Hansford Sensors
Excellence in Vibration Monitoring

A white paper from Hansford Sensors

Protecting cooling towers with vibration sensing

The sight of Cooling Towers is becoming more and more common throughout a wide range of industries.

Regardless of the size, type or configuration of cooling towers, there is a single common denominator: they need to be readily available. This single criterion requires the most effective condition monitoring and system maintenance procedures to be put in place.

At the heart of each cooling tower is a large fan system, providing forced air to the heat exchangers. This system typically comprises one or more rotating fans – each often several metres in diameter – plus drive motors, gearboxes and associated linkages and control mechanisms.

Almost all of these will have moving parts, which must be installed and aligned correctly to ensure continued reliable operations.

They will, however, be subject to normal wear and tear over time and, most importantly, a wide range of varying environmental conditions that can significantly increase the risk of failure.

Monitoring the condition of such critical systems is a crucial element if availability and uptime is to be maintained. This is where vibration monitoring of all rotating parts has a major role to play.

Monitoring Options

This is extremely dependent on the criticality and budget available. The number of sensors installed can give additional information but the key components are the motor and gearbox assemblies.

'Vibration monitoring offers a vital early warning, enabling engineers to take action before any substantial damage is caused.'

Vibration sensors can be installed for all of these applications. The selection of the correct sensor is of the highest importance.

At Hansford Sensors we have, within our family of vibration sensors, specific models that have been designed to withstand the potentially harsh conditions that exist within the cooling towers.

They also have the required frequency range to suit the application. Some applications are also designated as Intrinsically Safe and we have products which are certified for this.

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Mounting:

The most common positions to monitor are :

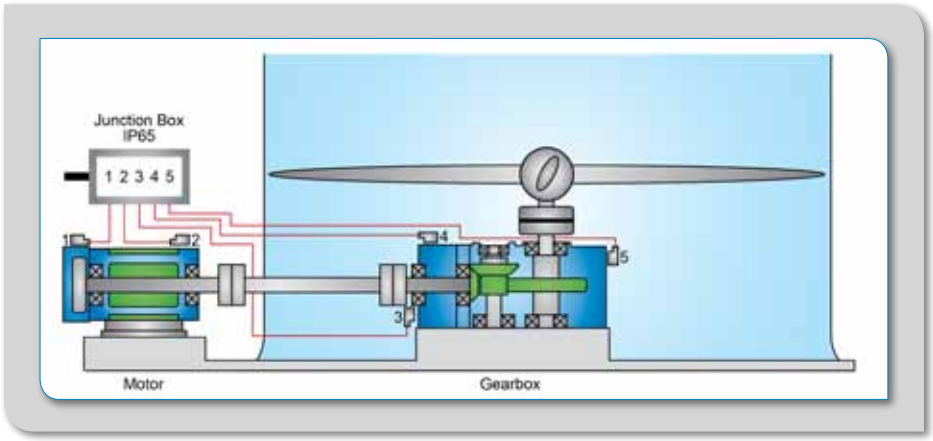
Motor; Drive End (DE) and non-drive end (NDE) where you will be mounting the sensor radially to monitor the motor bearing condition (g).

Gearbox; input and output shafts; the sensor will be mounted radially. This enables the condition of the bearings (g) and fan out of balance (velocity) to be monitored. An optional axial accelerometer on the input shaft would give a good indication of the thrust on the shaft.

In an ideal situation, online monitoring is always going to be preferred. However, with possible budget restraints, offline monitoring techniques are now widely used on cooling towers.

Offline:

With the sensors installed as described above, dependent on the accessibility, a local junction enclosure can be installed close to the motor and multicore cable (screen twisted pair) can be provided to connect



the junction enclosure to a switch/ connection enclosure. In some applications the sensor cable is connected directly to the switch enclosure.

The switch enclosure is an industrial enclosure that has been designed to withstand harsh conditions. It is available in various forms depending upon the environmental conditions, such as mild steel, stainless steel and polycarbonate.

A commercially available data collector can then be connected to the switch enclosure, the sensors powered and vibration data taken.

Online:

Using either the above or, in some low cost installations, 4-20mA sensors, the outputs can be connected to protection/ monitoring or PLC systems.

In the simplest form, four or five 4-20mA accelerometers, scaled in g or velocity to suit the required parameters, are installed as detailed previously.

The sensor is connected to a local junction enclosure and then multi-core (screened twisted pair) cable connected to the PLC system for trending and alarming.

'Downtime can be effectively minimised by using vibration monitoring to support a strong predictive maintenance strategy.'

In applications where more detailed analysis is required, the use of vibration modules with specific filters to suit the characteristics of the cooling towers, can be installed.

The configuration is the same as previously described, using AC accelerometers, junction enclosures and multicore cable.

This cable is terminated in an industrial enclosure, housing vibration modules that condition the accelerometer signals to provide bearing condition/ velocity output as required.

The facility also exists to enable a data collector to be connected for more

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detailed analysis. The output can then be connected to a PLC for trending and monitoring.

'...these devices can offer exceptional levels of repeatability even in the constant presence of dust, oils and other contaminants.'

However, in applications where, for whatever reason, there is no PLC, then the above configuration can be expanded to include local displays and trips to protect and shutdown the cooling towers if required.

Typical products for cooling towers

Offline

- 5 x HS-100 top entry or side entry waterproof sensors
- Junction enclosure (optional) in stainless steel, polycarbonate or mild steel HSJE-XXX
- Twisted pair cable
- Switch enclosure in stainless steel, polycarbonate or mild steel HSSE-XXX

Online (set-up 1)

- 5 x HS-420 waterproof sensors (1 x HS-420 and 4 x HS-422)
- Junction enclosure in stainless steel, polycarbonate or mild steel HSJE-XXX
- Twisted pair cable
- HS-570 power supply unit
- HS-580 enclosure
- 5 x HS-510 modules

Online (set-up 2)

- 5 x HS-100 waterproof sensors
- Junction enclosure in stainless steel, polycarbonate or mild steel HSJE-XXX
- Twisted pair cable
- HS-580 enclosure
- 5 x HS-535 modules
- 5 x HS-510 modules (optional)

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