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CHECKING 4-20MA SENSOR AND MONITORING SYSTEMS

INTRODUCTION

The most common process control monitoring instruments in industry are the Analog 4-20 Ma proportional output signal devices. They are commonly used on fans and blowers for measuring and monitoring pressure, damper positioning, vibration, temperature, speed, voltage, current, volume flow plus many more. When used for vibration monitoring they can produce a signal accurate enough for general overall amplitude monitoring but do not have an output signal that can be used for vibration analysis of discrete frequencies. That limitation is why some customers prefer a system usable for real time analysis in the discrete frequency range as well as overall amplitude. The drawback of this system is that it is more expensive, but the plus side is that it is usually much more accurate in determining vibration issues. One other limitation with the 4-20 ma devices is getting the calibration correct so that the reading at the monitor is correct. Problems in the sensor calibration, wiring, digital control system or PLC programming can give false readings. It is quite common for the user of these systems to conclude that something is wrong with the fan or blower when it may be the calibration and checking of the system for accuracy.

Steps are outlined below to check for accuracy of the 4-20ma system and to calibrate:

STEP 1

If a 4-20 Ma proportional signal, when quantified into an amplitude does not match a known calibrated testing device, then the 4-20 Ma system is defective in its purpose.

Test for instrument supply voltage.

Test for a voltage activated but machine shut down signal of 4 Ma. Less than 4 Ma base indicates a circuit fault. It's not uncommon for very slight dip below 4Ma to produce a negative number.

Use a 4-20 Ma signal generator to test feed the system to do a proportional test.

Example # 1... Velocity vibration sensor outputting in Inches per Second (IPS) on a scale 0.0 to 1.0 IPS

4 Ma Base Signal .... = .0 IPS

8 Ma Signal ..... = .25 IPS

12 Ma Signal ... = .5 IPS

16 Ma Signal .... = .75 IPS

20 Ma Signal .... = 1.0 IPS (FS)

Example #2 ..... Pressure transducer outputting in Pounds per Square Inch (PSI) on a scale of 3 to 15 PSI

4 Ma = 3 PSI

10 Ma = 7.5 PSI

20 Ma = 15 PSI (FS)

Drive the signal loop with the testing signal generator and cross check the output quantification on the display monitor in a control center. It has to be predictable and accurate based on test signal

If the sensor is accurate by its output in ma and if the sensor signal is being accurately and proportionally received at the DCS or PLC, then the sensor and wiring to the control room is correct and there may be a DCS or PLC error.

STEP 2

Check the programming of the DCS or PLC to ensure the 4 – 20 ma signal is being converted properly and displayed correctly in the system.

STEP 3

Check the alarms and trips to ensure the values are correct with the parameters supplied by the fan or blower company.