

Incident Summary

Glengap WTW Aluminium and pH Failures 12th July 2023

DWQR Inspector:
Moira Malcolm

Event No. 13574

Event Category: Significant

On 12th July 2023 the Intelligent Control Centre (ICC) passed a 'low treated water pH' alarm out to the day operator. This alarm led to a plant auto-shutdown. The operator arrived on site at 21:30, cleared the blockage on the lime dosing line and restarted the plant.

A second 'low treated water pH' alarm was received at 23:30 with plant shutdown at 23:45. The standby operator attended site at 02:00 on 13th July and restarted the plant but had difficulty re-establishing the lime dosing pumps. ICC phoned out several more alarms to the operator at 03:48 and a standby electrician was called out for assistance. At this time the 'primary filtered water aluminium' emergency action limit (EAL) had been breached, and over the night a number of calls were made between the operator and ICC, however they were not escalated to the public health team (PHT) or standby manager. At 05:35 the treated water aluminium level was off the scale of the online monitor, but this was only discussed internally within the ICC – not escalated or relayed to the standby operator.

The electrician arrived on site at 06:00 but found no issues with the lime pumps and so the works was shut down again as the operator had to leave site due to maximising his allowed working time. Overnight the WTW was in operation with forward flow between 02:20 and 06:22.

The day operator arrived on site at 08:15. The standby operator left a note to say there had been further lime blockages, but no detail was provided. The operator restarted the plant despite coagulated and final pH being high; but on identification of an issue with the lime slurry strength he instigated a plant shutdown at 10:30. He contacted the team leader then lowered the lime slurry tank level and diluted the lime slurry to clear and flush the blocked pipework, he then restarted the plant running to waste whilst waiting for the treatment processes to improve.

The Business Manager was informed of the issues at 14:10. At 15:45 treatment was improving and coagulation pH was back to normal and stable so the decision was taken to



allow forward flow to the Clear Water Tank (CWT). Due to the plant running to waste the treated water monitors were not in operation, however once flow was reinstated it was noted that treated water pH was still high and flow was again diverted to waste. This high treated water was escalated to the Business Manager and regular communication was set up to manage the event. The PHT were informed and samples arranged.

The secondary filters were found to be saturated with lime so were manually washed, followed by the primary filters. Final water samples were taken from the drain of the final water pH analyser as the low level of the CWT meant that no samples were available from the regulatory final sample point.

At 21:45 due to satisfactory readings from bench filtered and final aluminium samples the decision was made to return flow to the CWT. Turbidity and colour levels were also fine. The operator monitored trends until 00:30 before leaving site. The continuing trends show that treated water quality (from the monitors available) was back to normal by 08:00 on the 14th July.

On the 18th July the laboratory sample results taken on the 13th were returned and showed that aluminium levels were in fact 2495 and 1119µg/l and that levels of aluminium were above the PCV in the network for at least 2 days.

The root cause of the incident was a lime batching valve being stuck open, which caused a large amount of lime powder to be batched into the lime slurry tank. This blocked the delivery lines. Every time the plant was restarted the lime slurry was batched, plus because the pH was low (due to the blockages) the standby operator carried out a further manual batching. A total of 550kg of lime powder was batched rather than the usual 3kg/batch, which increased the lime slurry strength from 1.5-2% up to 28%. This then caused an issue with the lime pump non return valves (NRVs) which allowed further lime slurry to siphon through the system, even when the plant was not operating. The high pH then stripped aluminium from the secondary filters which went into distribution. The CWT was at a low level, so there was little dilution.

Scottish Water's investigation has raised a number of factors that contributed directly to the incident:

1. Communication between operations and ICC was poor, plus very little handover was provided to the day operator who was unaware of the extent of the problem;
2. TOMS procedures were not followed as per Scottish Water's protocol, with the EAL breaches not escalated. In addition the TOMS procedure for pH failures would have pointed the operator to the potential for a high slurry strength;
3. There was no 'return to supply' TOMS procedure for operators to follow, listing what parameters to check and ensure that all key parameters are trending in the right direction or have recovered;
4. The decision to return the plant to supply was based on incomplete bench readings, as the online treated water monitors were downstream of the run to waste, so were not available to provide a holistic view on the health of the treatment process.



In addition to the factors that Scottish Water has identified, I am critical of further factors that were instrumental to the extent and severity of the incident:

5. There was no online final aluminium monitor, so all parties were unsighted as to the aluminium failures occurring throughout the incident until the laboratory sample results were available five days later.

6. Despite the repeated problems and high alarms, ICC did not escalate to the standby team manager. It is my understanding that ICC act as the team leader out of hours, therefore it is their decision to escalate and not the operator. This is especially important when operators are on mandated rest times.

The event has been categorised as significant. Scottish Water has identified seventeen actions which DWQR accepts are appropriate and will monitor to ensure they are completed prior to signing off the incident. DWQR made three additional recommendations.