How data will steer tyre management's future

Tyre manufacturers and service providers say algorithmic manipulation and analysis of increasingly mature data generated by their products will give tyres a much broader role in improving a mine's productivity and safety and environmental metrics

By Craig Guthrie

Digitalisation of the tyre management process can give unparalleled insights further down the value chain

Advances in sensor technology in recent years have seen almost all mining tyres fitted with basic Tyre Pressure Monitoring Systems (TPMS) that measure tyre pressure and temperature, bringing tyre maintenance planning into the 21st century and making pencil-scrawled logbooks a thing of the past.

But companies operating in the space say this is the start of a long road towards solutions that uses AI and interoperability features to revolutionise mean time between service (MTBS) metrics.

"We are working on optimised forecast models that we're just starting to test. And what we're building suggests that 35-40% savings in downtime could become possible through planning and optimising events better", said Mark Goode, director of Business Insights at Canadian mining tyre service and supply firm Kal Tire.

Kal Tire offers the data-driven Tire Operations Management System (TOMS), which gives real-time tyre performance data,

including fleet inspection findings, with a dashboard showing KPI reporting that aligns tyre maintenance activity with their service agreements. The system allows Kal Tire teams worldwide to access tyre management data from a single platform.

"TOMS gives us bucketloads of data. It is tracking some 280,000 tires that have running on 11,000 pieces of mining equipment, and we have all that event data. So we can forecast when work is going to happen based on that history," said Goode.

"So, we're starting to recommend to customers when we do work, how much work we do based on these models, and suggesting dates, considering the stock availability, whether it be new or spare. Even if the 35-40% in theory, turns into 15-20% in reality, it is still a major gain. And those models will only get smarter."

Alongside TOMS, Kal Tire has been working with Pitcrew AI on a thermal image recognition system that automates inspection by identifying hot spots, belt edge and tread separations and other mechanical problems. It's getting close to genuinely predictive maintenance and generating many fleet data as a by-product proving attractive to OEMs.

"We've integrated the TPMS data into TOMS, the Pitcrew data, the thermal imaging, camera data, weather data, as well as other streams and, combining those, we are increasingly able to predict tire failure at an individual tire level," said Goode.

Germany automotive parts manufacturer Continental aims to expand the connectivity and interoperability of its tracking solutions with a new Bluetooth-enabled sensor patch, to be launched in October, that can be retrofitted to any mining tyre instantly and can connect to anyone's smartphone.

Continental launched a new version of its tyre management system, ContiConnect 2.0, in February, with a new web portal. The new multifunctional app is built on existing functions, such as continuous tire pressure monitoring used to digitally track the remaining mileage, tread depth, and condition.

"Digital solutions are essential for total tyre management," Matthew Futrelle. Head of Earthmover Tires at Continental told *Mining Magazine*. "Only they give you full transparency into 'what is this asset on your vehicle costing me?' and 'are you using the best asset possible for your routes?'"

Futrelle noted that one game-changing aspect of their new Bluetooth-enabled sensor patch – beyond its low cost and rapid deployment – is that it gives instant analytics on tyre performance that can be used as much by a company's CFO as its fleet manager.

"This information feeds into our ContiLogger site analytics service, which captures the vehicle speed, lateral force, distance travelled, cycle times, and any useful information that helps you optimise your fleet, their tires – and even bigger than that, through your operation in its entirety."

He adds that Continental has also acquired a fleet analytics digitalisation company called Zonar, which has a platform called sight IQ that uses API integration to track everything piece of equipment in a mine.

"So number one tires, of course, that's near and dear to our heart, but also the equipment, you can get information directly from the equipment, everything that's available to you. And then you can also track your conveying solutions. And this information can come from radar, LiDAR, cameras, and even drones".

Futrelle echoes the views of other observers in saying that the best way tyre data can help miners achieve ESG objectives is by preventing downtime, improving lifecycles and optimising routes.

"The data from our intelligent tires prevents punctures and downtime and increases sustainability through efficiency", he said. "At Continental, our goal is to be the most progressive tire company in terms of environmental and social responsibility. We invest in research and development to drive innovative technologies, alternative and sustainable materials, and environmentally friendly production processes."

GETTING PREDICTIVE

Anyone who has driven any vehicle appreciates the aggravation caused by a flat tyre. Still, the implications for major mining operations go far beyond getting to the mechanics – unplanned downtime costs thousands of dollars per hour or minute, depending on the type of operation. This is why companies are laser-focused on how data and machine learning can, in future, help predict, prevent and prescribe the right solution before failures occur.

"Predicting slow leaks or identifying hot tires are only the first steps of predicting a potential issue," said Frederic Marques, head of Michelin Mining Services.

"By knowing the rules of tyre design, the manufacturing parameters of each tyre, and the real tyre life with its usage and storage conditions, future AI algorithms will be able to predict a tyre failure even before it occurs. All this data will help us monitor the entire life of the tire from the cradle to the grave and optimise mine operations. In this case, it's going from reactive and pro-active to predictive tire management."

Marques echoes the belief that tyres will, in future, play a much more significant role in optimisation across an operation.

"The mining industry already collects a huge quantity of data but is struggling to extract value from it because without expertise on tires, vehicles, and a good knowledge of the operation from where data comes, wrong data interpretation can lead to incorrect actions. The mining industry is asking: 'what business rules should we apply? what link should we make between this and this data?'"

He cites an example of a South American mine site implementing an optimised tire rotation schedule and installing 53/80R63 MICHELIN XDR3 tires on the mine's Electric Powertrain Haul Trucks fleet. This could result in 150 fewer tire changes per year, consume 40 fewer tires annually and increase truck availability by up to 300 additional hours. The potential savings to the mine's tyre budget is US$1.2 million, with an additional 150,000 tons moved.

MEMS4 is Michelin's premium mining TPMS, which has evolved significantly since its launch in 2018. All the MEMS4 data gathered from sensors or GPS upgrades, whether in 4G or integrated mode, are available through automated dashboards and automatic alarms. The firm is seeing more and more customers integrating MEMS4 in their Triggered Action Response Plan (TARP), which enables the right person to take the right action in response to each MEMS4 alert, he adds.

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