Drinking Water Quality Regulator for Scotland

Incident Assessment

Mannofield WTW
High Aluminium
25 January 2015

DWQR Inspector:
William Byers

Event No. 6716

Event Category: Significant

Summary of Incident

On 25 January 2015, the Control Centre (ICC) was alerted to a problem at Mannofield water treatment works through alarms from the coagulation dosing pumps. The alarms, generated at 03:30hrs, related to a low flow in the duty pump and failure of the standby pump to start. The standby operator attended the site, reset the pumps, and after carrying out other checks on the process and systems and establishing normal operation, left the site. At 07:00hrs, however, the operator was again contacted by the ICC to advise that there were high turbidity values in the filtered water. Continued monitoring showed that the situation was not settling down and the Operator returned to the site at 09:15 to investigate further. At this time, monitors showed turbidity at the outlet of the clarifier process to be high and aluminium levels at the filter outlet to be 485µg/l, well above the 200µg/l standard. Checking the pH level at the coagulation point showed the monitor to be slightly adrift of the bench test results which meant restoration to the optimal setting for the process was delayed and the weakened floc blanket resulting from the cessation of dosing, continued to break up and wash over onto the filters. The instrument was re-calibrated and control restored to the optimised settings. A further consequence however was that all filters queued for backwash and it also had the effect of increasing chlorine demand in the disinfection process requiring adjustment to be made to the chlorine dose level.

Processes gradually recovered and by 13:30hrs, final water turbidity had returned to normal and aluminium levels were dropping on the monitors reaching normal levels a further 2 hrs later. The scale on the aluminium display monitors only allowed trending up to 500µg/l but a level of 1637µg/l of aluminium was recorded in a monitoring sample taken at 09:45 hrs from the final water from the works before it enters the clear water storage tanks on site. The same sample showed a minor exceedence of the turbidity standard but there were no other failures in samples taken from the works.

DWQR Assessment of Cause of Incident

There had been a history of changeover failures between chemical dosing pumps, with the most recent occurring only a week earlier. A subsequent dosing pump changeover failure in March, however, initiated deeper investigation of the problems with a complete strip-down of the system being carried out. This found chemical scaling / crystallisation on the inside of the flow switch and significantly reduced internal diameter of the chemical delivery line due to scaling causing restrictions on flow. The pipework was replaced and parts renewed and no further incidences have since been experienced. DWQR accepts that this is the likely cause of the coagulant dosing failure on 25 January.

DWQR Assessment of Actions Taken by Scottish Water

DWQR considers the actions taken by the operator and control room staff to have been key in arresting what may have been a much greater water quality incident. The escalation of the treatment problems to the team leader and seeking of support for the process recovery, demonstrates good practice and this is to be commended. Appropriate bench tests of process stage water samples and drop tests were carried out on coagulant and coagulant aid to verify monitor readings and dose rates.

Although speedy action was taken to attend the initial alarm and re-establish coagulant dosing, the 30 minutes that this was off had a significant effect on the process, taking some 10 hours for the effects to transit through the treatment stages. Measurement of aluminium at a level of 1637µg/l in a final water sample taken on 25 January, clearly demonstrates the importance of maintaining an effective coagulation process. Adjustment to the chlorine dosing rate ensured disinfection of the water was maintained at an effective level and there were no other failures of the quality standards in subsequent monitoring samples of final water from the works or in the distribution system.

With regard to the previous dosing changeover failures, DWQR is satisfied that reasonable causes for the failures were determined and remedial works undertaken at those times.

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.