

Glenlatterach WTW Coagulation Failure 19 February 2015

DWQR Inspector:
William Byers

Event No. 6759

Event Category: Significant

Summary of Incident

On 19 February 2015, the standby Operator was called to a problem at Glenlatterach water treatment works due to a low coagulation pH alarm. On attending the site, he found the lime dosing pump had failed due to low flow and being unable to find a cause, reset the pump, allowing dosing to resume. The same fault occurred almost daily over the next five days causing lime dosing to be off for periods of up to 90 minutes having the effect of reducing the coagulation pH significantly, causing the floc blanket to break up and some flocs to pass forward into the filters. All of these events were investigated but with no cause being found for the lime dosing pump to fail.

Over 25 and 26 February, five separate failures of the lime dosing took place, and the continually disturbed pH control resulted in the clarifier blanket having insufficient time to fully stabilise and significant level of flocs transferred into the pressure filters. By 14:00 hrs on 26 February, turbidity levels had reached 0.31NTU and aluminium, 350µg/l in the final water supplied from the site Clear Water Tank. The level of aluminium was determined by bench tests since there was a fault with the process monitor. As a result, there was no aluminium trend information available to the operator throughout this period. A formal water sample was taken at 15:00 hrs to monitor water quality leaving the works and this recorded a failure of the 200µg/l standard for aluminium, with a level of 425µg/l.

Investigation of the lime dosing system by Electrical & Mechanical staff could find no fault. Switching the duty lime dosing to a parallel system, which had been cleaned and had equipment renewed, resulted in continuing alarms and failures over the period 2 – 6 March. Specialist inspection expertise was subsequently arranged and this too failed to find any cause within the dosing system. The inspection however revealed a control loop within the process software between the dosed pH instrumentation and the lime dosing carrier water system, which inhibited flow when pH was detected out of range, and in this case when it breached the higher limit of 12. The consequence of this was that it sent an inactive signal to the dosing equipment. The code for this alarm had been incorrectly tagged which obscured the real fault during the investigations. The settings for the out of limit code were altered and since this was carried out on 6 March, no further failings in the lime dosing system have occurred.

DWQR Assessment of Cause of Incident

DWQR is satisfied the cause of this incident was the embedded loop in the control software, which closed down the lime dosing. Scottish Water has reported that it is unclear why the control code was changed but has identified that it was made in 2009 and the system had operated adequately since then. Process



optimisation adjustments made on 12 February, the week prior to the start of these events however increased the coagulation pH set point from 6.0 to 6.5. The consequence of this was the dosed pH then operated very close to the higher limit set within the software to close down the carrier water system. The wrongly tagged alarm for the out of limit condition misdirected investigations causing the extended delay in understanding the root cause of the dosing problems and it was a significant contributory factor in the severity of the incident.

DWQR Assessment of Actions Taken by Scottish Water

DWQR acknowledges the misleading alarm caused difficulty in identifying the real cause of the process breakdown. However, it is our view that the non-availability of the standby lime dosing equipment due to the need for repair was a significant factor in the delay in identifying the software problem. Had this been in place, the necessary step testing in the investigations to discount the carrier water system could have been completed earlier. Similarly, a linkage between process changes made the week earlier and the repetitive nature of the alarms should have alerted staff to possible process control issues.

Scottish Water put in place the necessary sampling of the final water from the works and in the distribution system to monitor the impact of the events. These showed two samples to have failed the aluminium standard in the final water of 425µg/l on 25 February and 225µg/l on 6 March. The unavailability of the aluminium monitor on the final water, which had been identified for repair in mid-January, was unhelpful to operators in understanding the severity of the levels in the final water. Whilst bench tests were carried out and samples were taken, these attest to a point in time and Scottish Water are unable to demonstrate whether those values recorded were in fact the most severe impact of the incident. It is noted that the aluminium monitor was returned to service on 16 March.

The event has been categorised as significant. Scottish Water has identified a number of actions and DWQR accepts that these are appropriate. Additionally, DWQR has made one recommendation and will be monitoring to ensure both it and the actions are completed prior to signing off the incident.

