The Internet of Laboratory Equipment

Mark Bosley, SUEZ Water Purification Systems

Seamless connectivity is coming to the laboratory. Its benefits include simplified equipment management, improved reliability and lower operating costs. Modern laboratory environments rely on a host of sophisticated equipment, from advanced analytical tools to a range of utility devices like refrigerators, heaters and water purification units, explained Mark Bosley, Business Support Manager at Suez. Lab staff have straightforward expectations for that equipment: they just want it to work, so they can get on with their jobs.

If equipment breaks down, or fails to perform to as it should, however, the consequences can be costly and even dangerous: work is delayed, test results are inaccurate or invalid, products are ineffective or unsafe. That's why proper monitoring and maintenance of equipment is a necessary, if inconvenient part of laboratory life. Staff or facility managers need to take appropriate steps to check, test and calibrate equipment on a regular basis. Consumables must be replaced as required.

Equipment makers try to make this activity as simple and straightforward as they can. Many devices include internal logging and diagnostic facilities, allowing staff to check how they are performing over time. Alarms warn users when performance slips out of specification, or attention is required.

Until recently, however, most lab equipment has operated in isolation. Data collected by a machine is held within it, accessible via the user-interface of the unit, or in some cases only through the use of a dedicated diagnostic device. That situation creates a number of undesirable issues. Facilities managers have to physically access each machine on a regular basis to check its condition. That's time consuming, and can be very inconvenient in large lab environments with widely distributed equipment, or where equipment is kept in cleanrooms and other inaccessible environments. Busy lab staff, who may be best-placed to notice and act on alarms and status reports, may also be tempted to supress or ignore them so they can get on with the jobs. The upshot: issues that could be addressed in a timely fashion are often missed, leading to breakdowns or bigger problems down the line.

Only Connect

Today, a new paradigm is emerging that promises to resolve many of the challenges associated with the effective management of lab equipment. Laboratory machines are now joining the Internet of Things (IoT).

Across many categories of industrial and consumer products, IoT technologies are transforming the way products are used, monitored and maintained. Broadly, the Internet of Things describes technologies that use low cost communication hardware and standards, like WiFi, Ethernet and the Internet Protocol to allow products and devices to talk to each other across networks. In the consumer space, IoT technologies have enabled new types of products, like smart speakers or home automation systems, and new services, like printers that automatically order replacement cartridges when their supply levels run low. In industry, they allow sophisticated large-scale automation systems and the remote monitoring of assets.

Now laboratory equipment makers are bringing the same capabilities and benefits to their products. SUEZ, for example, produces a wide range of water purification systems for industrial, lab and healthcare applications. We've been experimenting with IoT technologies for some time, and from 2018 we are introducing a new capability – called SUEZ Smart Connect – as a standard or retrofit option on our popular Select range of laboratory water purification units.

In our case, Smart Connect comprises a carefully integrated package of hardware and software. It includes a new, user friendly touchscreen human-machine-interface, an on-board computer with the ability to connect to wired, WiFi or GSM networks, and a web-based software platform that can be used on any PC, smartphone or tablet.

On launch, Smart Connect gives system owners a number of immediate benefits. The system allows secure, remote access to all the data recorded by the machine during

We are also developing predictive maintenance capabilities. Because Smart Connect allows us to collect and analyse a comprehensive picture of the way a machine is used and how it performs over time, we can spot the early indications of potential issues, and then take proactive steps to stop them developing further. Either advising our customers to make adjustments to the machine settings, despatching an engineer or – with the customer's permission – making the changes remotely ourselves.

That comprehensive picture of equipment use and performance will be useful for our customers too. Purified water is expensive, and Smart Connect will allow laboratory managers to understand exactly how and where the water is being used, revealing opportunities to modify working practices to minimise waste and control operating costs. The same data will give labs the information they need to make fact-based decisions about upgrades and changes to equipment configuration. And because the data is available on-line, it can also be integrated into existing laboratory management software for audit and compliance purposes.

New Service Potential

Over the longer term, we believe that IoT technologies will enable entirely new ownership and use models for water purification systems and other categories of laboratory equipment. Owners can choose to outsource the entire management and maintenance of their systems to the equipment provider, for example, who can use remote monitoring and predictive maintenance techniques to offer guaranteed levels of availability and a fast response when problems occur.

Alternatively, some labs may choose to adopt a utility model, where ownership of the equipment remains with the manufacturer and the user pays only for the service it provides. For laboratory water, that might be a straightforward flat rate for every litre of water at the selected level of purity.

It isn't just big, sophisticated items of lab equipment that can participate in the Internet of Things. Near Field Communication (NFC) technologies – the systems that power contactless payment cards and building security systems – allow the use of 'smart tags' that enable things as simple as bottles or beakers to carry secure digital information. In our sector, that paves the way for consumable products that can describe their type and configuration to purification machines, for example, or digital labels that allow users to find out the grade of water in a storage vessel, and the date of its production, with a swipe of their smart phone.

It will take time for some of the benefits of IoT to be fully realised in the laboratory environment and new use cases are likely to emerge along the way. There is little doubt, however, that seamless digital communication is poised to make laboratory equipment easier to manage, more reliable and more cost effective.

operation. That means that facility managers can see at a glance if the system is operating correctly and can check things like consumable supply levels and consumption rates without leaving their desk.

Furthermore, Smart Connect allows us to take on some of the burden of keeping our machines operating properly. The company can remotely monitor the status of consumables, for example, relieving users of the burden of managing inventories of cartridges and other replacement parts. If the customer's equipment status and usage patterns suggest replacement is imminent, we can work with them to ensure that appropriate parts are delivered in a timely fashion.

Boundless Potential

For busy laboratory managers, Smart Connect will offer an immediate productivity boost, but that's only the first in what we expect will be a wide range of new features and capabilities enabled by IoT connectivity. Our development road map already includes a number of additional offerings, including the ability to deliver software upgrades over the internet, and for our service engineers to conduct remote diagnostics to identify and repair issues if they occur. That will help our customers to ensure their systems run better and improve the speed at which we can respond to problems if they occur.