# Cooling Tower Fan and Gearbox

## Bearing Defect Detection and Vibration Monitoring Using the Machine Condition Transmitter (MCT)

*By Torsten Bark • SKF USA Inc.*

Cooling tower fans and associated gearboxes incorporating rolling element bearings are ideal candidates for monitoring with SKF's Machine Condition Transmitters (MCT's). Using a single CMSS 2110 accelerometer with integral over-braided cable, the customer can realize the cost effectiveness of multi-parameter monitoring with a complementary pair of CMSS 590-ENV (enveloped acceleration) and CMSS 530-VEL (velocity) MCT modules. Multi-parameter monitoring encompasses monitoring a single bearing for two parameters. These parameters are enveloped acceleration for rolling element bearing and gearbox defects and velocity for rotational deficiencies.


*Fig. 1. MCT transmitter with companion monitor (alarm unit).*

## What mechanical deficiencies and bearing defects do we detect from monitoring cooling tower fans and gearboxes with the MCT's?

All the following contribute to the cause of vibration or the generation of signals for which the early detection will surely preclude an expensive failure:

- Defective rolling element bearings (enveloped acceleration)
- Gearbox defects (enveloped acceleration; also 1x r/min and/or number of gear teeth × r/min in velocity)
- Misalignment of drive couplings or installed bearings (1x r/min, axial, velocity)
- Bent shaft (1x r/min, axial, velocity)
- Unbalance of rotating parts (1x r/min, radial, velocity)
- Machine looseness and foundation problems (2x r/min, radial (vertical), velocity)
- Aerodynamic forces (1x r/min or number of blades × r/min, axial, velocity)

Installing the MCT's locally and providing an analog output for use with centralized control systems (DCS, PLC etc.) for indication, decision making and protection (shutdown) are typical uses.


*Fig. 2. Recommended accelerometer CMSS 2110.*

In addition the MCT 's also provide two buffered signal outputs. One can be used for permanent connections, for example, routing it to the transducer input of a MCT enveloped acceleration module; the other can be used for temporary connections, for example, via front panel BNC connector to a portable instrument such as the SKF Microlog as part of a predictive maintenance plan.

The locally mounted MCT can provide an early warning when incipient mechanical deficiencies begin to appear in the cooling tower fan motor and gearbox. The MCT with companion monitor has two alarm relays that can also be wired to shut the tower fan down if matters become dangerous. The objective of installing MCT's is to prevent unscheduled failures to protect both the personnel and the machine.

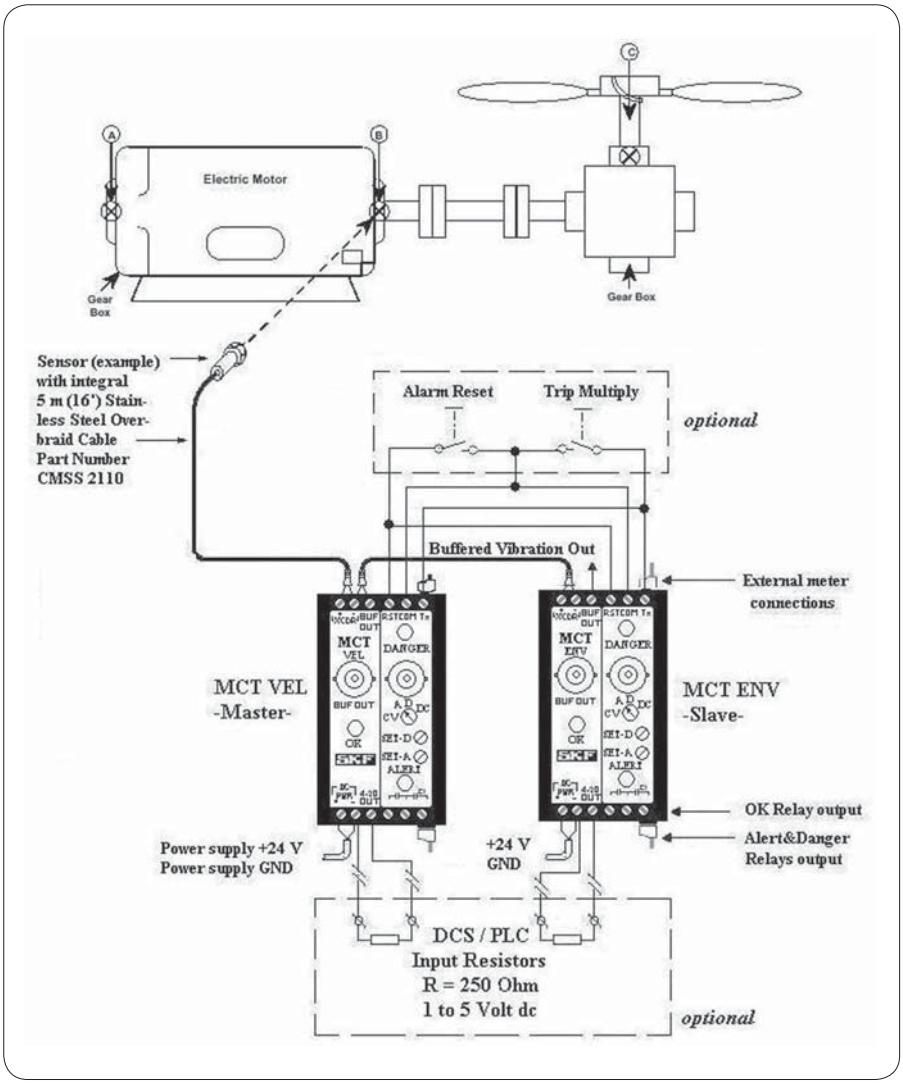


*Fig. 3. Cooling tower fan and gearbox, typical multi-parameter installation.*

## Typical installation

Referring to **fig. 3**, the recommended accelerometers should be mounted at points A and B on the motor and at point C on the gearbox to be monitored. The accelerometers should be mounted in a horizontal direction, and if the bearing housing is split, the accelerometer should be mounted below the split. The accelerometer is then connected to the transducer input of the MCT velocity module.

The verified distance between sensor and MCT transmitter is at least 30 m *(100 ft.)*. For longer distances, a junction box may be employed. In this example, the buffered output (BUF OUT) is used as the input for the MCT enveloped acceleration module. The MCT enveloped acceleration modules feature a jumper controlled constant current source (CCS) and are therefore the designated "slaves" in multi-parameter configurations.

The standard SKF MCT housing (CMSS 672-HSG, metal cabinets) has complete provisions for holding up to four MCT's with monitor (alarm module) or six MCT's without monitor. The cabinets can be ordered completely wired ready for installation and is ideal for monitoring cooling tower fans and gearboxes.

Please contact:

**SKF USA Inc.**
**Condition Monitoring Center – San Diego**
5271 Viewridge Court · San Diego, California 92123 USA
Tel: +1 858-496-3400 · Fax: +1 858 496-3531

**Web: www.skf.com/cm**



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