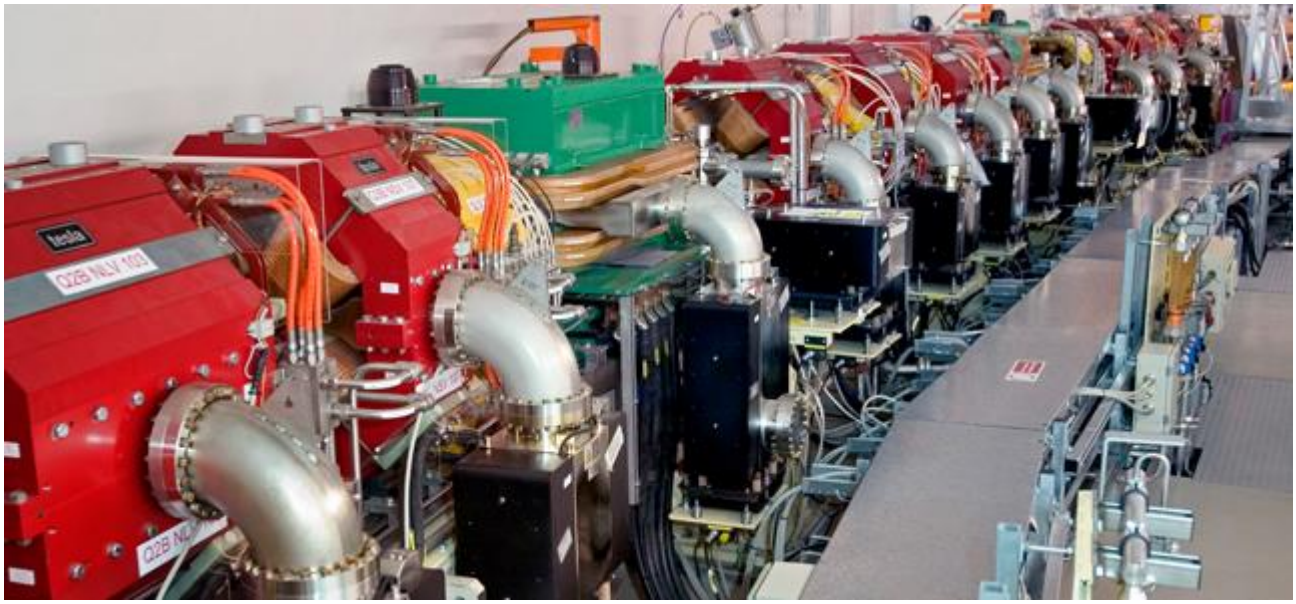
PLC change management and version control software minimises risk of machine downtime at Diamond Light Source

By introducing change management and version control software from M.A.C. Solutions for more than 400 of its programmable devices (PLCs and HMIs) at its facility in Oxfordshire, Diamond Light Source is minimising the risk of machine downtime caused by PLC back-up or software code errors, thus avoiding costly delays and disruption to its round-the-clock service for academic research scientists and industrial customers.

Located at the Harwell Science & Innovation Campus in Didcot, Oxfordshire, Diamond Light Source is the UK's synchrotron. It works like a giant microscope, but is 10,000 times more powerful, harnessing the power of electrons to generate bright light, which scientists can use to study anything from fossils and jet engines to viruses and vaccines. The machine speeds up electrons to near light speeds so that they give off a light 10 billion times brighter than the sun. These bright beams are then directed off into laboratories known as 'beamlines', where scientists use the light to study a vast range of subject matter.

Simon Lay, Senior PLC Engineer at Diamond Light Source, is responsible for all PLC-related activity at the site, including the protection of all plant, machines and equipment. He was responsible for overseeing the implementation of MDT Software's AutoSave Change Management Solution at the Diamond Light Source and is now responsible for the day-to-day management of the software throughout the facility. He comments: "Currently, we have in excess of 400 PLCs and 100-plus HMIs installed at the site, on a variety of different machines and equipment. These PLCs control and protect machines and equipment, from robots and vision systems, to vacuum pressure vessels, pneumatic valves, automated sampling machines, monitoring systems for flow, temperature and pressure sensors, and other motion control systems. These PLCs are manufactured by a variety of vendors, including Omron and Siemens. The PLCs are critical to our synchrotron process, which runs around the clock. Users of the facilities book a certain amount of beam time, for example, from just 20 minute slots to two or three days, in order to carry out their research."



He continues: "The demand for our beamlines is increasing and so we need to find ways of minimising downtime and getting more from our existing beamlines. We therefore constantly measure our performance and the mean-time-between failures [MTBF] of machines and equipment. We are also moving towards fully automated sample deliveries, whereby users will

have their samples delivered to us rather than coming to the site and we will then send them the results back. It's all about maximising the utilisation of the beamlines."

"My responsibility is to keep the equipment and machines running at all times, as a single stoppage can result in costly downtime of around £10,000 per hour. For example, if a vacuum on one of our beamlines degrades, the beam itself will degrade and ultimately be lost. We also have to maintain the beam in a focused and stable state at all times to allow research to continue unhindered. We generally work in front of the machines rather than remotely across a network. For example, we may need to program a PLC to teach a gantry robot where to go in order to pick up and place a sample from cold storage. We are constantly commissioning new equipment along our beamlines and our SCADA system has around half a million process variables to contend with. We therefore needed a better way of managing our PLC projects, which would ultimately help to improve our MTBF rates."

Prior to April 2017, Diamond had no formal system in place for managing version control or changes to PLC programs – back ups were made manually and there were no scheduled back ups or version control of PLC programs, although a paper-based version control system was in place.

Lay therefore looked for a suitable solution. "One of our contractors and a colleague at Omron both recommended MDT Software's AutoSave Change Management Solution, which seemed to be what we needed. I then spoke to MAC Solutions, the UK reseller for MDT Software, about the issues we had been having with PLC back ups and version control, who recommended an implementation of the software across all of our PLCs and HMIs. Following an online presentation of AutoSave by MAC Solutions, a site visit was arranged where MAC Solutions demonstrated AutoSave to the engineering team and Head of Controls here at Diamond. We were all very pleased with what we were shown."

"In my research, no other change management software provider could offer us a similar 'open' solution that enabled communication with multiple-vendor PLCs, HMIs and remote IO configuration files. MDT Software's AutoSave is also easy to set up and use. We also liked the flexible architecture of AutoSave and the very cost effective use of the AutoSave Universal plug-in.

MAC Solutions was also able to tailor the privileges of different users [e.g. drawing office engineers] to provide only the access required by each."

In April 2017, MAC Solutions implemented AutoSave at Diamond Light Source. The 400+ PLCs and 100+ HMIs are not connected to the primary network. MAC Solutions therefore used WiFi connections of AutoSave Client to the AutoSave Server and then local connections to the PLCs from AutoSave Client. Lay and his team are starting to migrate from the paper-based systems to AutoSave.

"We can now be in front of a PLC on a machine and we can just grab the correct PLC code from the AutoSave server using WiFi. We know we've got the latest version of the code and so we know we are minimising the risk of errors and help to ensure our beamlines can continue uninterrupted," concludes Lay.

Over the next 12 months, MAC Solutions will be assisting Diamond in configuring the remaining PLCs and HMIs not already in the AutoSave system.

AutoSave: three steps to success

MDT Software's AutoSave is an enterprise change management solution that provides a full suite of tools to protect, save, restore, discover and track changes for industrial programmable devices and documents. The system unifies plant automation software under one common user interface, resulting in a secure, well documented, controlled environment that significantly reduces the time and effort needed to manage a manual backup system.

The software enables administrators to automatically schedule 'compare' procedures. Automatically comparing the program in the device with a program stored in the AutoSave library can detect and identify changes between the program that may have been unknown or unauthorised. This therefore protects that company's process, people and equipment.

When a change is made to a PLC program, the software can be set up so that designated users are immediately notified via email. Detailed, logic-to-logic and selected data table value comparison reports are generated and users are notified of differences via email. These mailed results,

generated for schedule, program, or demand compares, are viewed via a web browser that features hypertext links to detailed logic and documentation differences.

In just three steps, users can ensure that any program changes are tracked, saved and protected. In the office, a field technician identifies programs of interest and AutoSave downloads copies to the engineer's laptop using the **AutoSave Program Manager** tool. **AutoSave Client** is then used for non-networked devices to make changes to the program. Changes are then synchronised across multiple sites by comparing local files with the server and sending/receiving updates.

For more information on MDT Software's AutoSave Change Management Solution, please visit www.mac-solutions.net or telephone MAC Solutions on 01527 529774 or email sales@mac-solutions.co.uk.

About MAC Solutions
Founded in 1996, M.A.C. Solutions (www.mac-solutions.net) is a specialist provider of Industrial Data Communication**,** M2M (machine-to-machine) solutions, process automation solutions and alarm management systems.
M.A.C. Solutions provides a range of hardware, software and consulting services, which enable operators in the transportation, infrastructure, power/energy, marine, oil & gas, utilities, security & surveillance, packaging, pharmaceuticals, and automation industries to securely connect and manage their distributed assets. Productivity data from these assets can be monitored over time to enable high-end analytics and visualisation. M.A.C. Solutions is an ISO 9001 registered company and is certified to OHSAS 18001:2007.

About Diamond
Diamond is a not-for-profit limited company funded as part of a joint venture by the UK Government through the Science & Technology Facilities Council (STFC) in partnership with the Wellcome Trust. The synchrotron is free at the point of access through a competitive application process, provided that the results are in the public domain. Over 7,000 researchers from both academia and industry use Diamond to conduct experiments, assisted by approximately 500 staff.