

Connected thinking



As more agricultural systems move towards remote monitoring, the ability to turn information into action is becoming increasingly important. But smart technology relies on more than sensors alone – it also requires the connectivity to keep data moving. *CPM* explores.

By Charlotte Cunningham

For many growers, crop management doesn't stop once grain leaves the field. Maintaining visibility of what's happening in store is another area where technology is helping to replace manual checks with more informed decision-making.

Rather than relying solely on physically inspecting grain stores, connected monitoring systems are allowing information to be collected remotely and delivered directly back to growers.

But for any remote monitoring system to work effectively, there are two

fundamental elements required – the equipment gathering the information, and the connectivity infrastructure allowing that data to be shared.

MONITOR AND CONTROL

It's this combination which sits behind the Farmex grain monitoring system, where sensors within the store provide growers with information on crop conditions remotely. Via the same hardware platform, it's possible to not only monitor stores, but control them too.

According to Farmex's Simon Leach,

the aim of the technology is to give growers a clearer picture of what's happening within stored grain and the confidence to react when required.

The system works by using monitoring equipment positioned in the grain to collect information such as temperature and humidity, before transferring this back into software where the data can be viewed. By providing this information remotely, growers can keep track of storage conditions without relying solely on physically inspecting stores.

However, while capturing accurate information is the first step, ensuring that data can travel reliably from the store to the user is equally important – particularly where farm buildings may be located in areas with limited connectivity.

To provide this link, Farmex works with telecommunications provider Spitfire, which supplies the connectivity behind the system. "Farmex provides the grain



Remote monitoring and control

The Farmex grain monitoring system uses sensors within the store to provide growers with information on crop conditions remotely.

monitoring equipment, while we provide the connectivity side,” explains Spitfire IoT team leader Stephanie Tam.

She says although the technology behind the scenes is complex, the principle for the grower is straightforward. “The Farmex system uses lances which are placed into the grain and these measure parameters like temperature and humidity,” says Stephanie. “That information is sent back into the software where it can be monitored and tracked.”

Rather than waiting until a change in conditions is identified through a manual inspection, the system can alert users when action may be required. “The software can send an alert to the farmer to say, for example, moisture levels or temperature have reached a certain point. They can then react accordingly, whether that’s changing settings, using fans, or taking action to reduce moisture or temperature.”

For Simon, one of the key advantages of remote monitoring is providing greater visibility of what’s happening in store and helping growers to maintain confidence that conditions remain within the required parameters.

PEACE OF MIND

Stephanie says this ability to access information remotely changes how growers can approach monitoring. “Having some form of remote monitoring in place allows them to not have to think about it in the same way, but also gives peace of mind that crops are being stored correctly and aren’t being spoiled.”

But as agricultural systems become increasingly reliant on information being transferred between equipment and users, connectivity becomes a critical part of making these technologies work. And for many farms, achieving a reliable connection isn’t always straightforward. ▶



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Connectivity partnership

Farmex works with telecommunications provider Spitfire, which supplies the connectivity behind the system, explains Spitfire IoT team leader Stephanie Tam.

- ▶ Stephanie says one of the reasons Farmex chose to work with Spitfire was the need for a connection suitable for agricultural environments, where equipment may be located in areas with inconsistent mobile coverage.

A key part of this is Spitfire's dual IMSI multi-network SIM technology. Unlike a conventional SIM card that operates through one network provider, the system is designed to increase resilience by allowing equipment to access multiple networks. "On the physical SIM card there are two profiles – a primary IMSI and a secondary IMSI," explains Stephanie. "The primary looks for the home network which uses EE's radio access network. This means all of the data comes back through our network and stays within the UK, which gives better performance because there's lower latency."

However, if that primary connection isn't available, the system automatically searches for an alternative. "If EE isn't available, or the signal isn't strong enough, it fails over to the secondary IMSI which carries the other three networks – O2, Vodafone and Three.

"That provides a lot of resilience in rural areas because typically there's going to be at least one network available."

This ability to switch between networks has proved particularly valuable in agricultural situations where equipment is often operating away from traditional connectivity infrastructure, she adds. "We've seen it used for things like RTK in tractors in the middle of fields, as well as in barns. In terms of coverage

and reliability, it covers those bases."

While the technology required to keep systems connected is advanced, Stephanie says the aim is to keep installation and operation simple for the user. "From our side, we provide the SIM card and a gateway which just requires a typical three-pin power socket. It all comes pre-configured, so essentially it's very easy to install – it's plug-and-play."

The gateway can then provide either a Wi-Fi signal or LAN connection depending on the equipment requirements. "We work with customers on a case-by-case basis to understand exactly what they require and make sure we're providing the right solution," she says.

PAYMENT MODEL

Another consideration with connected agricultural systems is that their data requirements can be very different from a standard mobile contract. While many people associate connectivity with large amounts of data, remote monitoring equipment often only requires a small amount to operate.

Because of this, Spitfire operates on a pay-per-megabyte model, meaning users only pay for the data required. "If you buy a standard SIM card, you might have a package with two gigabytes of data, but you're paying for data you're not actually using," explains Stephanie. "With this type of application, it's about matching the solution to what the technology actually needs."

And as more systems on farm become connected, she says the focus isn't just on introducing new technology, but ensuring it can operate reliably in the environments where it's required.

Although sensors and monitoring equipment are often the most visible part of a system like Farmex, the connectivity behind it is what enables growers to turn that information into something useful. "For us, it's about understanding what the customer is using the technology for," says Stephanie. "We know the application, we can see how it's performing and we can provide the right support behind it."

Ultimately, she says successful adoption of connected technology comes down to making it simple and reliable for the end user. "The technology has to work practically on farm. It's about having the connectivity, reliability and support behind these systems so growers can have confidence in the information they're receiving." ●

Smarter spraying

Further solutions enter the AI-driven weed control arena

With chemical costs, resistance pressures and environmental scrutiny all continuing to influence crop protection decisions, interest is growing in technologies capable of applying products only where they're required.

One area gaining momentum in particular is AI-enabled spot spraying, which combines camera recognition technology with individual nozzle control to target weeds rather than treating the whole field.

While in April issue of *CPM* the concept of drone-powered weed mapping was explored, now, further innovative solutions are being introduced to the UK market. One recent example is the Rumex range of AI spot sprayers, now available through OPICO, with the RXF600 and RXF900 offering working widths of 6m and 9m respectively.

Originally developed in Bavaria by cousins Michael Thier and Thomas Ullrich, the technology was created to overcome a very specific challenge – controlling docks in grassland where blanket applications weren't permitted. The alternative was labour-intensive treatment using backpack sprayers, prompting the pair to develop a system capable of identifying and treating individual plants automatically.

Since then, the technology has evolved beyond its original grassland application, with AI recognition being developed for a wider range of high-value crops.

At the centre of the system is artificial intelligence software which analyses images from cameras mounted across the machine, identifying target weeds based on visual characteristics rather than simply detecting areas of green growth.

The RXF900 uses six cameras supported by two spotlights, producing 43,200 lumens per unit to provide consistent image quality. This enables the system to work in challenging conditions, including variable light levels and shadows, without requiring a covered hood over the spray area.

Once a weed has been identified, treatment is applied

using individually controlled flat-fan nozzles spaced at 40mm intervals. On the RXF900, 222 nozzles allow the machine to apply herbicide precisely to individual targets while leaving surrounding crop areas untreated.

According to OPICO product specialist Tom Brookes, this ability to differentiate between crop and weed is where the technology offers its greatest potential.

“The spot sprayer offers clear advantages for growers in terms of cost savings, earlier crop harvests and improved crop quality,” he explains. “There’s a big market for these sprayers in the UK, especially for onion and carrot growers, but the use of AI technology means there’s potential for other crops too.”

For crops including onions, carrots, potatoes and sugar beet, the machine’s ‘All Green’ function allows treatment during the early establishment phase. This targets emerging weeds before the crop breaks through the soil, reducing competition without exposing the crop itself to herbicide.

As well as reducing total chemical use – with potential reductions of up to 94% compared with blanket applications – targeted spraying can also



AI weed control

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help avoid the crop check associated with some herbicide treatments. By only treating weeds, the crop isn’t forced to use energy metabolising chemistry, helping maintain growth.

The machine has also been designed with practical farm use in mind. Mounted via a standard three-point linkage and PTO connection, it requires no additional tractor interfaces and can operate with tractors from 50hp upwards.

An adjustable chassis allows operation across common bed widths from 1.5m to 3m, while oscillating bearings and lateral guide wheels maintain the distance between nozzle and target plant, even across uneven ground. The system

also continues operating through turns and varying forward speeds.

Tom says the wider opportunity will come as the AI continues to learn and expand into more crops and weed species. “As the AI algorithm is continuously refined for wider use, the Rumex sprayer is a future-proof investment that will become increasingly applicable to more crops and weed species,” he says.

With herbicide availability, application costs and efficiency under increasing focus, systems such as Rumex highlight how AI could move precision spraying from concept to practical field application...

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