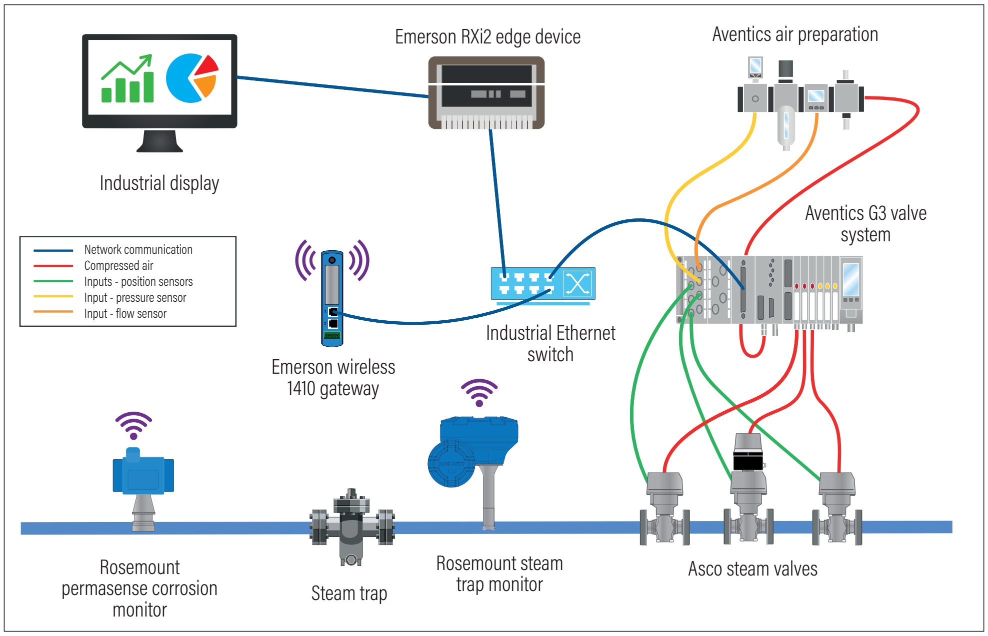
tire technology EXPO 2020 EXHIBITOR

Reduce costs in curing

How to reduce scrappage, lower steam costs and increase machinery reliability by monitoring every part of the curing process



Tire manufacturers are continually looking for ways to reduce costs and maximize production throughput, such as by minimizing energy use, downtime and waste. Crucial to achieving these targets is ensuring that the curing process is operated as efficiently as possible. For instance, any unexpected machinery failure affecting product quality and leading to scrappage at this stage of production is extremely costly because of the value that has already been put into the tire. The combined effect of machinery downtime and tire scrappage can have a major impact on overall production efficiency. It is therefore vital for manufacturers to constantly monitor the performance and health of their curing system machinery. This will not only help to optimize the system's energy efficiency, but will also enable the implementation of predictive maintenance strategies, resulting in minimized levels of tire scrappage and the avoidance of long and costly periods of downtime.

The only elements of the curing process that are typically continuously monitored are the temperature in the mold and the time the tire spends in the mold. However, monitoring the entire process provides manufacturers with significant opportunities to create added value. A complete automated monitoring solution involves the installation of sensors to collect data, a wired or wireless communications network over which to transmit the data, and a ruggedized edge device to bring health and performance insights closer to the operator. This enables meaningful actions to be taken immediately, and servicing and repairs to be scheduled during planned periods of downtime between production cycles, thereby not affecting productivity.

There are several elements of the curing system that can be optimized through continuous monitoring. Air-operated piston valves are critical for precise control of steam and bladder inflation and enable rapid cycling and tight shut-off to ensure that the curing press operates reliably and efficiently. Very rugged, high-performance devices are available specifically for these demanding applications. However, should a valve fail in the curing press, it can affect the process and lead to a substandard tire being produced and costly late-stage scrappage. It is therefore important to monitor the health of the valves.

Diagnostic functionality provided by the latest Aventics G3 fieldbus valve system technology from Emerson enables valve performance to be continuously monitored, so that developing problems can be identified earlier. For example, if the system detects that the travel time of a valve is increasing, this indicates valve wear. The valve system also features self-diagnostic capability in the form of integrated voltage monitoring. Early identification of issues supports predictive maintenance strategies, preventing failure during a production cycle and leading to lower maintenance costs, reduced downtime and increased productivity.

Air filtration is an important factor in ensuring the long service life of valves, because if compressed air to the pneumatic system is not

Above: Schematic shows how the tire curing process can be monitored, what devices are required, and how everything is connected. Real-time data is shown on a display and gives (actionable) insights into the curing process

Right: Tire curing in action at the factory

properly filtered, the machinery will not function correctly and the valves can be damaged and may fail prematurely. Air-preparation systems include coalescing filters that purify compressed air by removing metal and dirt particles, moisture and oil from the pneumatic air in the system, preventing it from reaching the machinery.

The latest systems feature diagnostics that monitor coalescing filters, enabling alarms to be issued when they are clogged, so that timely maintenance can be performed. Clogging is undesirable as it reduces the air pressure downstream, and the compressor then needs to generate compressed air at a higher pressure, thereby increasing energy consumption and operating costs. Continuous monitoring of both filter condition and pressure is therefore crucial.

Knowing the airflow rate is also important in helping to optimize energy consumption, as deviation from the required rate can indicate leakage issues. The latest flow sensors in air-preparation systems monitor not only the flow, but also the pressure and temperature in the feed line, enabling advanced diagnostics of the system's operating parameters. This facilitates the efficient management of energy consumption and significantly reduces costs.

Another important means of reducing energy consumption and costs is through steam trap monitoring. Steam is a major energy expense and any inefficiency or loss can cost operators many thousands of dollars. Steam traps are self-contained valves that are used to automatically drain water without allowing steam to escape. It is important to ensure these devices are performing correctly. If a steam trap jams in an open or partially open position, large amounts of steam can escape and be wasted until the issue is detected. If a steam trap sticks in a closed position and the water is not drained, it can reduce the operating efficiency of the steam system through a lack of heat output and can also cause physical damage to valves and pipework through water hammer or corrosion.

Steam traps are usually monitored manually through periodic inspections, but this is time-consuming and requires manpower. Continuous monitoring can now be provided by wireless acoustic transmitters that monitor steam trap health and detect failures

Above: Multiple Asco steam valves assembled into a single manifold. The performance of these valves can be continuously monitored so that any potentially developing problems can be identified earlier

in real time, enabling immediate repair or replacement. This greatly reduces steam loss and equipment damage, leading to increased energy efficiency and productivity.

Corrosion in steam pipes can eventually lead to clogged steam traps and pipe thinning, or even failure if it remains undetected and untreated. This can result in leakage and wasted steam, as well as equipment damage. Automatic monitoring provides much greater visibility into the condition of the pipework compared with measurements that were traditionally taken manually and infrequently. This enables better decisions to be made regarding pipe maintenance and replacement, leading to increased reliability and productivity. Non-intrusive ultrasonic sensors can measure and monitor the thickness of pipe wall areas that are at elevated risk of internal corrosion. These easy-to-install sensors communicate accurate and reliable data via a wireless network. If excessive corrosion is identified, maintenance can be scheduled during periods of planned downtime, helping to avoid costly steam leakage and incidences of shutdowns.

A major benefit of continuous monitoring is that the real-time data collected from the various parts of the curing process can be analyzed and presented to the operator at the machine. This provides greater visualization at the factory floor level. This is achieved using an edge computing device such as Emerson's RXi2, which collects and analyzes the data and can present the analytics to operators on an industrial display, enabling them to make informed decisions at the machine. The latest programmable logic controllers, such as Emerson's CPL410, now feature an integrated edge-computing capability, which helps to minimize the number of devices required. This is an important consideration, with environmental regulations putting manufacturers under increasing pressure to reduce the footprint of their operations. **tire**

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