

Digitalisation

Digitalisation simplifies refinery gas analysis and emissions monitoring

Refiners continue to invest in process automation to widen margins and tightening environmental legislation is driving additional continuous emissions monitoring system (CEMS) requirements. Accurate online gas analysers for energy efficient process control and air quality protection play a key role in ensuring that refineries operate in harmony with the environment.

An array of digital solutions combined with innovative service delivery and modern low-maintenance analysers are cutting the lifetime costs of gas analysers in refineries. The results are reduced capex, simpler operation and a lower cost of ownership.

For many reasons, additional or replacement gas analysers will feature in the refinery capex plan. Investing wisely in new process control or CEMS gas analysers can make a huge difference to the cost of ownership and bolting on service packages can result in increased simplicity and reduced operating expenditure.

Some instrument technicians may feel that the landscape has changed significantly in the past decade as the offers have become more digital and high-tech. Keeping up with the trends is the best way to ensure cost effective compliance and trouble-free process control.

Quality hardware is the foundation

Despite the digitalisation dynamic, the quality of the gas analyser still makes a significant difference to the cost of ownership. "The kit inside the box really matters. We are on a mission to control our customer's costs, cut complexity and make their capex go further. That's why we work tirelessly to improve our gas analysers". So says Stephen Gibbons, Head of Product Management for the Continuous Gas Analysers product range at ABB Measurement & Analytics.

"Take the example of combustion optimisation and CEMS from a steam methane reformer (SMR) producing hydrogen for hydrotreating or hydrogenation on the refinery. These processes are essential to produce clean burning low-sulphur fuels and biofuels. Our Advance Optima product range can bundle together all the gas analysers that a refinery would need for their SMR emissions monitoring with one controller. It means simplicity and cost-effectiveness". Diving down one layer deeper, analysis of the total oxides of nitrogen (NO_x) in the steam methane reformer emissions is an area where gas analyser hardware is becoming simpler. ABB's Limas gas analysers use UV detectors to differentiate between NO and NO_2 . Compared to a chemiluminescence detector, that's a real step-change in performance and a huge reduction in the complexity of the instrument. At present detection

of the separate species NO and NO_2 within the total combined NO_x emissions provides a greater level of environmental emissions visibility than is generally required, but if legislation shifts, the purchase of a gas analyser which can perform at this level will be a future-proof investment.

Staying with SMRs but switching to process and quality control applications, direct read NDIR analysers are ideal for measurement of the final hydrogen purity. Gibbons points out that "it's generally taken for granted that the gas coming off the SMR will be hydrogen but what really matters is the absence of CO and CO_2 . These two gases are poisons to the hydro-treating catalysts in the subsequent processes, where the hydrogen is used in the refinery. Typically, the final hydrogen product specification will have a maximum total combined CO and CO_2 content of 10 parts per million by volume (VPM). Simultaneous measurement of these two components is right in the sweet spot for our Uras26 NDIR gas analyser".

Using an NDIR gas analyser is nothing new for CO and CO_2 measurement, but the Uras26 is fitted with cells which are filled with gas mixtures of known concentrations. These enable automated calibration of the gas analyser and eliminate the need for gas mixture cylinders. Calibration of the CEMS instrumentation is a fundamental requirement for emission monitoring compliance and this ABB technique has multiple international certifications to validate its use. Ensuring that instruments are properly maintained helps with regulatory compliance at minimum cost and complexity.

Service from experts where and when it matters most

One of the most powerful trends for services bundled around refinery gas analysers is to integrate the services provided by people more closely with digital solutions. As an example, Adrian Heaton, Global Service Sales Manager for the Measurement & Analytics Division at ABB outlines a recent case where low-maintenance CEMS gas analysers and field service engineers teamed up to support a major operating company in Italy. "Our customer was targeting immediate cost-savings and looking for a reliable service provider to support their installed CEMS gas analyser base across their 13 sites. To meet the cost-saving target, we offered a holistic approach. That included a standardized maintenance strategy across their sites with rapid response and optimized routine services. The ABB Ability™ Condition Monitoring solution was also implemented".

Condition Monitoring enables service teams to work with refinery or gas processing plant instrumentation engineers to review the health and status of their gas analysers. The concept means fixing little glitches in the gas analysers proactively before they escalate on the one hand and avoiding unnecessary maintenance if it is not required on the other. All in all, condition-based intervention saves time, reduces cost and improves safety.

"The condition-based monthly review of the CEMS devices resulted in better emissions data reporting uptime and lower labour costs", concludes Heaton.

A further trend with services is simply to offer more. "We will be there during the full



Photo: ABB – Gas analyser installation

lifecycle of a gas analysis instrument” says Heaton. “Our services begin with product selection proposals, equipment installation, commissioning and training. In the operational phase the focus shifts to spare parts, consumables, maintenance, technical support and repairs. As time moves on, extensions, upgrades and retrofits are the order of the day. And, when twilight finally comes it’s time to consider replacement and end-of-life services”. The ABB Measurement Care packages are a modular framework which allows each refinery to customise a service package from all the available options that focuses on their needs. That means service is there, when the refinery or storage terminal needs it the most and costs are simultaneously contained.

Digital trends

Augmented reality, cloud computing and QR Codes are not just buzzwords. David Lincoln, Global Digital Lead at ABB’s Measurement & Analytics Division explains why digital solutions matter: “the right combination of digital technology, service delivery and high-tech hardware puts us in the sweet spot to provide unrivalled value for money to our customers”.

As part of the ABB Ability™ suite of digital solutions, ‘Remote Insights’ allows an operator’s instrument technician to communicate directly with an expert remotely. It is a two-way augmented reality video and voice interaction enabled by a hand-held device such as a tablet computer or mixed reality headset. It means that the instrument technician can share, what they are seeing directly with their counterpart at ABB and get instant feedback about the best course of action. Lincoln says that “in the past, training, maintenance, troubleshooting and repairs all meant a service call-out. With Remote Insights, there will be much less travel required – saving time, cost and CO₂ emissions”.

‘Remote Assistance’ is ABB’s new collaborative cloud-enabled operations concept. Many refineries operating within a large company have implemented ‘Remote Operations Centres’. These are like the ‘Remote Assistance’ model. The concept relies on Condition Monitoring health diagnostics in the gas analysers, which can inform the operator’s instrument engineer, or the service team at ABB about the status of the gas analyser. This data can be used to diagnose consumable materials replacement require-

ments or trouble shoot equipment faults. The goal is to guide the local operations team towards a speedy resolution.

Dynamic QR codes are a digital innovation that is being integrated into the ABB Measurement Care service offers to help operators get closer to 100% uptime availability for their gas analysis instrumentation. This uptime target is important for many process control applications but has special significance in regulated CEMS. In many countries, emissions measurement data must be reported 98% of the time to avoid shutdowns and penalties. The Dynamic QR code displays the latest system configuration data and the real-time analyser status. The instrument owner can transmit real time information so that an ABB engineer can offer advice immediately or follow up with a site visit to fix the issue.

Lincoln adds that “data privacy and data security are key topics in this digital age. The Dynamic QR code technology is sensitive to this issue because there is no permanent physical connection needed to transfer data from the gas analyser to our systems”.

Gundula Harrison, Managing Consultant, sbh4 GmbH ■

Refinery

Ingolstadt ex-refinery site environmental remediation hits key milestone, meeting safety, budget and performance targets

Throughout the year, 500 people have been active with environmental remediation and building work at the 75 hectare IN-Campus development in Ingolstadt. “Safety has always been the number one priority at the IN-Campus site” said Dr. Rüdiger Recknagel, Chief Environmental Officer at Audi. “The workforce has just achieved the milestone of 250,000 hours of incident-free op-

eration since work began in 2016”.

“My team is very proud to be involved in this project, which we believe is the largest ex-refinery remediation task ever undertaken in Germany” adds Recknagel. During more than four decades of operation of the refinery which previously existed on this site, there were occasional spillages of oil and other chemicals. This is the legacy

which the IN-Campus team are now working to remediate. “Our environmental management experts know that it is a once in a lifetime opportunity to return such a beautiful piece of land bordering the river Danube to its pristine condition. And I am immensely proud of them because they are working so responsibly and achieving all our milestones”.

“The excellent safety statistics are just one example” continues Recknagel. “We are also working within our budget and proceeding according to our timeline. Up to now, we have cleaned-up about 400,000 tonnes of contaminated soil from the site, which is fractionated into sand and stones in the washing process. That is about 65% of the total requirement. And the technologies that we have chosen are performing as expected to return the site to a very high environmental standard: up to now, they have successfully captured and disposed of 450 Tonnes of hydrocarbon pollutants”.

Safety and respect for our natural environment are the heart of the project concept. IN-Campus GmbH, a joint venture between AUDI AG and the town Ingolstadt, is responsible for the site development. The Managing Director Thomas Vogel explains, how these concepts are also core to the long-term vision: “The innovation campus that will be created on this site will be used



Photo: AUDI AG IN-Campus Environmental remediation of legacy refinery at Ingolstadt - air sparging unit