UNIFOREST CONNECT - DIGITALISATION IN FORESTRY TECHNOLOGY

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As with most modern equipment, both for leisure and industrial purposes, there is an increasing demand for monitoring machine operating parameters via mobile devices. This allows for easy insight into the condition of the machine, monitoring of work performance, alerts about potential problems, and preventive maintenance. The aim of the project is to provide users of forestry machines with a very easy insight into the heart of the machine. All important parameters and data that end users, owners of multiple machines – companies and dealers – want to monitor are recorded there. Therefore, it is necessary to enable wireless connection of forestry machines with smart devices (phones, tablets, etc.), through which users will be able to access the machine's data. This will provide users with much better information about the machine's condition. It also makes it easier to diagnose faults on the machines. This helps the manufacturer, the service technicians, and, on the other hand, the user to minimise unwanted machine downtime.

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1 Introduction

As a manufacturer of forestry equipment, we are aware of the fact that a good machine with innovative solutions cannot satisfy users without good technical support and fast and responsive service in in case of problems. Therefore, if we want to satisfy our customers in this regard, we must be very familiar with user habits, their way of working, and the specifics of work in different markets. To this end, we have developed electronics that ensure the machine functions perfectly and at the same time stores all important events that occur on the machine, and can be sent to a smart device via a Bluetooth module.

For this purpose, an application suitable for smartphones was developed that recognizes the machine and displays important information to the user based on serial number (Figure 1).

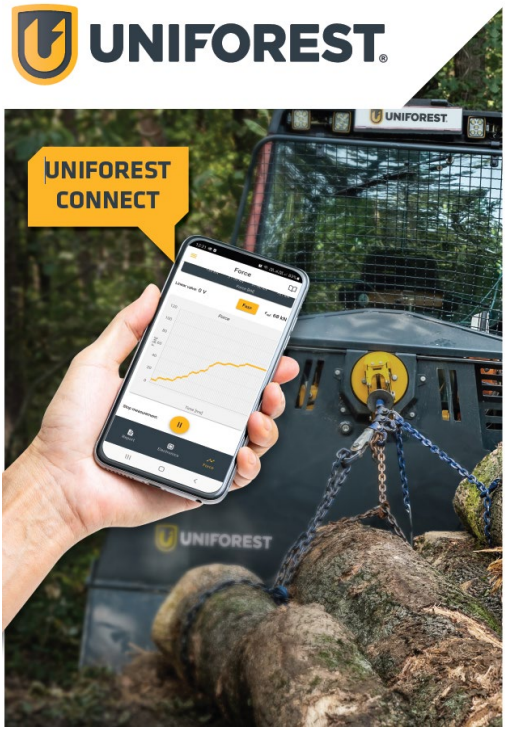

Figure 1: Smartphone app screen for controlling forestry machines »Uniforest Connect«.
Source: Uniforest, d.o.o.

This involves synchronizing two-way data flow between a smart device and electronics. Data security is of great importance in communication to ensure that data is reliable and usable. All data collected via the application is stored in the company's database. This contributes to much greater transparency of the machines on the manufacturer's side. The machine's serial number is used to record all of the machine's work cycles, usage times, and individual functions. On some models, the pulling force of the machine can also be monitored in real time, and the supply voltage is also displayed in real time. This data is presented to the user in a user-friendly graphical format.

2 How Uniforest Connect works

Users can install the app on their Android mobile phones via the Play Store/iTunes. It is also important that the smartphone has a Bluetooth connection, which the app uses to communicate with the winch electronics (Figure 2).

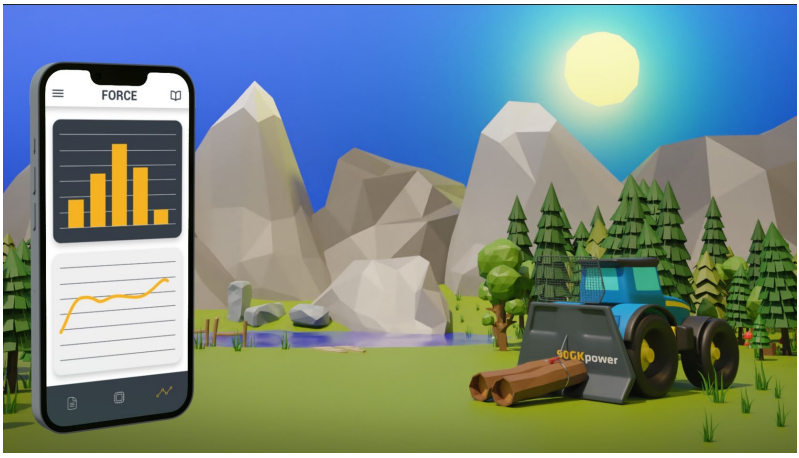

Figure 2: Connection of the Uniforest Connect app to a forestry winch via a wireless Bluetooth connection.
Source: Uniforest, d.o.o.

The functions offered by the "Uniforest Connect" system are described below.

- It can monitor the operation of the clutch, brakes, unwinding device, and limit switch.
- At the same time, the user has an overview of the service interval of the winch.

- Winch load monitoring: The electronics record the percentage of time the winch operates under load (Figure 3). This allows the user to determine whether the winch is suitable for their needs. At the same time, the user has an overview of the winch's service interval.
- Diagnostics: Power supply, pulling force (Figure 4), remote control signals, and inputs and outputs on valve coils are actively monitored at all times.

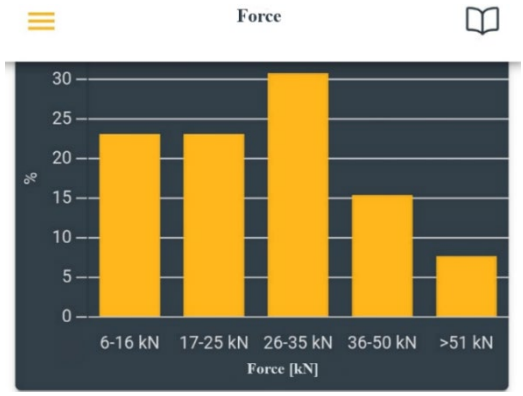

Figure 3: Recording the load percentage of the winch
Source: Uniforest, d.o.o.

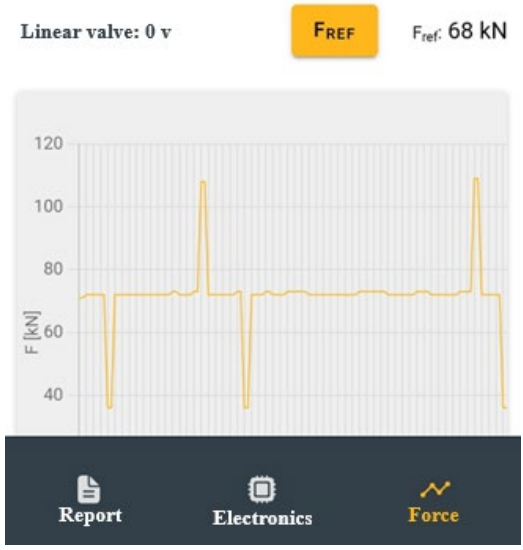

Figure 4: Recording the measured pulling force of the winch.
Source: Uniforest, d.o.o.

3 Benefits for the user

The newly developed application enables users to perform real-time diagnostics, monitor multiple machines simultaneously and optimise service cycles. The strong advantages of such applications are listed below: The user can perform basic diagnostics on site. Business users with multiple employees and multiple machines can monitor machine performance and efficiency on a daily basis. Service intervals help the user to optimise machine maintenance (reminders for regular maintenance). In tenders where Industry 4.0 or digital machine monitoring is required for tender funds, it will be possible to participate with our system.

This gives the user a real time insight into the operation of the device. It can later be saved and presented as a report, which can be useful for further analysing the operating regime of the individual winch. In case of a malfunction, the recorded history can provide valuable information for estimating the expected life of the machine, and with advanced knowledge and expertise in this field, appropriate preventive maintenance can be ensured.

4 Download. Connect. Extend. Warranty 2+1

Connect to the Uniforest Connect app and secure an additional year of warranty!

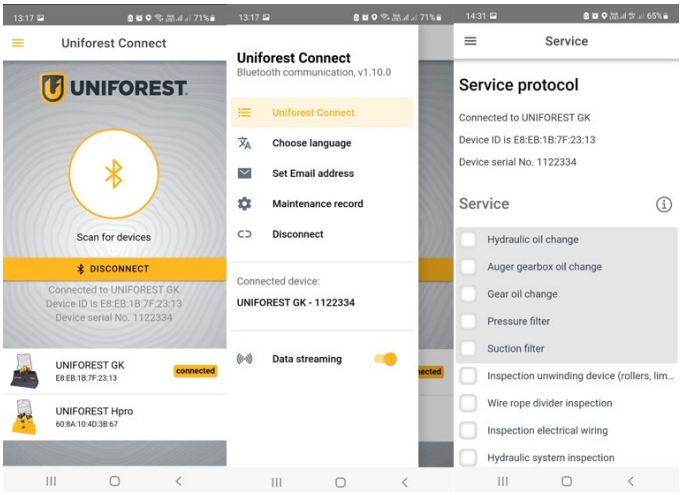

Figure 5: Settings screens of the "Uniforest connect" application.
Source: Uniforest, d.o.o.

– Well-maintained machines have a longer service life;
– If the service intervals are adhered to, an extended warranty period of 2+1 year is guaranteed.

Uniforest is the first forestry winch manufacturer to enable digital diagnostics and take the user experience to another level! In this way, we can not only maintain our competitive advantage, but above all we want to implement further solutions to improve the user experience for end customers, vendors and service providers.

5 How Uniforest Connect works on cutting and splitting machines

Figure 6 shows the settings screen of the "Uniforest Connect" application for cutting and splitting machines [1]. There are several options from which the user can select the optimum settings for their needs.

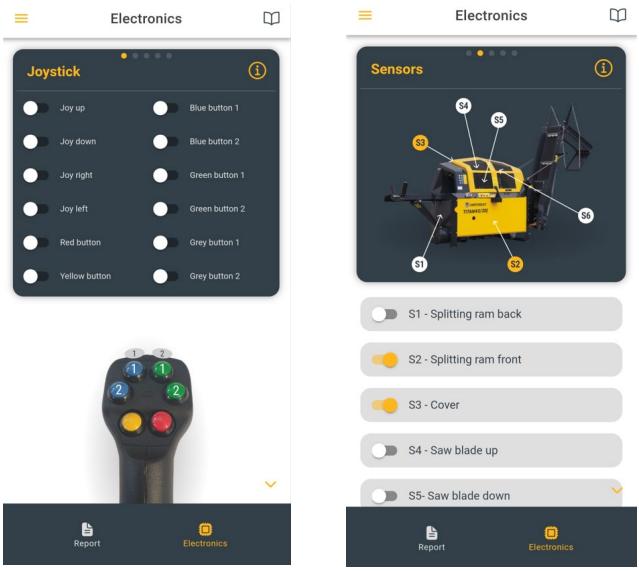

Figure 6: Settings screens of the "Uniforest Connect" application on cutting and splitting machines.
Source: Uniforest, d.o.o.

Cutting and splitting machines, provide the user with:

– a complete diagnosis of the electronics,

- an overview of the inputs and outputs of the control unit, an overview of the operation of the sensors, measurements of the machine temperature, measurements of the machine speed, and if the instructions are not followed (tractor PTO speed too high or too low), the application warns the user,
- measurements of the control signal voltage,

With Log measurement setting, you can easily calculate the total quantity of logs by measuring the length, diameter, and volume of the logs or the chopped wood (Figure 7).

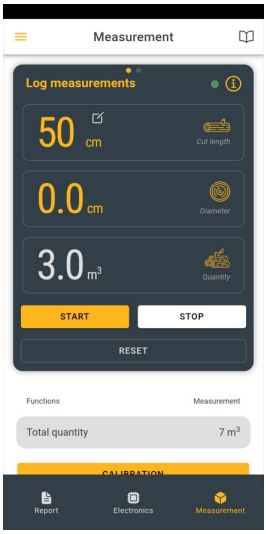

Figure 7: Diagnostic display of completed work – split logs on a cutting and splitting machine
Source: Uniforest, d.o.o.

6 The significance of Industry 4.0 and Industry 5.0 for users and the positioning of "Uniforest Connect"

Technological developments in recent years have brought about the increasing introduction of artificial intelligence into the operation of machines, production, storage and other systems, the creation and dissemination of information, and, finally, into people's everyday use in the form of "smart" devices, cars and homes. Automation, device connectivity, and artificial intelligence are the foundations of Industry 4.0.

However, the independent operation and learning of software in various forms and its response to real-world circumstances is not always ideal, which is why the next stage of development has brought about Industry 5.0. This puts people back at the centre and focuses on safe and ergonomic working and the optimisation of work processes for optimum efficiency, considering the reduction of the negative effects of modern work on people.

The most widespread forms of Industry 5.0 include: generative artificial intelligence, which interacts with humans and thus develops according to the user's needs, augmented reality, which combines virtual and real reality with the aim of promoting creativity and efficiency, digital twins for the continuous monitoring, simulation, and optimisation of industrial processes, the use of blockchain as a data tracking system for greater security and transparency in industrial processes.

6.1 Connectivity and smart maintenance with Uniforest Connect

Uniforest machines are connected to the central Uniforest database via the Uniforest Connect app (Figure 8), which enables tracking of the service cycle, predictive maintenance, and timely notification of service centres. Thanks to this technology, spare parts are always available, and the work process remains uninterrupted. Industry 4.0 in practice – integration of IoT and data analytics [2].

Figure 8: Connect diagnostic and monitoring system
Source: Uniforest, d.o.o.

6.2 Real-time diagnostics and remote control

Solutions at your fingertips – anywhere, anytime. With advanced remote machine diagnostics and a response time of 0.3 seconds, operators and service technicians can monitor machine loads live, check input signals, and quickly troubleshoot faults (Figure 9). Industry 4.0 – advanced monitoring of machine performance in line with the EU strategy [3].

Figure 9: Uniforest connect - response in 0.3 s
Source: Uniforest, d.o.o.

6.3 Machine traceability and safety

System provides all machine information in one place. Every Uniforest machine is traceable via its serial number, which is stored in the electronics and on the declaration plate. The service history is available, at any time and provides a complete overview of past interventions and future maintenance work (Figure 10). Industry 4.0 – transparency and intelligent data management in line with EU directives [4].

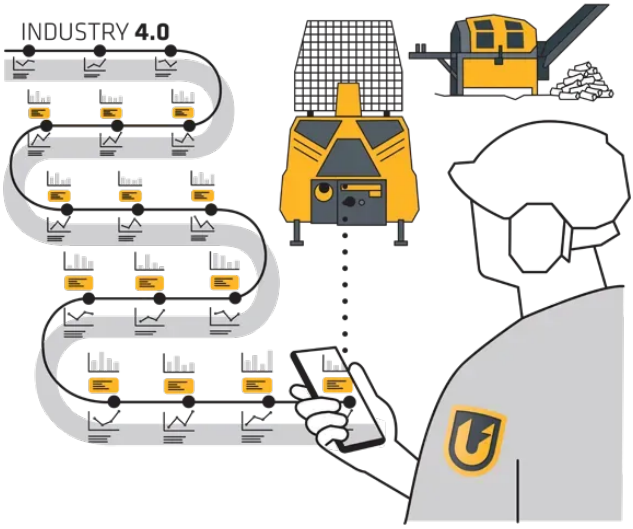

Figure 10: Machine traceability via the Uniforet Connect app.
Source: Uniforest, d.o.o.

6.4 Ergonomic design according to EU standards

The system features a less-effort approach with more security. Uniforest machines are designed in accordance with EU ergonomic guidelines, including ISO 12100, which reduces operator fatigue and improves the working environment. Customized control systems and user-friendly applications enable easy operation in multiple languages. Industry 5.0 – people and a safe working environment at the centre [5]. Reference to the EU Directive: Directive 89/391/EEC on safety and health at work.

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