

Invercannie WTW
Coagulation Failure
18 November 2014

DWQR Inspector:
William Byers

Event No. 6564

Event Category: Significant

Summary of Incident

Invercannie treatment works automatically shut down twice on 17 November. In the first instance, an alarm was passed to the operator at 07:00 and on investigation, it was found to be caused by a failure in the cleaning process on a membrane cell leading to subsequent queuing of other cells in the wash schedule. This fault was rectified and the operator managed the treatment process back into full production in stages before resetting the works back to automatic at normal flows. The second shut down was initiated in the afternoon, again due to problems with membrane cells queuing for a wash. In this case, a faulty flow switch prevented completion of the cleaning programme. On determining the cause, the operator took manual control of the works to allow the queued cells to complete their cleaning process. Full auto control was later restored and before leaving the works at the end of the day, a final check around process monitors confirmed there to be no further alarms.

Subsequent low pH alarms at the inlet to the membranes were generated over the course of the night. The situation was monitored by control centre staff but call out of operators was deferred to 05:30 the next morning when it was noted that there were high Aluminium levels being recorded in the membrane permeate. Other process monitors had indicated there to be no issues with the coagulation process. Investigations found there to be problems with the lime dosing system to the coagulation process causing insufficient lime to be added. In addition, the pH instrumentation which controlled the coagulation failed to react to the change in the process. The consequence of this was that the works produced water with an Aluminium content above the regulatory level for a period of almost 12 hours, during which a peak of 500µg/l was recorded. Once lime dosing and accurate pH instrumentation signals had been re-established, the process returned to normal. Formal sampling of the final water from the works showed only a minor exceedence of the standard for Aluminium of 207µg/l, on 18 November.

DWQR Assessment of Cause of Incident

Scottish Water's investigation of the lime dosing system has identified problems with the pressure setting in two load valves drifting to a low point. These control both the dosing line and a bypass and the low pressure setting permitted a knock-on effect on the carrier water flows and pressures which resulted in the failure to control injection of lime. DWQR accepts this to be the root cause of the coagulation failure and that the carrier water flows may have been influenced by the shut down and re-start of processes the previous day.

DWQR Assessment of Actions Taken by Scottish Water

DWQR considers Scottish Water to have taken appropriate actions to recover production levels following the automatic works shut downs and to restore the subsequent coagulation process failure. In this, however, it is clear there are a number of issues with instrument sensors and monitoring and SCADA (Supervisory Control and Data Acquisition) equipment.

A prior problem with the motherboard in one of the two SCADA systems meant there was limited trend information on processes available to Operators in the lead up to and during the course of these events. This issue was resolved by the end of the day on 18 November. The Operator was however able to carry out bench tests on water quality and compare results with the on-line monitor readings to understand process status and re-establish control.

Although DWQR accepts it is normal that Control Centre staff monitor process performance and take a view on when operational staff need to attend a problem, it relies upon fully functioning equipment to properly assess a situation. DWQR finds it unacceptable that key process alarms for coagulation pH and Aluminium failed to operate from the site that would have allowed an earlier call out to be made to standby operators.

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

