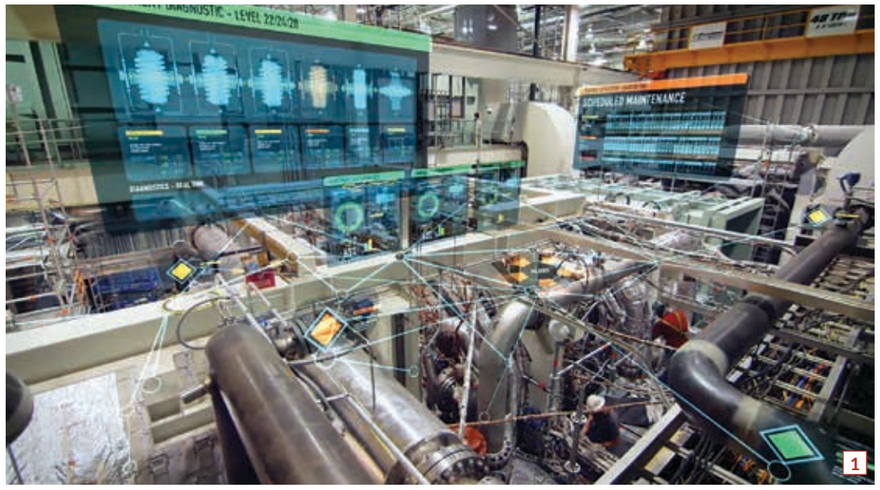
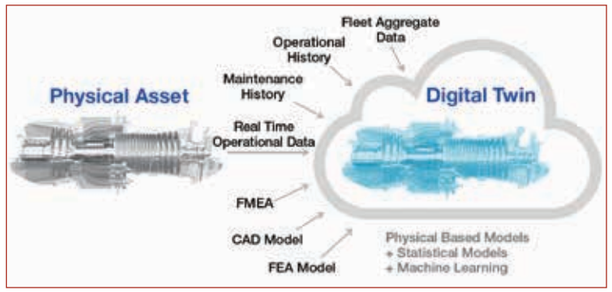


1

2



Above: An integrated view of asset management data enables a 'digital twin' of the physical world to be established.

1: For asset management purposes, solutions that can import data from sensors and systems that have already been installed are needed, which can be combined with new sensors for accurate predictive maintenance management on a single platform.

2: "Eventually, all the data must come into one place where we can apply analytics and business intelligence (BI) solutions so as to establish work flows, trigger actions and such like," notes Swanepoel.

IIoT and the changing face of asset management

MechChem Africa talks to Stefan Swanepoel of enterprise, physical asset management and monitoring specialist, Pragma, about how the Industrial Internet of Things (IIoT) is blurring the lines between asset management, condition-based maintenance and operational performance.

The Pragma R&D group looks after R&D and product development and in that group, Swanepoel is responsible for R&D projects – and the IIoT is playing an increasingly big role in all Pragma's development work.

"We realised some while back that the IIoT is coming and we needed to prepare for it. We were highlighting the trend and advising clients to get up to speed. What we are now seeing, though, is that the push is coming from clients, for very sophisticated solutions," he says.

Pragma has long been involved with predictive maintenance, remaining life assessments, monitoring plant equipment that is already enabled for sending data electronically. "But we have now specifically identified some projects around the IIoT, to choose partners we can align with and the skills we need to develop to get the best out of this fast emerging technology," Swanepoel informs *MechChem Africa*.

"There are a gazillion different IIoT devices, platforms and providers these days and it is quite important for us to choose the ones that meet the different needs that we are likely to encounter. And these needs are very diverse, as well. We have field service clients with distributed assets, where low volumes of data need to be collected from assets onsite and, on the other extreme, we have clients who expect us to monitor plant wide systems on a real-time, per millisecond basis. So a one-size-fits-all solution is not possible," he suggests.

Most importantly, he says that Pragma needs a platform that can bring in data from different sensor technologies – be it low volume or high volume data, coming in bursts or in continuous streams. "Eventually, all the data must come into one place where we can apply analytics and business intelligence (BI) solutions so as to establish work flows, trigger actions and such like," he notes.

Sigfox and LoRaWAN

Two IoT network technologies of interest to Pragma right now are the Sigfox- and LoRa-type network connectivity service providers for the IIoT. "LoRa, for example, enables the use of a public network to connect low power wide-area network devices to the Internet. Via a Cloud-based IoT account, LoRa-enabled sensors and monitoring devices are registered on the company's LoRa platform, in the same way as a phone would be registered on a cellular network. This immediately allows data to start flowing for storage on a secure Cloud-based site.

"What is attractive about LoRa is that a private company-owned base station can be set up, in a remote area, for example. Wireless-enabled sensors can connect equipment to the company's private LoRa network, independently of any direct Internet connection. This enables areas not covered by network services to also participate in the IIoT.

"Sigfox is similar and has already established wide coverage in South Africa for acquiring data from IIoT devices, but does not allow a company to set up a private base station, so users remain dependent on Sigfox as a 3rd party provider. Each sensor has a unique ID and the moment it is registered and the back end is connected to a company's own systems, then data analytics capabilities become available.

"One of the challenges is that many of our clients have already made significant investments in sensors, SCADA systems, PLCs and other technology to collect data in various ways. Clients are thus reluctant to rip out existing infrastructure for replacement with a new technology. A lot of these systems work perfectly well within their chosen scope, even if they are restrictive by emerging standards.

"So from an asset management perspective, we need solutions that can import data from sensors and systems that have already been installed into a single platform together with new data from the sensors required for accurate predictive maintenance management purposes," he explains.

Giving an example, Swanepoel says that pump flow rates might already be monitored for process control purposes, but for condition monitoring one might want to know the shaft vibration levels, bearing temperatures and drive motor currents of the pump system. "We therefore need ways to install and integrate new sensors to collect data in addition to what is already available," he notes.

"We have in recent times been working with a technology provider called IoT.nxt, a South African company that has developed products to tap into existing data sources located in different systems, while also being able to integrate data from new sensors for processing in one platform.

"Data is the 'oil' of the future in terms of monetary value and technologies such as that of IoT.nxt helps to break down the data silos arising from different equipment OEM vendors, sensor providers and other IT systems competing for exclusive access to data. This puts asset managers and owners in the position to have one integrated view of their asset management data and to be able to establish a 'digital twin' of the physical world that could be used for decision-making and automation purposes."

Explaining further, Swanepoel says the full current and historic operating context of a machine or component is ideally needed for use in machine learning algorithms and cognitive processing systems to accurately model and predict its future behaviour. "The fact that IIoT technology now makes this more cost-effective and technically feasible is what makes it attractive for asset management service providers such as Pragma," he says. "And systems such as IoT.nxt provide an effective way of using data that is already collected in combination with data from new sensors to establish and digitise the full operating context of a machine or component."

Also, most people expect to push all the data they collect into the Cloud, where it will be processed and analysed to assist decision making. But as more and more devices get connected, data volumes become a challenge. "We believe that local processing is becoming increasingly important, so that only essential and pre-processed information needs to be uploaded to Cloud processing platforms.

"For a vibration sensor, for example, it is possible to analyse the frequency spectrum locally, and periodically upload only the spectrum rather than having to continuously stream the raw time series data to the Cloud." This is called Edge processing, "and enhancing this capability is likely to become increasingly important for IIoT implementations."

Another use of the IIoT is for facilities and service management to take care of distributed assets at smaller and/or remote sites. On site staff at such locations may not have the tools or skills to assess problems that emerge, so a field service engineer is called to inspect the equipment. Only on arrival can the necessary tools and replacement spares be indentified for later delivery and repair. The IIoT can help to avoid this. With the right sensors installed, the nature of a problem can be analysed remotely via the IIoT platform, which enables the correct spares and an appropriately skilled and equipped field service engineer to be immediately dispatched.

Such smaller and/or remote sites typically have fewer data points. Using the same technology that applies to a connected automotive plant, for example, might be prohibitively expensive and unnecessary. "It is in these situations that we believe technologies such as Sigfox and LoRa will play a bigger role," Swanepoel suggests. "Each carefully selected sensor can transmit low volumes of data directly into the Cloud for analysis on a central processing platform," he explains.

Sigfox devices typically send about 6 to 8 bytes of data every 10 minutes, in many cases enough to distinguish between problems and understand a machine's condition. For temperatures of a motor or a tank level on a fuel site, where information doesn't change very quickly, a sample every ten minutes is more than adequate," Swanepoel explains. "And the data is easy to combine with Edge data from other sources if the correct IIoT platform is used.

"The challenge is simply to select the right combination of sensors for the application being managed and making sure that these are all compatible with the IIoT platform. Careful thought about technology redundancy, obsolescence, system expansion, maintenance and service are also vital," he says.

With respect to costs, a sensible and pragmatic approach needs to be adopted, tightly linked to the business strategy. "Rather than measuring every data point that you can think of, if the impact of a failure or the effect on production is low, it may not be cost-effective to include it in the IIoT strategy," he advises.

Any IIoT investment must be linked to what the business is striving to do: the future strategy, what are the critical assets; what could go wrong, how best to incorporate reliable pre-warning strategies; specific response procedures; and the people who will action each response. "It is always be better to decide on an IIoT solution after a strategic analysis of an organisation's business objectives, asset management maturity and performance, than to simply connect up the plant without understanding what you want to achieve.

"What is fast becoming apparent is that the IIoT brings maintenance and operational performance management much closer to each other. Once an organisation develops an understanding of its equipments' condition, remaining life and the role it plays in the production cycle, then organisation's cost-, energy- and production-optimisation programmes become far more effective and easier to develop and apply.

"We all need to ready ourselves for this opportunity," Swanepoel concludes. ❑