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Chasing the Checkered Flag

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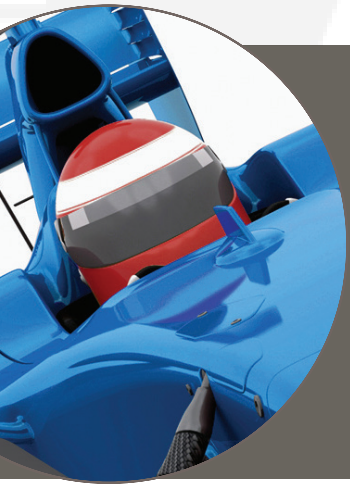


What the Process Industry Can Learn from Formula 1 Racing about Remote Reliability and Performance Monitoring

by Mike Boudreaux

For the past three years, the top teams in the world have gathered at a 5.5 kilometer track in Austin, Texas, on a Sunday in November to race for 56 laps at speeds pushing 200 mph. The Formula 1 United States Grand Prix showcases precision, high performance and innovative vehicles driven by best-in-class drivers. In an industry where hundredths of a second can mean the difference between winning and losing, race teams are looking for any advantage they can get. They use every tool at their disposal to design, tune and maintain Formula 1 (F1) cars in the pursuit of excellence. For these teams, remote monitoring is an important means for achieving gains in performance and reliability.

The Road to Remote Monitoring

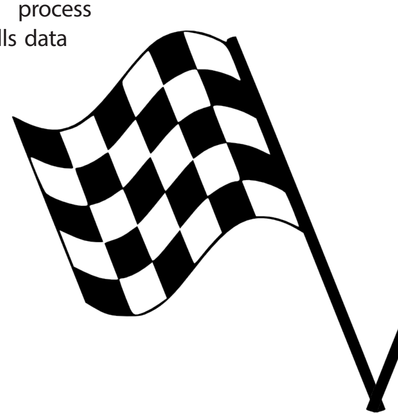
Years ago, F1 cars were designed by instinct, experience and history. Once the car got to the track, the driver communicated information about the car's performance based on the feel of the car and what could be seen. The crew relied on their senses, too. They watched the car accelerate and turn and brake, looking and listening for problems. Often, by the time they spotted a problem, it was too late to make a change. Other times, although they identified a problem early enough, they didn't have the right spare parts to fix it.

These days, teams design new cars every few years. They use cutting-edge technology to develop incredibly complex machines, constantly tweaking the formula. The driver is supported by engineers on the track, stationed locally and at team headquarters. An F1 car has hundreds of sensors on it, which are used for control of the vehicle, as well as monitoring its performance. Sensors measure the pressure and temperature of the tires, the engine temperature and oil pressure, among other key performance indicators. And performance data is collected from numerous points on the vehicle for analysis.

Data Driven Decision-Making

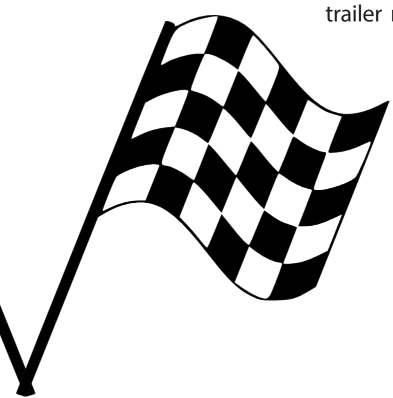
Similar to how process operators use distributed control systems to control their processes, drivers use the control unit in the car to make operational adjustments to adjust to changing track, environmental and equipment conditions. The driver changes gears approximately 3,500 times during a race, keeps radio contact with the crew team, checks fuel level, deploys the kinetic energy recovery system and selects tire adaptation. The driver can preset the wing to accommodate race conditions and view useful information on lap times, speed and gear, as well as change brake settings and activate the pit lane speed limiter as needed.

There is a separate monitoring unit called the team data acquisition system (TDAS), which is similar to a monitoring system deployed in process control. The TDAS pulls data from the control unit and collects unique sensor data as well. This data is transmitted wirelessly back to the team so race engineers can



perform remote analysis to enable better and faster decisions about how they set up and configure the car.

The three-day F1 format more fully illustrates the role technology plays in enabling the collaboration and fast, accurate decision-making needed to win races. The first day is dedicated to practice. The qualifying race to determine position is on the second the day. And the third day is the race itself. Teams use the practice day to identify how well their car is performing and what adjustments need to be made. A driver's engineering team is in an enclosure on the track, closely collaborating with the driver. In a trailer near the track, another group of engineers is using a suite of software tools to analyze engine performance, chassis performance and other aspects of how the car is performing on the track. Their systems receive data from high performance computing systems that collect it from the wireless systems on the car. Data is also sent wirelessly via satellite to the team's headquarters where additional computers store the data for use in simulations, trending and future design. Before any changes are made to the car on the track, the team will run the simulation multiple times at headquarters to ensure they're making the right decision.



Enabling Technology Is Available and Cost-Effective

In addition to Formula 1 racing, industries, such as energy, transportation, military and commercial aviation, routinely use integrated operations. A wide variety of technology enablers currently available have made adoption of integrated operations increasingly common. New sensor technologies are available that are less intrusive and more cost-effective, including corrosion, ultrasonic, acoustic and infrared. Wireless technologies, such as WirelessHART and 4G networks, have enabled easier collection of data. Access to and reliability of the Internet have become ubiquitous. Collaboration tools, such as video conferencing and social media, make it easier to make informed decisions, no matter where members of the team are located. Advances in display technologies and high fidelity process simulation have made virtual training a reality. The increase in the ability of devices to

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Figure1: Remote monitoring - Formula 1 and process industry

communicate about themselves, the ability of pervasive sensing to capture a whole new level of site operations data and the use of big data for analytics promise even better monitoring for increased reliability.

Applying Remote Monitoring to Process Problems

What's happening in the racing industry today is also taking hold in the process industry. Traditionally, the process industry has been a conservative one. It hasn't pushed the limits of technology in the same way as the racing industry. However, just like a race team can't make money if the car isn't performing well on the track, a company can't be competitive with unexpected outages or underperforming production.

Common challenges preventing reliability and performance improvements include a lack of specialized resources, inability of organizations to change their work practices and increasing complexity of technology. For example, powerful technologies may be deployed with a vision for success, but the organization doesn't realize the expected value because of its inability to adapt. The problem may be a lack of organizational awareness, training, experience, or leadership. In addition, leaders are often too busy fighting fires to spend the time needed to drive true change.

As operations become more remote, these challenges are exaggerated. The early adopters of remote monitoring solutions are found in industries with 4D operations, meaning those located in dull, dirty, dangerous and distant environments. The mining industry provides an excellent example; gold and diamond mines are located near the Arctic Circle, hundreds of kilometers from the nearest large city. Conditions in these mines are inhospitable to say the least.

With the growing trend of people wanting to work where they live, attracting experienced, skilled subject matter experts to go to these isolated locations is nearly impossible. If a company does find someone who is willing, the logistics can pose safety and economic problems. For example, oil companies operating in Northern Alberta have seen cost impacts of housing one employee in Fort McMurray to be $200,000 more than what it would cost to employ the person in Calgary.

When the ultimate goal is to improve reliability and performance in far-flung operations, remote monitoring is often the best option. Remote monitoring of reliability and performance in process automation assets, as well as production assets, is increasing. End users are monitoring the condition of critical assets, such as turbines, blowers, cooling towers and heat exchangers. They are also remotely monitoring control systems, instrumentation and valves. And new sensing technologies are enabling remote monitoring of site safety, energy use and the environment. Professionals can analyze the data generated through remote monitoring and provide early warnings of pending failures, no matter where they are located. When a problem is identified, local operations personnel have time to plan, schedule the maintenance, and ensure the right parts and maintenance equipment are available.

The ability to leverage data from remote monitoring for collaboration among subject matter experts is available to companies of all sizes. Large-scale companies can leverage internal experts from across the globe for faster, more accurate decision-making. For companies without the scale to have subject matter experts in a range of technologies, leveraging third-party process experts makes sense. These process experts, just like the race engineers in the trailer or at headquarters, have a depth of knowledge and experience that can be applied to a problem anywhere in the world.

The Future Is Here

In the Formula 1 racing world, teams are harnessing the latest technologies in wireless and remote monitoring, coupled with high-skilled subject matter experts, to make better, faster decisions and optimize performance for a three-day race. The stakes and the payoff in reliability and performance improvements for implementing remote monitoring capability in the process industry are even greater. Some process companies may see remote monitoring capabilities as a vision for the future. But the fact is, the future is here for the process industry. The technology and expertise exist today and adoption is gaining momentum.

For companies chasing the checkered flag to success, the time to deploy remote monitoring capabilities is now.

__Mike Boudreaux__ is the Director of Remote Asset Monitoring and Analytics for Emerson Process Management. Prior to his current role, he has held various roles in engineering, product management, marketing and sales at Emerson, Alcoa, and AkzoNobel. He holds a B.S. degree in Chemical Engineering from the University Houston and an MBA from the Kellogg School of University of Houston Management at Northwestern University. www.emerson.com