MAINTENANCE TECHNOLOGY
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Reliability Advancements Over a Generation

Rotating equipment has always been a source of unplanned downtime within operations. I know that from experience. I began my professional career in the 1980s working as a systems engineer on offshore oil & gas platforms in the Gulf of Mexico. The rotating equipment we dealt with included turbine and reciprocating generators, turbine and motor-driven compressors, various types of pumps and more.

Although we had control and safety systems at the time, we were just starting to look at machinery-protection systems. Vibration sensors had not yet been fully ruggedized for the wet, salty conditions of the Gulf. In the 30 years since, technologies—and their ruggedness—have advanced considerably.

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Triaxial accelerometers can now measure vibration in the x, y and z axes from a single-mount location. Installation has become much easier with the wireless vibration transmitters now available. (That capability alone would have opened up many more pieces of rotating equipment to continuous monitoring had we been able to leverage it "back in the day.")

The diagnostics that interpret the incoming vibration and temperature signals have also substantially improved. Some specialized diagnostics are available to spot pitting in bearings to provide early warning of failures. Advanced notification means maintenance activities can be planned instead of reacted to.

Other advanced diagnostics help spot resonant frequencies, misalignments, machinery impacts and lubrication issues, to name a few. And there are more ways to get these diagnostics into the right hands than ever before. Portable vibration analyzers make these analyses available to the technician performing route-based maintenance. They also connect with computerized maintenance management systems (CMMS) to schedule work orders as issues are identified.

Condition-monitoring systems also were once an island unto themselves. They now connect more closely with plant control systems. Similar to the dashboard warning lights in your automobile, these monitoring systems can provide early warning to operators in the control room. This provides a path of communications between the operators and maintenance teams about potential problems that require further investigation.

As technologies have advanced, the need for specialization has increased. Remote communications access is important to bridge the time and distance between plants and experts. These experts may work for the process manufacturer, the reliability technologies and services provider or be independent contractors. Condition-monitoring equipment and portable analyzers, though, have become so sophisticated that they can provide information from remote points to experts wherever they are located. Many companies are developing integrated strategies to connect experts to all of their plant sites, thus providing continuous expertise around the clock. Through early detection, analysis, recommendations and action, unscheduled downtime can be greatly reduced.

Remote access brings its own set of issues around cybersecurity. The same set of best practices around control and instrumentation system security need to be applied to reliability-based systems. Much like a safety program, the process starts with having a security program in place. Also needed are a champion and high-level support to get the organization engaged in the importance of following secure practices and continuously finding ways to mitigate security risks.

Changes in technology over a generation have been far-reaching in the areas of reliability and safe operations. They've also highlighted the need for specialization and the ability to connect experts to plant personnel in the quest to reduce unplanned downtime and increase the overall efficiency of manufacturing processes. Looking forward, I see continued expertise being added into the technologies to provide a clearer, more actionable recommendation set for operations staff to improve the performance of their facilities. **MT**

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