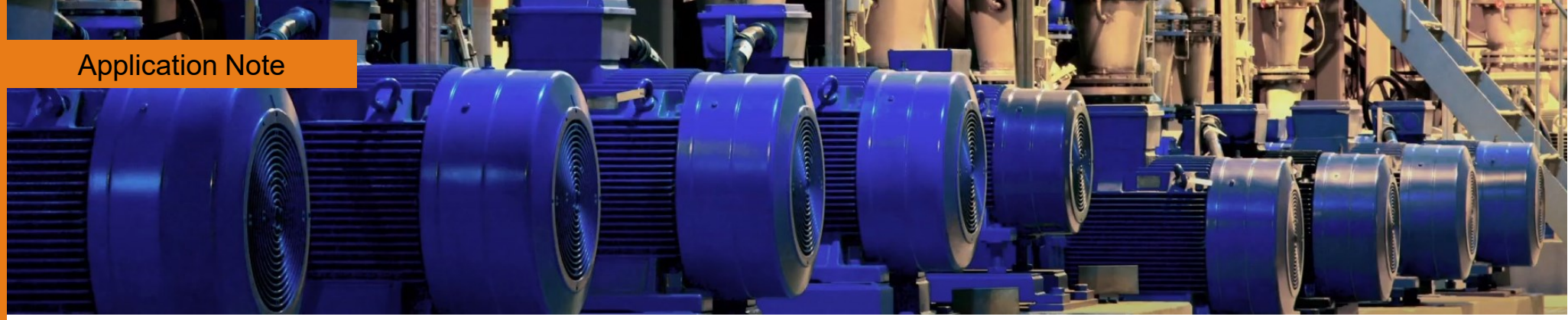
Application Note



Industrial Process Optimization through Pump Motor Condition Monitoring

The Challenge

The electric motors that power pumps and drives are critical assets in widespread use throughout the process industry. Uninterrupted operation of these motors with minimal downtime is necessary to avoid expensive process shutdown and startup, and the associated loss of the production. Unfortunately, electric motor failure is commonplace with many failure modes, amongst the highest ranking being:

- Winding failure
- Insulation breakdown
- Bearing failure

These failure modes can be driven by poor construction and installation, contamination, AC drive stress, overheating, moisture ingress or ineffective lubrication. Early detection of the onset of these and other failure mechanisms can be achieved by effective condition monitoring, wherein departure of one or more sensor measurements from a normal operating envelope automatically flags a maintenance need. The maintenance of the affected asset can then be scheduled at a time that is least impactful to the process, and an in-service failure of the asset can be avoided. In this way, condition monitoring offers the ability to:

- Extend the lifespan of the motor
- Avoid expensive, in-service failure
- Allow planned maintenance when least disruptive
- Avoid unnecessary, routine maintenance

Condition monitoring, however, relies on the use of multiple sensors to directly measure the parameters of interest. In the various process industries where many motors operate, and condition monitoring offers most value, there can be significant technical challenges for conventional electronic sensors, namely

- Extremes of temperature, pressure and vibration
- Operation in explosive atmospheres
- Difficulty to achieve enough measurement points
- High electromagnetic interference
- Exposure to moisture and/or corrosive fluids
- Inability to locate sensors where needed

As a result, condition monitoring is often too expensive and not used, or less effective systems are implemented which do not deliver sufficient value, or alternative techniques using indirect, inferred measurements with questionable validity are used.

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Proximion

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The Solution

Fiber optic sensors, in which measurements are made inside miniature (<=250µm) glass fibers, have a very small form-factor, support a large number of measurement points and are ideally suited to use in extreme harsh environments.

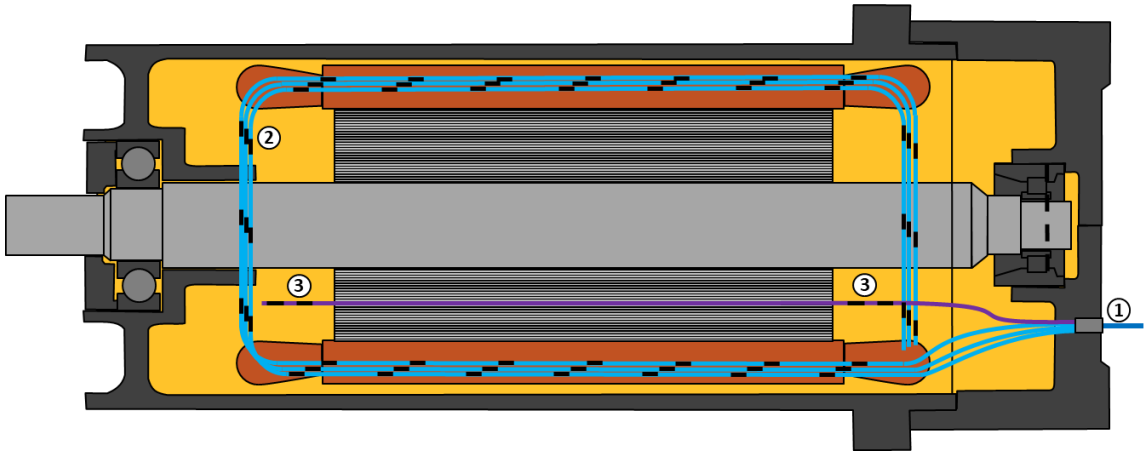
With fiber Bragg grating (FBG) technology, many FBG sensors are written into a single fiber, with each sensor reflecting a wavelength that varies with temperature. Proximion has developed a unique process for writing more than 100 customised fiber Bragg gratings in a single fiber at separations as low as 5mm.

FBG technology offers an extraordinarily high number of measurements points that can be distributed across multiple assets in a process plant, read from a single centralised instrument. FBGs are sensitive to temperature, the most useful measurand for condition monitoring, and can also be used to measure pressure, vibration and many other parameters.

For the process industry motor condition monitoring challenge, FBG technology offers the following, unique advantages:

- Hundreds of measurement points
- Highly robust, miniature sensors
- Intrinsically safe systems
- No electromagnetic sensitivity

Proximion technical experts have experience applying the unique advantages of FBG technology to electric motors and other critical electrical static and rotating equipment. Please contact us to learn more.



Example motor instrumentation scheme: 1) fiber penetrator, 2) distributed temperature measurement through winding phases, 3) lubricating oil temperature measurement.

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