

IoT enabled sensors for smarter tunnels and roads

Over the last few years, IP (internet protocol) networks have highly penetrated traffic infrastructure. Many road operators install corporate networks alongside highways and inside tunnels. Environmental sensors have not kept pace. They either still use analogue outputs for measured values and relays for status information or traditional two- or four-wire interfaces like RS-232 or RS-485 with fieldbus protocols like Modbus RTU (remote terminal unit) or PROFIBUS DP (process fieldbus decentralised peripherals). Such sensors do not seamlessly connect to a modern IP network infrastructure. Instead, they are embedded into a traditional SCADA (supervisory control and data acquisition) environment where a PLC (programmable logic controller) picks up their signals.

IoT-enabled tunnel sensors
Without IP compatible sensors, direct access to the hardware is lost, meaning it is not possible to implement modern technologies like remote maintenance or condition monitoring to improve reliability and reduce costs. Introducing the concepts of Industry 4.0 like the Internet of Things (IoT) in transport infrastructure environments will unlock these potentials. Technologies are proven, now sensor manufacturers, system integrators and road operators need to work together to ensure that IoT-enabled sensors easily integrate in tunnel control systems and corporate IP networks.

Other devices can remotely access sensors within the same IP network. Some operators feel cautious about cybersecurity, worrying that a sensor could be hacked. But in fact, IP connected



Left: Having IP compatible sensors opens up a whole new world of tunnel and road management

Below: René Jung



Need to know

The JES Smart/Architecture infrastructure sensor system consists of...

- IoT-enabled sensors that can also connect to classical SCADA environments via a PLC
- An IoT hub that serves also as operating unit and allows to connect sensors without Ethernet port
- An asset management server for data acquisition, visualization, condition monitoring, remote maintenance and firmware management either in an on-premises setup or hosted by JES

sensors do not add any major new challenges to cybersecurity. Firstly, most sensors connect only to corporate networks of road operators and not to the internet. Further, the sensors use standard Internet technologies that IT security specialists know how to deal with.

“At JES tunnelsafety.at we have created the Smart/Architecture for our new IoT-enabled sensor generation, to launch by the end of this year” René Jung, managing partner, JES

The future sensor

Future tunnel sensors should actually be open for access by different authorised devices like other sensors, a PLC, a SCADA system, a PC or an asset management server within a road operator’s IP network. This remote access is the basis for all necessary and useful applications.

For human operators, a modern sensor should offer a web interface, which means that no special software from the sensor manufacturer is required to configure or troubleshoot a sensor.

The tunnel control system will also connect to the sensor via the IP network: either using TCP/IP (Transmission Control Protocol/Internet Protocol) variants of established fieldbuses like Modbus/TCP and Profinet or via modern architectures like OPC UA. Austrian road operator ASFINAG (Autobahn and high way financing stock corporation)

has already defined an information model for tunnel control systems in OPC UA (OPC Unified Architecture) but there is no international standard yet.

Smart/Architecture will be launched together with two new JES sensors for the monitoring of air characteristics in tunnels. Other JES sensors and selected third party sensors will follow for the deployment of in-road weather stations and for use in underground car parks.

JES has always been a company dedicated to optimal service for the road operators. Along with the IoT solution, JES will also offer condition monitoring and remote maintenance as a service. ○

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