Monitoring machinery health with displacement sensors

PC420DPP-40

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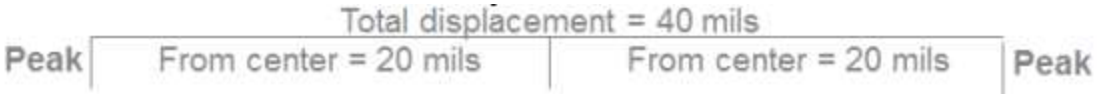
Wilcoxon SENSING TECHNOLOGIES

4-20 mA displacement monitoring

PC420DPP-40

- **PC:** Designed to work with existing process control system for machinery health and process monitoring
- **420:** Outputs a value between 4 and 20 mA that represents the overall vibration at the monitoring point
- **D:** The vibration is integrated to displacement to detect faults at the 1x running speed
- **PP:** Displacement is measured “peak-to-peak”; the farthest displacement from either side of center is combined for total displacement



- **40:** Full scale displacement, 40 mils, which is equal to 0.04” (1 mm)

4-20 mA displacement monitoring

- Many facilities want to monitor machinery vibration, but don't want an expensive vibration program. 4-20 mA products keep track of vibration levels so that maintenance professionals can take action on machines that start trending upward (higher vibration).
  - No training needed
- Balance specifications are given in mils displacement
- Before machine failure, imbalance level will increase
  - Monitoring displacement 24/7 will alert staff when the level increases
  - Unsafe levels can be established from ISO 10816 guidance charts
  - Displacement level can be tied to programmable alarm modules such as the iT401 vibration alarm

4-20 mA displacement monitoring

How does displacement relate to machine condition?

- A machine's vibration level is established by the force generated by the rotating component
  - Force is transmitted to the outside case through the rotor containment method, usually the bearings
    - Force = mass x acceleration
  - The acceleration signal will emphasize high frequency vibrations (>10x running speed)
  - Integrating the acceleration signal to displacement (double integration) provides a means of emphasizing the lower speed components of the machine such as 1x running speed
  - Running speed is associated with the machine balance condition, a desired quantity to know

4-20 mA displacement monitoring

Bearing reaction to rotating machinery force

- Bearings are the mechanical interface between the rotating component and the machine outer case
  - Roller element (ball or roller) bearings hold the rotating shaft firmly in place
    - Ball bearings offer maximum strength with best axial and radial load characteristics
    - Roller bearings offer stronger side loading characteristics
  - Sleeve bearings are monitored using a different kind of sensor, a displacement probe
- The energy of the rotating shaft is transferred to the outer frame of the motor, through the bearings
  - The bearing has a frequency dependent component known as stiffness
    - Stiffness can amplify or attenuate the force from the rotating component

4-20 mA displacement monitoring

Suitable equipment for monitoring

- Ideal for rotating equipment with a fundamental running speed between 300 rpm (5 Hz) and 3,600 rpm (60 Hz)
- Responsive to frequencies as high as 60,000 rpm (1,000 Hz), but displacement may “roll off” at high frequencies
- Fundamental belt frequencies are lower than the slowest shaft they are connected to and often are in the ideal frequency range
- Attaching the PC420D to a shaft rider allows shaft vibration to be recorded directly

Wilcoxon products

Precisely what you need

For more information, please contact Wilcoxon's sales and customer service team:

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