Cloud-supported data acquisition monitors emissions and energy consumption in paint spray booths

TwinCAT IoT helps optimize smart vehicle repairs

Beckhoff has developed the perfect addition to its proven TwinCAT 3 engineering and control software with TwinCAT IoT. As a basic technology for the fast and efficient implementation of applications in the context of Industrie 4.0 and the Internet of Things (IoT), TwinCAT IoT helps users implement a wide range of solutions in different industry segments. As one of the most recent examples, the Danish company Carheal uses TwinCAT IoT in its vehicle spray booths for paint work.

With its Smart Repair spray booths, Carheal has delivered a turnkey solution with which car repair workshops can swiftly repair minor damage to the paintwork of cars. The complete body panel is not repainted in the conventional manner, only the immediate damaged area. The advantage for the customer is that they can collect their car from the workshop on the same day they drop it off. Henrik Bro Christensen, Carheal’s founder and managing director, wants not only to set a new standard in repair quality and duration with his spray booths, but also to meet the highest environmental protection requirements. Christensen consistently pursues Industrie 4.0 concepts by connecting the spray booths to a cloud system. Apart from state-of-the-art automation, Christensen aims above all with the booth concept to create scalable solutions that can be used all over the world in order to offer intelligent B2B services. To do this, Christensen makes use of IoT technology from Beckhoff. The special feature of the Smart Repair spray booths is their innovative filter system, which creates no impact on the environment. The air from the interior of the booth is not transported to the outside; instead, it is cleansed completely of solvent residues and reconditioned by an integrated filter system. This substantially improves the supply of fresh air and prevents the emission of particle-laden air. An ARM-based CP6606 Panel PC with TwinCAT 3 automation software is used to control this advanced exhaust system.
The Smart Repair spray booth is suitable for outdoor use, for example in auto shop yards or in the vicinity of shopping malls or airports.

The interior of the booth offers perfect conditions for quick and straightforward repair of minor paint damage. The right light and smart repair tools are crucial for the quality of the paint results.

About Carheal

Carheal was founded by Henrik Bro Christensen as an online platform and network for car repair workshops that fix minor damage using special Smart Repair systems. The idea was to create a contemporary alternative to traditional workshops that can quickly and inexpensively repair minor damage on the vehicle body, the paintwork, in the car interior, on the windshield or on the headlights. With the development of the Smart Repair booth, which is a self-contained, turnkey system for both indoor and outdoor use, the company offers trend-setting solutions with regard to both environmental impact and the consumption of energy and raw materials. Between September 2016 and August 2017, the company installed seven turnkey systems worldwide – in Australia, England, Norway, the Netherlands, Germany, Denmark and the USA.

Carheal founder Hendrik Bro Christensen expects cloud connectivity to bring many benefits for scaling his business model.
TwinCAT IoT for simple communication with the cloud
The Smart Repair spray booths are connected to the cloud via TwinCAT IoT, which features various functions to exchange process data via standardised communication protocols and to access special data and communication services from cloud service providers. Corresponding services can be hosted in public cloud systems, such as Microsoft Azure™ or Amazon Web Services™. Alternatively, they can also be hosted in local networks.

Together with the CP6606 as the IoT controller, TwinCAT 3 PLC and TwinCAT IoT establish a seamless connection between the Internet of Things and the Internet of Services in the solution realized by Carheal. In the company's Smart Repair booths, the analog and digital sensor signals recorded in real-time are sent by means of TwinCAT IoT to the Microsoft Azure IoT Hub at intervals of five seconds, five minutes or ten minutes, depending on the relevance and properties of the information. Among other things, the data provides information about the location and general condition of the booth, the filter operating hours, the air quality, the duration of the individual work steps, and the consumption of energy and paint. The system raises the alarm if volatile organic compound (VOC) limit values are met or exceeded.

The primary reason for using the Beckhoff control platform is the fact that TwinCAT IoT offers the option to communicate with the Microsoft Azure IoT Hub directly from the PLC logic, even on small ARM-based CPUs such as the one found in the CP6606.

The acquisition and evaluation of data in the cloud is currently still new territory for Carheal, but Henrik Bro Christensen expects it to provide him with many advantages when upscaling his business model. The cloud connection makes
sense, especially in view of the growing number of Carheal booths and service providers internationally. It guarantees the secure storage of data on various servers all over the world. The data are already being used to measure Key Performance Indicators (KPIs), which provides information on performance and utilisation, and helps improve the service of the Carheal booths. If a workshop operates several booths, data can be compared and potential areas for optimisation can be determined. Another advantage is the addition of predictive maintenance functionality. By tracking the measured values from the booth, the operator can tell at an early stage when, for example, filters need to be replaced, sensors exchanged or paints refilled. As a result, maintenance costs can be reduced significantly.

A dashboard provides information about all relevant spray booth parameters, such as air quality or progress of the individual spray processes.

The Carheal Smart Repair booth for installation inside auto repair shops: thanks to the integrated and innovative air extraction system, the air in the repair shop is not contaminated with solvent particles.

An ARM-based CP6606 Panel PC is used for controlling the air extraction system in the spray booth.

Further information:
www.carheal.net
www.beckhoff.dk