Mayhill WTW
emergency works

We were very proud of our team who worked around the clock to help Dwr Cymru Welsh Water return Mayhill WTW in Monmouth, back into service following the terrible flooding caused by Storm Dennis. The project outcome was a demonstration of collaboration and commitment from several key contractors, working together to help out in this emergency.

Water is pumped from the River Wye a short distance to Mayhill Water Treatment Works and supplies Monmouth town, Osbaston, Wyesham, Manson, Overmonnow, The Kymin and Kings Fee.

The Project

People living in Monmouth were told to cut water usage following flooding at the site that resulted in no power to operate the works. A spokesperson for Dwr Cymru Welsh Water said:

"Due to the flooding in the Monmouth area we are unable to access our water treatment works in Mayhill, Monmouth.

"As a result, we have limited storage of drinking water until we're able to access and restart the treatment works." Wales Online.

With the river levels subsiding following the aftermath of unprecedented rainfall, access to the flooded water treatment works was able to commence.

The project was executed to the highest specifications within OSS's Integrated Management System - accredited to:

- *ISO 9001 for Quality Assurance,*
- *TickIT Plus for Software Quality Assurance,*
- *ISO 27001 for Information Security and*
- *ISO 45001 for leadership in Health, Safety & Wellbeing.*

The Challenges

With advance warning prior to flooding, the regional electricity supplier's transformers were powered down leaving the treatment works in relative safe mode, but without any external supply. Because of this the uninterruptible power supplies were depleted and the entire electrical system became inoperable.

Our teams waited for the clean-up operations

The River Wye flood waters at Mayhill WTW.

to be completed and floors cleaned of river silt and made safe.

As multiple disciplines were involved in the restoration of the plant and flooded equipment and devices, the initial task was to dry out and, in some cases, replace equipment with serviceable spares resourced from other areas.

As devices were restored and power re-applied, our teams were able to assess their operability - it was in effect a recommissioning exercise.

Our Approach

Our first and foremost issue was the SCADA PC that had powered down. This was an issue as it was required to access the engineering software, whilst the operations personnel needed it for the visualisation of plant. We introduced a temporary PC to the existing control system allowing us access to the engineering software and free up access to the SCADA PC for operating the plant.

The plans were discussed and implemented and handover from OSS engineer to engineer was made as seamless as possible with a log of issues and corrections being maintained. We checked and logged the devices that were going to need further investigation as they were deemed as incorrect. Some of the RGF instruments were identified and calling on our

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Key Tasks

Our teams carried out the following:

- *Provision of 24-hour site support for bringing the plant back to an online state,*
- *Identifying, logging, and reporting of key devices that were not operating as expected and would prevent plant from being brought online in as required,*
- *Re-commissioning of instrumentation and plant devices that were serviced or replaced due to ingress of moisture,*
- *Assisting in the servicing of components due to ingress of moisture, and*
- *Advising on requirements to achieve the run-to-waste process stages and give a general feedback of plant availability, ready to run status.*

experience with similar devices, we successfully 'jump started' them. As more devices were made available to us to check the more, involved in commissioning we became.

The actuator for the isolation of the common RGF outlets was found to be in conflict with the feedback positions. Replacement parts were not readily available, and the valve was essential for protecting the filter gallery from flooding. After some attempts to clear the faults with the feedback switches, we asked to take a look at them, with nothing to lose. The microswitches were carefully disassembled and cleaned, checked for operation both mechanically and electrically, reassembled, retested, and refitted resulting in the actuator being returned to service.

This allowed the forward flow through the RGF to commence without further risk of flooding to the filter gallery. The common RGF outlet was pumped from the RGF sump, but the level device and the common sump outlet flow meter had both failed.

The level device was easily replaced and reconfigured, the flow meter however, was not. We had to temporarily create a pseudo-flow reading to replace the actual reading until the flow meter could be replaced.

The inlet area of plant that was also submerged during the flooding and had to be investigated as from the hardwired remote

The River Wye in flood upstream from Mayhill WTW.

connections it was still reporting power failure.

The signals were identified, and junction boxes and terminals were stripped, cleaned and returned to service to clear tracking faults. The fish screen flow meter was inspected and after using proprietary approved water dispersant and drying out the electronics, we cleaned off the deposits that could cause tracking on the circuit boards. Upon refitting, the electronics kicked back into life and readings were confirmed as being within normal expected values.

As the works were brought back online in controlled stages, running to waste for periods of time before advancing to the next stage of the process, was key to returning the plant to full service.

To achieve this, we introduced workarounds with temporary code and simple *'force*

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values' to allow the plant to run without the need for upstream plant being available.

Stages

As the water quality at each stage passed the criteria set, we could advance to the next stage. During filter washing, a number of issues had to be resolved with actuator feedbacks requiring attention. During washing of the RGFs, the initial issue was identified as water within the air blower pipework preventing forward air flow. This had to be drained off before the RGF wash routines could be fully tested.

The RGF backwash flow meter was then found to be faulty and that was overcome by empirically setting the flow control valve to a fixed value to achieve a flow rate that was deemed by eye, to be about right.

Filter gallery, post flooding with actuators.

As the power had been off for a substantial period of time, during the returning of service of GAC units, it was noted that two of the water quality analysers had lost their range settings and were not reporting back the correct values to SCADA. With our experience of these devices, we were able to re-program the ranges and check them. The two devices were logged as requiring their on-board back-up batteries to be replaced.

In the final stages of achieving water into supply, we removed the temporary code and cleared the remaining forces. These were easily identified from the logs we had kept, and the dosing flow switches, which were not readily available as spares at the time, were finally restored to full operation.

Key in-house Skills

Our engineers have varied backgrounds, skills, and capabilities.

It is their combined knowledge and experiences with Computing, Electrics, Instrumentation and Control being of significant benefit, coupled with a 'can do attitude and a willingness to go the extra mile' that makes them great to have around in a crisis.

Challenges Faced

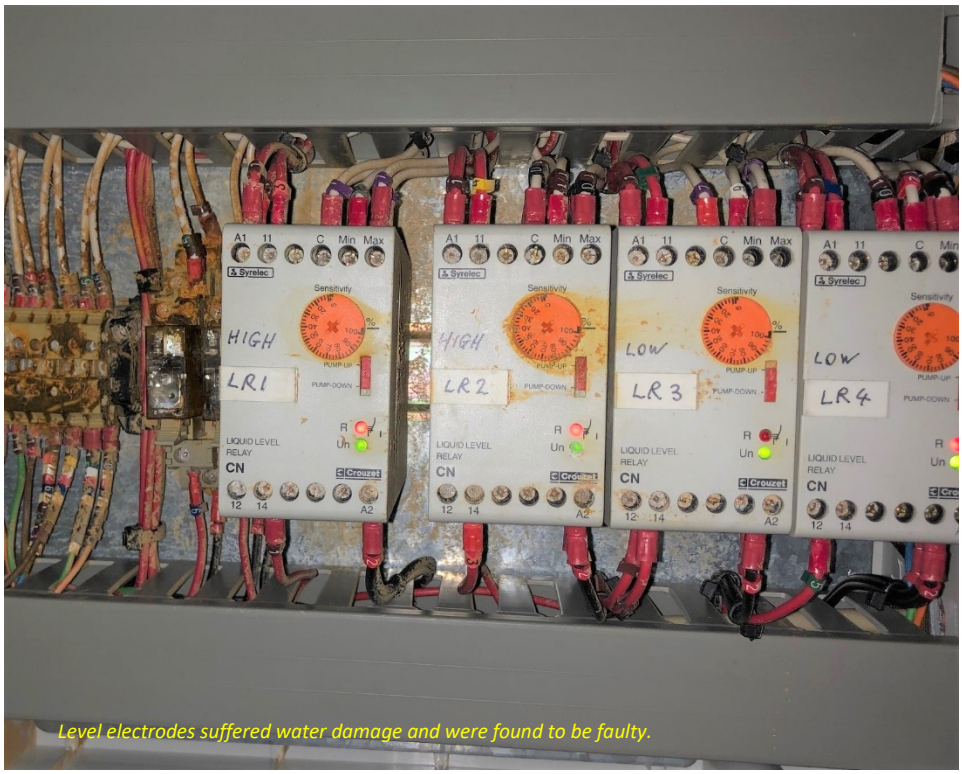
This was a major flooding event causing extended power failures, abrupt power failure of the SCADA PC failure of the CMOS battery. Redundant PSU failure of B side system. With so many devices still powered down the main challenge was to assess the initial status of plant.

To overcome device failures which could not be replaced for some time, it was essential to find an alternative temporary solution. Where flowmeters and flow switches were integral checks to plant operations these had to be emulated to fool the control system until permanent repairs were completed.

Collaboration

Teamwork within the OSS engineers being able to pass the baton to the next engineer to keep the momentum was key to the success of the project.

The flexibility of our OSS engineers to attend



Level electrodes suffered water damage and were found to be faulty.

the site out of hours and over the weekend period was appreciated by management and by our client.

Our team's working knowledge of the control system and the water treatment plant processes was a key driver in our quick response and flexible approach in this emergency.

Innovation

By being able to provide an additional engineering PC to perform our work, it removed the foreseeable bottleneck that would have been encountered when restoring the plant to an operational state. The additional engineering station allowed us to investigate and quickly identify any issues that the operations personnel reported to us during the recovery process of the crippled plant.

How Did We Stand Out?

The site was managed by others and our teams worked under the control of the electrical contractor. We worked with all parties to identify and report the equipment issues which would affect supply into service. This collaborative way of working was paramount in order to achieve success and return the plant to operation. Our team is particularly proud of the work we carried out at Mayhill WTW and as part of the larger team assembled to restore this vital piece of water infrastructure and provide ongoing services to our client's end users, the general public.