Can ILoT Help Optimize Your Material Handling Conveying system?

Part 3: Condition Monitoring Can Enhance System Operations

CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION
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There is a wide variety of condition monitoring systems available at varying price points. Depending on the reliability requirement placed on the conveying system, in many cases the costs of monitoring systems can be justified in unscheduled downtime avoidance. Generally, the more advanced the condition monitoring system, the more responsive and the greater labor saving it can be.

To be more responsive, a sophisticated system can have an electronic diagnostic device, commonly referred to as the "brain" that creates a "Smart" feature. The addition of the brain also makes the device more expensive. An added benefit for many of the diagnostic systems available in the market is the ability to "self-learn" normal operating parameters. This eliminates the need to track baselines, which saves labor.

Through the "self-learn" feature, selected data is continuously collected, then compared to historical operating data previously collected. If a change in data is detected, a preselected action is triggered. The simplest action could be triggering a specific light in a light tree. Other actions could include sending a signal to a control panel or HMI, or even shutting down the system. Typically when shutting the system down is an option, it only occurs after an alarm period of a specified length is exceeded. The most sophisticated of these systems will predict hours of operational life left until equipment failure.

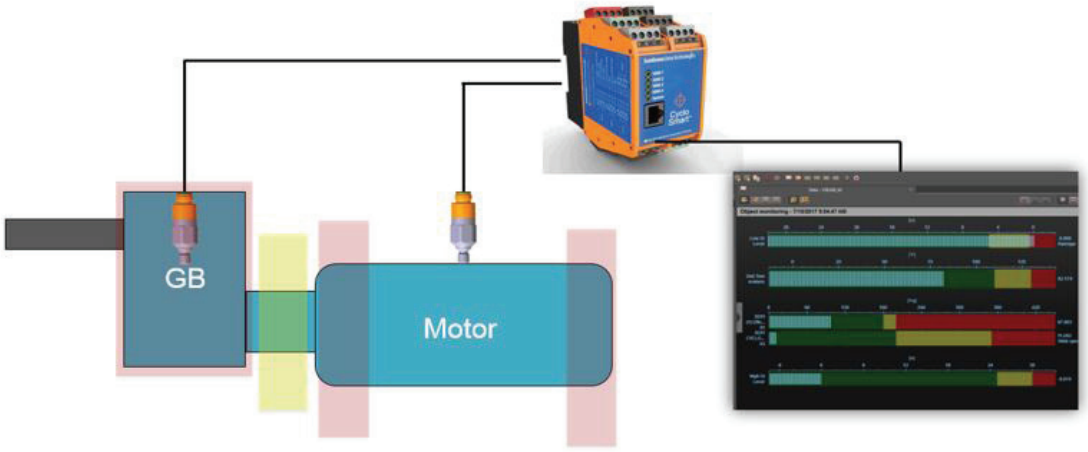

Figure 1: Monitoring System with Two Sensors and an Electronic "Brain" Sending Signals to an HMI

A critical consideration with all of these systems pertains to communication feedback. The communication options are endless, from sending a text message to a cell phone, to a signal hard wired to a PLC isolated by an air gap from the outside world. Experience suggests that the more access/control that the diagnostic device has, the more stringent the security (Cyber Security) protocols are.

Price vs. Cost: To Have or Not To Have a Diagnostic System

Condition monitoring devices can both optimize productivity and minimize total cycle costs, consider the following examples:

Scenario I: Cement Plant Breakdown
A large cement plant running 24 hours a day can produce 10,000 tons of clinker per day. Assuming a value of $40 a ton, the value of the clinker produced daily is $400,000. One conveyor transports the clinker from the kiln, with a single gear reducer driving the conveyor. Any unscheduled repair, beyond adding oil, to a large reducer will take at least 8 hours to complete. Eight hours is a best-case scenario assumption based on the following, minor repair i.e. seal replacement, experienced maintenance team, readily available parts, necessary tools and lifting/rigging available of suitable capacity.

The crux of it is, that with some luck, the end-user will lose approximately $130,000 in lost production, plus an additional $150,000 in man-hours, parts, and equipment rental. In this situation, a clear case can be made for investing in a condition monitoring system. This is especially true when considering that the average price of a condition monitoring system would have been roughly 3 ½% of the total down time cost. A secondary benefit of condition monitoring in this case, is if the gearbox failure is detected earlier in the "P - F" curve, the repairs will be significantly less expensive and faster to complete.

Scenario II: Medium Size Parcel Handling Hub
A parcel handling facility sorts 25,000 packages per hour. Assuming each package is $12 in total revenue, and each package travels through three facilities, the value of the sort is $4 per package or a total of $100,000 per sort. Typically, parcel facilities are comprised of several small conveyors with low horsepower systems and a many redundancies. As such, conveyors with alternate paths may not be candidates for condition monitoring. However, those systems without redundancies, must either be capable of rapid change outs to mitigate downtime cost, or be considered for condition monitoring.

In this case, while the value of the gearbox is small, the value gained is in maximizing the throughput, and consequently, revenue.

In summary, there are many more options and tools to increase system reliability and maximize up time. Recognition that equipment failure is a process, rather than an event is key to understanding the needs of the user. Balancing production demands against monitoring equipment costs and required additional head counts, if any will facilitate selecting the appropriate maintenance tools and program, and at the same time insure profit optimization.