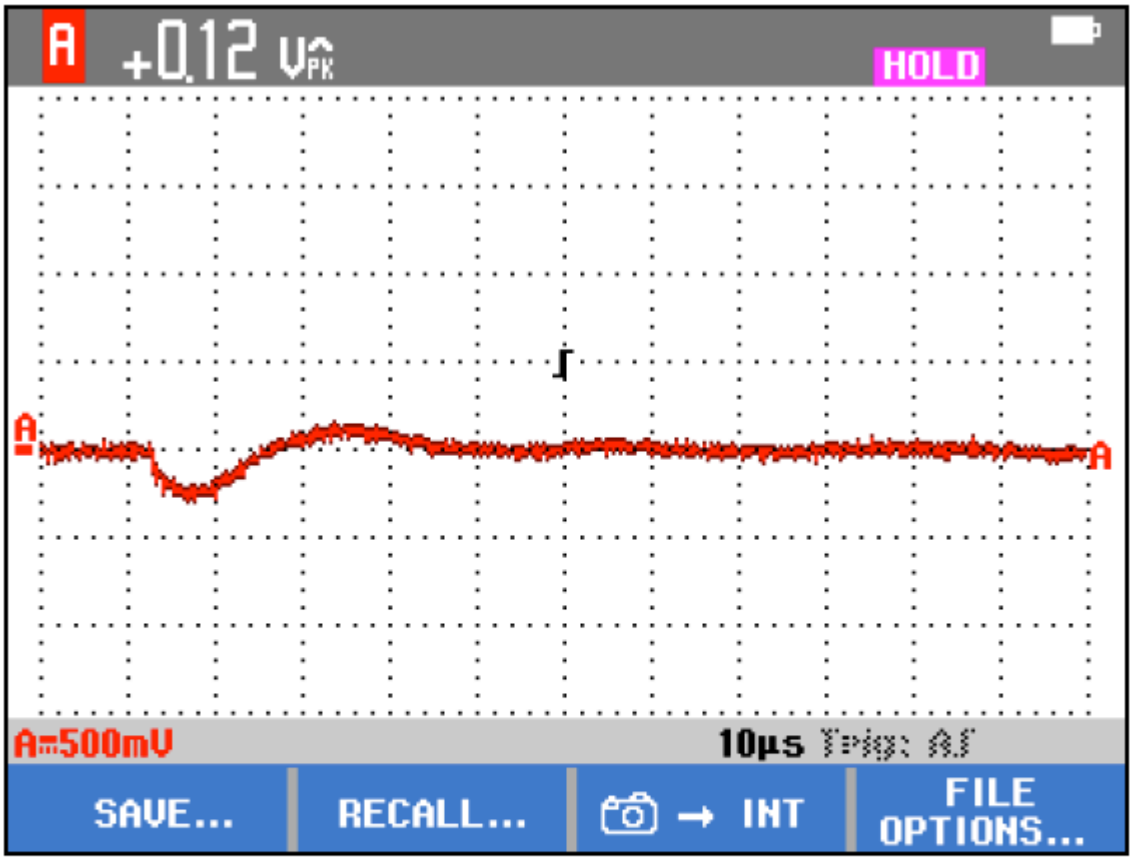
By lowering the High Frequency current this has also helped the windings in the motor, from spikes and over shots. You have also removed the current on the Ground wire, which this helps with Ground fault shut downs, phantom shut downs and many other issues.

Property of TEMR 05-13-15

On 06-01-2015 Topeka Electric Motor Repair was asked to come and take High Frequency readings on Conche #2 after Mars had installed the CoolBlue and Nala cores.

The photo below shows the CoolBlue and Nala cores installed in the control cabinet.





MA-TOP-CP1-L10-CN02 conche #2
CoolBlue and Nala cores installed.
.12 v divided by .05 =2.4 amps
06-01-15 10:50:17 test # 48

The above graph shows the amount of High Frequency current that was on the Common mode leads. (T1-T2-T3).

Before the CoolBlue and Nala cores were installed the voltage was .58 vac. divided by .05 = 11.6 amps. That was 11.6 amps of current flowing through the bearings. (refer back to the first graph).

After the CoolBlue and Nala cores were installed there was 0.12 v, the conversion formula is 0.12 vac divided by 0.05 = 2.4 amps of current flowing through the bearings.

This was a reduction of more than 80% in High Frequency Common mode currents.

In Summary: We need to evaluate this theory.

With the increasing use of VFD's, the problem with the High Frequency current is going to become more prevalent. There will be more issues with a metal detectors, sensors, meters, gauges, electric motor bearings, electric motor windings, 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 are still present. By redirecting the High Frequency current to the ground wire, you have created the issues seen in the test. What is the possibility that all of these issues have turned all of these manufacturing plants in to a big capacitor waiting to discharge, to damage the motor bearings, reek havoc on sensors, meters, pick up sensors, etc.

06-01-2015