MACHINE-ORDERED MAINTENANCE

Donaldson expanding wireless Filter Minder concept to liquid filtration, engine and hydraulic oil monitoring.

By **Mike Brezonick**

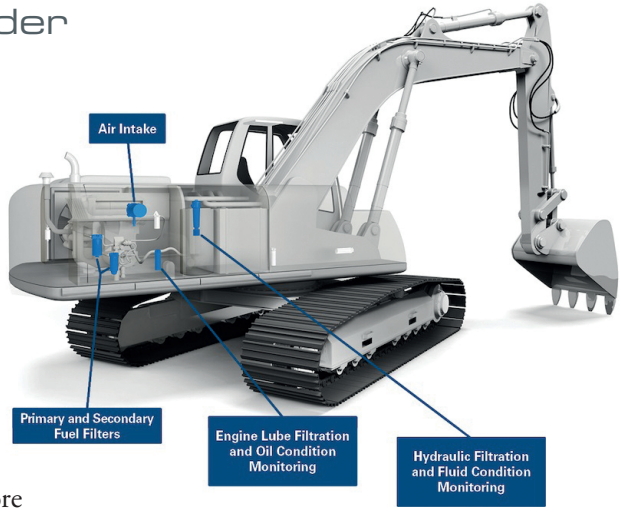
There was a time when the most reliable guide for those responsible for maintaining a piece of mobile equipment or vehicle was an hourmeter or odometer. Or perhaps even a calendar.

Maintenance cycles – when to swap out filters or change fluids or do any other regular engine or machine tending – have historically been time- or mileage-based. When a machine worked a particular period of time, measured in hours or sometimes months, or reached a certain mile marker, maintenance personnel would simply follow whatever the schedule dictated, regardless of whether the machine was worked hard, lightly or even much at all. Hence the term "service interval."

Now in the era of the mobile communications and connectivity, it's not surprising that maintenance practices have been evolving toward something much more precise.

One company driving that evolution has been Donaldson, the Minnesota-headquartered filtration specialist. Over the last several years, the company has been enhancing its Filter Minder product line with wireless sensing technology and expanded it to meet a growing list of component monitoring segments.

It started with wireless air filtration monitoring for heavy-duty trucks and at ConExpo-Con/Agg earlier this year, the company expanded that capability to air filtration systems used in off-highway machinery. Now Donaldson is in final development of an even more expanded system that will offer condition monitoring of liquid filtration systems, including fuel, engine oil and hydraulic fluid, used in heavy-duty applications.



Donaldson is expanding its Filter Minder wireless monitoring system, which began with engine air filters, to incorporate literally all the types of air and liquid filtration technologies found on vehicles and equipment.

MANY INEFFICIENCIES

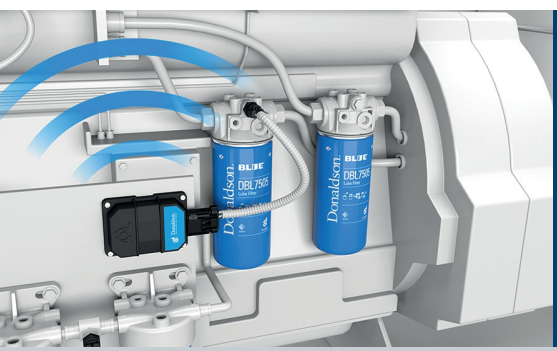
"Most people service products based on time or distance," said Nathan Zambon, director of Donaldson's Filter Minder business. "Every 25,000 miles I bring my truck in the shop or once a year, I change out this or that. There are a lot of inefficiencies created with that way of doing things.

"And if you look at something like commercial trucks, they're used in all sorts of applications – heavy-duty, light-duty, over-the-road, maybe in a quarry environment. In that situation, standardizing all the maintenance practices just off time or mileage-based intervals is really not optimal. If you service too early, you're potentially wasting money and there can be increased environmental impact with disposal of unnecessary filters. And every time you pull that filter off, you're bringing more contaminants into the engine. With the high levels of emissions complexity and emissions components on today's engines, you really need to be protecting those systems and so you don't want to service too early.

"On the flip side, you don't want to service too late. If you're plugging an air filter, you're generating a lot more soot and if the soot is plugging the diesel particulate filter, that could lead to more regenerations, you're burning more fuel and potentially cracking the DPF. And on the lube oil side, if you're changing oil too late, you could have accelerated engine damage.

"Connected filtration solutions enable fleet managers to perform routine maintenance at the exact right time."

Donaldson's development of the Filter Minder technology began in 2015, when it acquired Engineered Products, an Iowa-based manufacturer of air and fuel



The wireless Filter Minder system for engine lube oil will allow for measurement of a range of oil conditions, detecting temperature, soot level, coolant level, fuel dilution, oxidation and other factors that could impact engine life.

filter restriction systems sold under the Filter Minder brand. Filter Minders were mechanical indicators designed to provide a progressive visual indication as to when airflow through a filter reached specific restriction levels, giving service personnel a visible reminder concerning filter changeouts. "Donaldson acquired Filter Minder because they were the experts in filtration monitoring and Donaldson is the expert in filtration," Zambon said. "If you bring filtration and filtration monitoring together, we believed that would offer a combined strength in filtration as a solution."

Donaldson enhanced the Filter Minder technology with the addition of wireless capability and spent more than two years refining the system. The company teamed with Geotab, a Canadian specialist in IoT and connected transportation technologies.

"We recognized Geotab as a leader in the telematics space," Zambon said. "There are two million Geotab devices in the field, half a million in heavy duty."

SIMPLE INSTALLATION

The wireless Filter Minder system is engineered to be compact and easy to install, with small wireless sensors on each filter unit and a compact receiver positioned nearby. The receiver sends data to the cloud, from which it is accessible through the MyGeotab Dashboard fleet management system, enabling managers of on-highway fleets to monitor the status and performance of their air filters in real time.

"For our integration, we developed a receiver that captures all of our sensor data and plugs it directly into the Geotab device," Zambon said. "So instead of adding an additional cell device, we're leveraging the existing connectivity.

"One of the things we heard in our testing from truck fleets was, 'I don't want my truck going down the road with six cell phones hanging behind it.' They've already made big investments in telematics and so let's not add more complexity to it.

"The beauty of the wireless Filter Minder is that it's a very simple install. We take the mechanical indicator off, thread the wireless sensor on, plug the receiver into the Geotab device and we're now delivering all that information back into the Geotab platform."

With the wireless Filter Minder and MyGeotab Dashboard fleet management system, managers of on- and off-highway fleets can monitor the status and performance of their filters in real time, allowing them to more precisely plan machine maintenance and avoid unscheduled downtime.

At ConExpo, Donaldson said it was in testing with an expanded version of the wireless Filter Minder system that encompasses liquid filtration, including fuel filtration, hydraulic filtration and engine lube oil and hydraulic oil condition monitoring. "This solution enables us to bring additional monitoring capabilities," Zambon said. "We have an oil conditioning monitor sensor so we can get real-time lube oil condition. It can measure things like soot level, coolant level, fuel dilution, oxidation and longer term TBN number. In a best-case situation today, people are doing sampling at oil change intervals. If we could be measuring in real time, there is a real value proposition.

"Say for example, you are able to pick up a little coolant in your oil. That could be because of a cracked EGR cooler. Instead of running that engine until a normally scheduled service – and maybe by then you've wrecked a $40,000 engine – now you can determine that this is maybe a $2000 part that needs to be changed now, saving your fleet a lot of money and reducing downtime.

"We have pilots in the field now for all of these technologies, validating the performance of the sensors, and validating the analytics generated from the sensor data and how that information gets shared back to the customer."

TESTS ONGOING

The wireless Filter Minder Connect is being tested on "a wide spectrum of machines," Zambon said, including over-the-road and vocational trucks, as well as construction, agricultural and mining equipment. Overall, he said the testing would encompass "several hundred pieces of equipment."

"Testing is being held in a variety of locations and environmental conditions to ensure we cover the full range of typical uses of equipment," Zambon said. "We're also covering a broad spectrum of geographies."

As far as preliminary test results, Zambon said "in general, we're finding that, in most cases, filter service intervals are pretty conservative, meaning filters get changed a lot more often than they need to be.

"That's what we're learning so far in field tests – that there's an unnecessary or excessive amount of servicing that goes on and therefore an opportunity to optimize filter and fluid maintenance.

"That's why the Filter Minder technology is so valuable. The wireless sensing capability sends filter performance data to the cloud, while predictive analytics help users make more efficient filtration maintenance decisions. By optimizing filtration maintenance, fleet managers can save on maintenance downtime and expenses."

Zambon said that Donaldson's oil conditioning and fuel filtration monitoring solutions are expected to be launched late this year, with hydraulic filter and hydraulic fluid condition monitoring to debut in the first half of 2021. ■

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