

CHLORINE METHOD FOR A NEW WATER TESTING LABORATORY IN WALES

PROBLEM

Drinking Water Inspectorate (DWI) regulatory requirements for portable sampling and testing of chlorine now require UKAS 17025 accreditation.

SOLUTION

Hach Pocket Colorimeter II, with HPT210/HPT310 chlorine liquid DPD reagents.

BENEFITS

The Hach portable solution meets the working range, linearity, precision, bias and limit of detection as specified by the DWI.

Initial Situation / Background

A new water testing laboratory at Glaslyn, Wales was officially opened on the 5th November 2012. The laboratory tests approximately 145,000 potable water samples per annum for various determinands and is supported by thirty six field based samplers who are located throughout Wales and Herefordshire. The sampling team is based from three main depots in South East, West and North Wales and their role is to collect potable water samples in the field for regulatory analysis.

In 2013 the Drinking Water Inspectorate (DWI) for England & Wales announced that in order to comply with the 'Water Supply (Water Quality) Regulations' and the 'Private Water Supplies Regulations', water samples collected in England and Wales must be tested in a laboratory that meets the Drinking Water Testing Specification (UKAS Lab 37 Accreditation). The instruction for sampling to also fall under the UKAS ISO/IEC 17025 accreditation was issued by DWI in an information letter reference 05/2013⁽¹⁾.

Improvements

The Drinking Water Testing Specification ensures that a laboratory is operating to specific standards for drinking water sampling and analysis. By making UKAS accreditation under ISO/IEC 17025 a mandatory requirement for all sampling, transport and analysis of drinking water (within the scope of the regulations) the DWI have ensured good lab practice and improved analytical quality. The scope of the requirement covers all regulatory compliance parameters for potable water, including the disinfection parameters chlorine and total chlorine.

The guidance for residual chlorine testing from the DWI (2) is as follows;

Trueness The greater of 10 % of the result or 0.05 mg Cl₂

Precision The greater of 10 % of the result or 0.05 mg Cl₂

Limit of detection 0.05 mg Cl₂ or the minimum concentration specified as either a target value or an action level at any of the water company's treatments works or in its distribution system, whichever is the lower concentration.

At the time of the new DWI instruction, the chlorine method employed at the Welsh Water Bretton laboratory was unable to meet these requirements, notably for the prescribed limit of detection. This prompted the laboratory Quality Assurance Officer, Rachael Oaten, to investigate new analytical options for monitoring residual chlorine.

Solution

One of the options that the laboratory investigated was the Hach Pocket Colorimeter II, for Chlorine (Free & Total) with liquid DPD reagents (HPT210/HPT310). Following a trial which showed positive results, it was decided to conduct a full trial of the Hach unit and reagents.

The design of tests and calculation of performance for the validation was in accordance with the NS30 protocol (3).

This involved the laboratory measuring 11 different sample batches over a period of 11 consecutive days using different analysts. Three different water matrix types were used; soft, medium and hard. In addition potassium iodate standards (owing to the instability of chlorine in solution) were prepared and used in accordance with BS EN ISO 7393-2:2000.

The final validation results demonstrated that the Hach Pocket Colorimeter II and HPT reagents performed within the parameters as set out in DWI Regulation 16, being within 10 % for trueness and precision and having a minimum limit of detection of 0.05 mg/L. A subsequent UKAS assessment visit in October 2014 accredited both the analytical residual chlorine (free & total) method and the sampling regime. To maintain this accreditation, UKAS will continue to review implementation on an annual basis and perform an in depth assessment of the laboratory every 4 years.

Now that the accredited method is in place, the laboratory and sampling teams maintain the quality of analysis by daily Analytical Quality Control (AQC) and participation in External Quality Assurance proficiency schemes. This involves the samplers coming into the laboratory with their portable Pocket Colorimeter II and running an AQC sample that has been produced by the laboratory. The result is then passed over to the sampling office where the data is plotted on a Shewhart chart. Each sampling instrument has its own Shewhart chart which provides a visual indicator of the performance of the equipment. For samplers who are remote (North and West Wales regions) and unable to get to the laboratory, AQC standards are transported to stations across nine locations where they must be analysed within seven days. An AQC failure will trigger an internal investigation which will then look at potential sources of error in the measurement. This process has



Pocket Colorimeter II

highlighted areas such as stained sample cells or under/over filling of cells, which help to maintain a good level of best analytical practice amongst the sampling team. Hach UK have supported the drinking water plant in ensuring best practice for analysis.

Frequent calibration checks of the analysis is also performed by the sampling team using Hach Spec Check Secondary Gel Standards Set (DPD Chlorine). These standards are measured twice every day on each instrument (before first sample measurement of the day and after final measurement of the day). The use of the gel standards helps to verify the quality of the analysis on each instrument.

The system has been received very positively by the sampling operators.

Conclusion

The implementation of the portable Hach chlorine system is helping to improve the quality of regulatory data reported by the South UK drinking water plant and ensured DWI compliance.

The company in question has now completely standardized across all regions with fifty Pocket Colorimeter™ II chlorine units in place.

(1) <http://dwi.defra.gov.uk/stakeholders/information-letters/2013/05-2013.pdf>

(2) DWI Guidance on calibration and AQA for residual chlorine measurements – v1 Date of issue: 24 January 2005

(3) Manual on analytical quality control for the water industry. NS30. ISBN Number: 0902156853. Publisher: WRC(1989)



Chlorine, liquid DPD reagent set, 0.02 – 2.00 mg/L Cl₂