Drinking Water Quality Regulator for Scotland

Incident Summary

Alligin WTW
Loss of disinfection
5th August 2024

Event No. 14776

Event Category: Serious

At 14:27 on 5th August 2024, a loss of chlorine dosing occurred at Alligin WTW when the sodium hypochlorite dosing pumps changed duty following a routine automated foam ball clean of the membranes, but pump B failed to deliver chemical despite the pump running. The dosed chlorine alarm was not received by the ICC due to a fault with the group alarm suppression persisting despite the permeate flow returning after the foam ball clean. Despite the lack of chlorine dosing, the pump did not change duty due to a defective flow switch which was incorrectly registering a flow. Furthermore, the dosed chlorine and post-chlorine contact tank (CCT) auto-shutdown levels were not triggered as the set-points had been reduced to 0.01mg/l and 0.05mg/l respectively during previous maintenance and had not been reset to the correct levels.

At 15:09, Scottish Water's ICC received a post-CCT chlorine low alarm. An incorrect assumption was made that the site was preparing to shutdown and the Standard Operating Procedure (SOP) was not followed, so the alarm was incorrectly suppressed rather than being passed to an operator. Alligin WTW shut down automatically at 16:10 due to the high clear water tank (CWT) level, and when the aforementioned alarm suppression cleared, the ICC confirmed that the plant was idle and applied a further suppression without checking associated chlorine trends.

When Alligin WTW restarted at 19:15, the sodium hypochlorite pump restarted, but again failed to deliver chemical. The ICC interrogated the chlorine trends at the works at 20:37 when the post-CCT chlorine low alarm suppression lapsed, with no contact made to the

standby operator until after a final water low chlorine alarm was received at 21:06. The ICC contacted the standby operator at 21:11, however they were unable to attend due to being over the working time directive limit. A second standby operator was contacted at 21:20 who was able to attend, but had a two hour travel time to site, with the plant continuing to run with no chlorine dosing throughout this time.

Upon arriving at Alligin WTW, the standby operator confirmed that the duty chlorine dosing pump B was available but not dosing. Online chlorine monitoring and bench testing confirmed a chlorine residual was maintained in the final water (chlorine readings of 0.44mg/l and 0.55mg/l respectively). The operator manually changed the duty dosing pump to pump A, which also failed to dose, resulting in a site shutdown. Pump A was then manually tested and found to be delivering chemical, so the works was restarted and dosing restored, with the dosed chlorine residual returning to normal by 23:52. The CWT was also spiked with 30ml of sodium hypochlorite after discussions with the Public Health Team and Escalation Team Leader, and a further final water sample was taken by the standby operator before leaving site. 3 further samples (1 final water and 2 customer tap samples) were taken on 7th August 2024, with no water quality failures occurring.

The root cause of the incident was chlorine dosing pump B failing to dose chemical, although the mode of failure is not known. The pump has since been replaced. This incident, however, was avoidable as the site was equipped with seven risk control measures relevant to this fault, which should have alerted Scottish Water and automatically shutdown the plant to minimise impact to consumers. Six of these risk control measures failed to work effectively with the following factors exacerbating this incident;

• a lack of clear instruction on routine task scheduling meant the failed chlorine flow switch was not identified;
• inadequate management of alarm set points resulted in dosed chlorine and post-CCT chlorine shutdown set points being left too low following plant maintenance;
• a failure of the low dosed chlorine alarm to “latch off” the group suppression when permeate flow resumed after a foam ball clean (the cause of this is still under investigation);
• and a failure to promptly responded to alarms received within the ICC.

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