

Digitalisation



Digitalisation can help to improve productivity, safety and environmental management in the energy and chemicals sectors.

Background

On the 29th of August 2018 the US high-tech stock index, the NASDAQ Composite, reached a new all-time high at just above 8109. Clearly there have been some market gyrations since then, but it demonstrates the long-term positive dynamic that exists in the high-tech sector. The world is going digital and there is money being made by those that are winning the race to innovate. The momentum in this topic is phenomenal because the changes are transforming people's lives and industry for the better.

Nexant examines a few case studies in this field to plant a few seeds of how digital technology can transform the energy and chemicals sectors. We present how a water treatment company has been able to trouble shoot odour emissions, how refineries can detect gas leaks in the knowledge that their wireless sensor network will function with utmost reliability and how service engineers can travel to engagements with the right spare parts in their van, having received diagnostic information prior to leaving their depot. It all adds up to increased productivity, improved safety and has many positive environmental benefits.

QR codes improve productivity for analytical instrumentation service teams

The holy grail of any continuous emissions monitoring system (CEMS) installation is to achieve 100% measurement accuracy 100% of the time. FTIR instrumentation is commonly used for the most complex CEMS applications, for example waste incineration or the co-combustion of fossil fuels with biomass or waste. A blue-chip standard in this sector would arguably achieve an average availability exceeding 98%, close to, but not quite at that elusive 100% uptime target.

Digitalisation is playing a role in the next step up the ladder to 100% availability of the CEMS. One leading FTIR manufacturer is using QR codes to make the next step change in performance possible. The QR code is generated within the FTIR system management software and displayed on the control panel. It contains information for system identification, the current system configuration data and the real-time analyser health status. It is compatible with standard QR code reader APPs that end users will most probably have on their smart-phone or tablet. The idea is that the instrument owner can send the service team real time information so that a maintenance engineer can respond immediately with remote support, or with a site visit and fix the issue. The days of engineers arriving, looking at the instrument and then driving back to the depot to pick up the relevant spare parts are history!

Some of the most hotly debated topics on the digitalisation agenda are the issues of data privacy and data security. This issue is more topical than ever with the recent introduction of the EU General Data Protection Regulation (GDPR) on the 25th of May 2018. With this QR scanning data transfer mechanism, there is no permanent data link from the FTIR unit to any external systems, so any cyber security sensitivities can be avoided.

QR codes improve productivity for analytical instrumentation service teams (Cont'd)

With continuous emissions monitoring systems being used on every major refinery and fossil fuel electrical power plant, the topic here is of immediate relevance to the energy and chemicals sector. Beyond the specific case, it is a thought provoking example of how Industry 4.0 can contribute simultaneously to increased operational efficiency and customer value.

Bluetooth data transmission trouble shoots odour issues

Following complaints of nuisance odours, a major UK Water Company sought a cost-effective method of monitoring and logging ppb levels of Hydrogen Sulphide (H₂S) gas. It suspected the gas was being released from their pumping station, located next to a new housing development. Challenges included its remote location, without AC power, and being an unmanned station, staff could not oversee the 24/7 gas monitoring and data capture.

The solution was to mount a battery powered portable H₂S gas detector on the fence line between the pumping station and housing development. The gas detector had a measurement range of 0 to 500 ppb and was programmed to record gas concentrations every two minutes. An IP67 housing allowed the device to be located outdoors for three months over which time the recorded data was logged onto an SD card for subsequent download using Bluetooth wireless communication to a tablet. The collected data pointed to specific events that prompted further investigation and resolution.

Local electrical power generation, e.g. from proton exchange membrane fuel cells that are either directly or indirectly powered by methanol is increasingly being used for similar environmental monitoring applications in remote locations. The methanol is either used directly in the fuel cell, or more commonly is cracked to form hydrogen which is used in the fuel cell. The pros and cons of methanol or the direct use of hydrogen gas for this application are widely debated in the mobile power sector, but it appears that methanol is making good inroads due to the convenient transportation and high energy density when compared to compressed hydrogen gas. For a deeper insight, the application of methanol for these distributed power requirements is covered in the 2018 Nexant Subscriptions report discussing the technology and economics of various applications that are anticipated to drive methanol growth. The low-energy requirements of Bluetooth might mean that it is part of the ideal digitalisation solution for data monitoring and transmission from such installations.

WirelessHART® creates a safe data mesh for flammable and toxic gas detection

The cases above refer to QR codes and Bluetooth, both of which were developed in 1994 and are digital technologies that we encounter frequently in our daily lives. This next application uses a digital communications protocol that is perhaps less well known and is just over a decade old. WirelessHART® is a networking technology based on the Highway Addressable Remote Transducer protocol.

WirelessHART® is an open protocol and has been implemented into commercial products. Notably, one leading process automation firm has integrated this communications protocol into their range of wireless LEL and toxic gas detectors for refineries and chemicals plants. This takes process safety gas detection one step further up the ladder of reliability because the WirelessHART® network of gas detectors can transmit data in all directions and to and through all devices in the mesh. The implication is that if one device fails, or is taken out of service for routine maintenance, the data from the network of gas detectors will flow through an alternative route to ensure the security of gas detector data transfer. The resultant mesh of sensors can therefore be both large and complex in shape.

WirelessHART® creates a safe data mesh for flammable and toxic gas detection (Cont'd)

Quite simply, when refineries and gas storage terminals want to monitor for flammable gases and toxics, such as Hydrogen Sulphide they do so for good reasons: a gas leak can be poisonous or cause an explosion. So, the combination of the gas detectors with this self-repairing digital mesh is the optimal solution to monitor for gas leaks in hydrocarbon processing and storage facilities.

Despite all that we may read about oil reserves running low or the emergence of electrically powered vehicles, the installed refinery capacity in the developed world is likely to remain at current levels through to 2034, according to Nexant MD data. So, in broad terms, innovation to support refinery in safety and digitalisation should be a good bet for the future. And, this case study might also stimulate other ideas for the application of this robust data mesh in the energy and chemicals sectors.

Bringing it all together

Through our daily exposure to the energy and chemicals industry dynamics, Nexant has identified several mega-trends that are likely to influence the energy and chemicals sectors in this and forthcoming decades. Amongst them are the drive to electrification, the emergence of alternative and renewable fuels and the increasingly important role that digitalisation will play in enabling Industry 4.0. At Nexant, we have a range of services from grid management software, off-the shelf technical reports, market analysis data, training courses and bespoke consulting services to help the global energy and chemicals industry to navigate these changes. Our services exist to ensure that individuals and companies maintain their relevance and competitive advantage in the face of these mega-trend transformations.

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