

Sensor Shield Grounding Recommendations for SKF On-line System Installations

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Introduction

This paper describes SKF Condition Monitoring's recommended grounding scheme for sensor cable shields, as it applies to both the SKF Multilog Local Monitoring Unit (LMU) and SKF Multilog Condition Monitoring Unit (CMU) on-line surveillance systems. The recommended approach follows IEEE Standard 142-1991. The grounding recommendations set forth by this IEEE standard are designed to protect plant personnel, machinery and the products they produce from electrostatic discharge.

Proper sensor shield grounding helps to ensure higher vibration data quality, specifically with respect to the induction of 50 or 60 Hz line frequencies and other electrical noise sources onto the vibration signal. Proper sensor shield grounding also provides plant and personnel protection.

Proper grounding of the sensor cabling shields becomes more and more important as cable lengths increase. The probability for external noise polluting the vibration signal increases as cable lengths increase. Noise sources include electric motors, fluorescent lights and ballasts, radio frequency devices and other similar devices typically found in industrial environments.

The standard

IEEE states that in order to be effective, shields must be grounded. To achieve this for signal frequencies below 1 MHz, which applies to SKF's on-line system installations, the shields should be grounded at only one side, with the other end insulated from ground. This prevents the shield from acting as a conductor for voltage differences between the two ends of the cable.



Figure 1. The SKF Multilog Condition Monitoring Unit (CMU).

The IEEE standard recommends grounding the shield at the signal source side. The shield should be grounded at the sensor (machine) end of the cable. This requires that the machine itself be properly grounded. If the machine is not properly grounded, then the sensor cable shield should be isolated from the machine side and grounded at the LMU or CMU.

In a case where all of the sensor cable shields are tied to ground at the instrument end, any noise riding on the shield is forced to flow to the instrument. This increases the likelihood that noise on one channel will affect a measurement being made on another channel. In effect, the shields act as antennas, pulling in noise from multiple sources. The preferred method is to ground at the machine side to keep the noise away from the measuring device.



In LMU and CMU installations, the sensor cable shield should never be grounded at both ends. Grounding at both ends creates ground loops and provides an opportunity for voltage potential to exist on the machine, to raise or lower the instrument ground. Grounding at both ends may cause permanent damage to the on-line system, along with unpredictable behavior in the LMU or CMU.

If the routing of sensor cables cannot avoid severe electrical noise sources, such as machine tool applications, then double-shielded cable can be used. For double-shielded applications, the outer shield should be tied to the sensor end and the inner shield should be tied to the instrument end. Another cable routing tip is to avoid routing sensor cables in close parallel with power lines. If crossing is unavoidable, sensor cable routing should always cross power lines in a perpendicular fashion.

The ideal installation

In order to maintain the highest level of safety, reliability and data quality, SKF strongly recommends that all efforts be made to ensure that plant machinery is properly grounded, and that these grounding installations are periodically checked and maintained. In some cases, the consequences of not doing so can be severe. Electrostatic buildup on a paper machine, for example, can lead to equipment damage, fires or injury when the buildup is discharged.

Additional information

Additional information on proper online system installations, including wiring diagrams, can be found in the LMU installation manual, document number 31801300, revision A, as well as the CMU installation guide, document number 319559a0.

A good description of the IEEE standard 142-1991 can be found in the book *IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems*, ISBN Number 1-55937-141-2.



Figure 2. The SKF Multilog Local Monitoring Unit (LMU).

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