By and for end users

Junkkari brings predictive maintenance to unchartered domains

In the South Ostrobothnia region of Finland, Junkkari Oy has been collaborating with farmers and the wider agricultural machine trade for three generations. Following their fundamental principle of listening to the experiences of the customer, they design, market and manufacture machines for sowing, transportation and forestry – products which they've recently taken to a new level via participation in the ITEA project SMART-PDM (A Smart Predictive Maintenance Approach based on Cyber Physical Systems).

Robust but low-tech

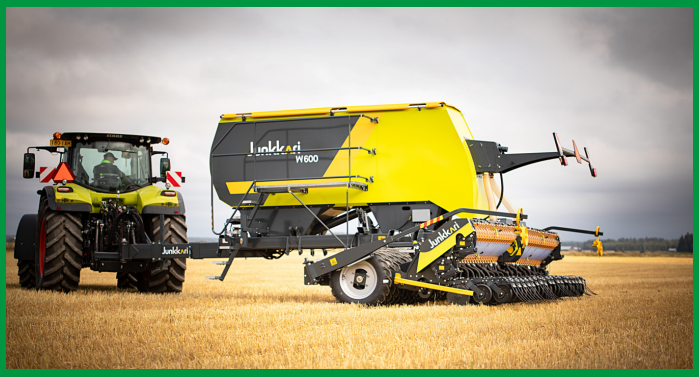
Today, even cars have internet connections, yet the agricultural and forestry domains continue to rely on robust, low-tech machines which cannot easily be connected to cloud services. Predictive maintenance – the capacity to determine the condition of machinery while in service – is uncommon even for tractors, which are typically the most crucial piece of equipment for farmers. This translates into a reliance on visual observation and simple alarm systems, leading to big downtimes when a machine runs until failure. Given the short length of the sowing season, such an approach is needlessly risky.

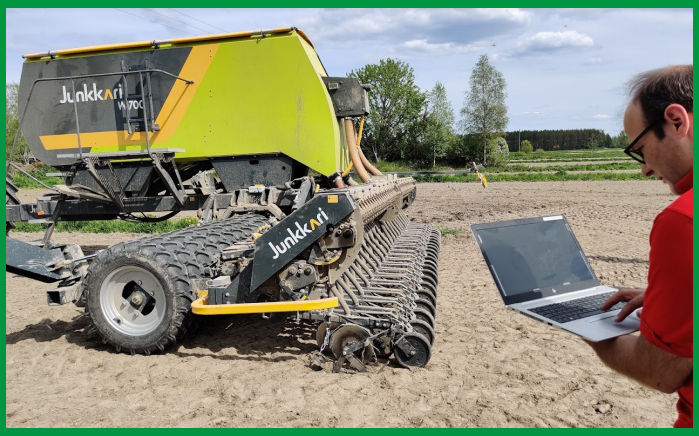
No more unnecessary subscriptions

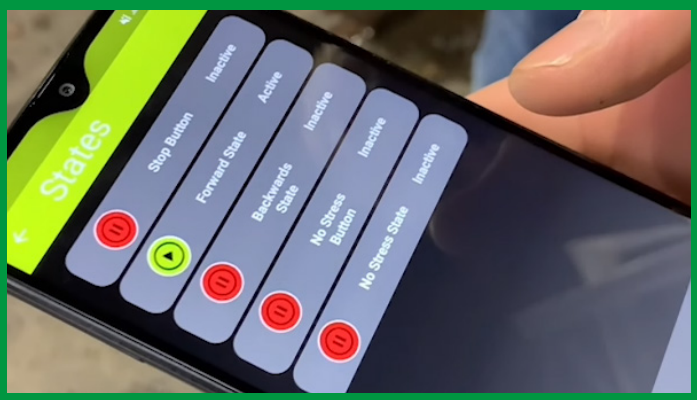
Having recognised the need for improvements, Junkkari was interested in SMART-PDM from the moment that they were contacted by Finnish consortium leader VTT. As a whole, the project aimed to acquire manufacturing data to provide diagnosis and prognosis information while improving the financial feasibility of the underlying technology. Within this, Junkkari became the owner of two use-cases (seed drilling and woodchippers) and developed the idea of using operators' mobile phones as gateways. This would negate the need for their customers to acquire separate SIM cards and monthly subscriptions from local teleoperators when the products in question are only rarely used.

A menagerie of measurements

This new connection system in their products was an eye opener for the company, leading them to explore what else could be monitored. For woodchippers, the subsequent implementation of sensor systems has allowed them to measure hydraulic pressure, temperature and blade condition. For seed drills, the same technology covers the entire spectrum of ground moisture, seeding depth,







coulter pressure, fertiliser moisture/temperature and the seeding conditions of air humidity and temperature. Crucially, this monitoring can take place in real time thanks to data prepossessing in cloud services, which will also help to further the development of precision farming.

The best of all worlds

Of course, such results could only be achieved through close collaboration with the rest of the ITEA project consortium. As Junkkari's representative in the project, Research and Development Manager Tarmo Kukkola provided their partners with information on what their end-users consider added value, helping to keep these customers at the centre of all developments. Junkkari was also able to contribute a large number of expert mechanical designers, but held less experience in coding, data processing, hardware and sensor technology. As the consortium had experts in all of these areas and more, Junkkari's knowledge and understanding of predictive maintenance has expanded enormously, allowing them to effectively add features that are beneficial for their end-users while maintaining their goal of simple, easy-to-use products.

One of a kind

Following the conclusion of SMART-PDM in 2022, Junkkari is now working on the integration of its results into the following model series of woodchippers and seed drills, as well as further dissemination through participation in major events like the International Conference on Smart Farming. By providing a digitalisation boost to both products, they expect to increase customer satisfaction via reduced downtime costs, better troubleshooting and greater usability overall. In turn, this will boost Junkkari's brand value and increase their sales – especially as no other comparable system exists for handfed woodchippers.

The virtuous circle

In the longer run, SMART-PDM has created a virtuous circle for Junkkari: the ability to gather useful data efficiently will improve their R&D, allowing them to make even better products and gather more data. The project will also have a large impact on challenges that are currently in the spotlight worldwide. Smartphones, for instance, are so prevalent that their use removes the need to build separate modem systems and use up precious semiconductors during the global chip shortage. By minimising machine downtimes, predictive maintenance will also help to boost wheat production at a time of instability. This expansion of new technology to the domains of agriculture and forestry is only the beginning of advancements which will likely be felt for generations to come.

More information:

https://itea4.org/project/smart-pdm.html
https://www.junkkari.fi/