New TU5 Series Process Turbidimeter for Raw Water Monitoring

Challenge

A water treatment plant in the Czech Republic required permanent raw water turbidity monitoring. This plant uses source water from a reservoir, with turbidity between 2-5 FNU and occasional peaks of 25 FNU. The high turbidity increases the fouling risk for any optical measuring cell.

Solution

The treatment plant ran a 4-month evaluation of the TU5300 sc turbidimeter equipped with the Automated Cleaning Module (ACM). The evaluation verified the performance of the TU5300 sc with ACM against a reference analyser, the Hach® Ultraturb sc, which was a proven solution for this application.

Benefits

The results of the evaluation have shown that the TU5300 sc analyser with an ACM may be used for measuring raw water successfully. Users can now take advantage of the TU5300 sc's superior features, such as quicker response times, and faster cleaning, calibration, and verification times, when compared to the Ultraturb sc.

A long-term evaluation of applicability of a TU5300 sc turbidimeter equipped with Automated Cleaning Module (ACM) for raw water monitoring was conducted at a surface water treatment plant in the Czech Republic. The plant uses the source water from a reservoir. The reservoir water usually has turbidity in the range of 2 - 5 FNU with occasional peaks up to 25 FNU.

Due to high fouling capacity of the source water, the use of ACM with TU5 Series turbidimeters is mandatory for raw water monitoring. The goal of this study was to verify the new turbidimeter's performance against a reference analyser (Hach Ultraturb sc) which had been working in this application for many years. Main parameters of the evaluation included direct comparison of the readings (logged every 5 minutes) with focus on trends, maintenance requirements, and ability of the ACM equipped with a fibre wiper to keep the measurement cell clean. The ACM was set to clean the cell every 12 hours. The test lasted for almost 4 months and its results are presented in both graphical and numerical formats below.

Automatic Cleaning Module for TU5300 sc and TU5400 sc

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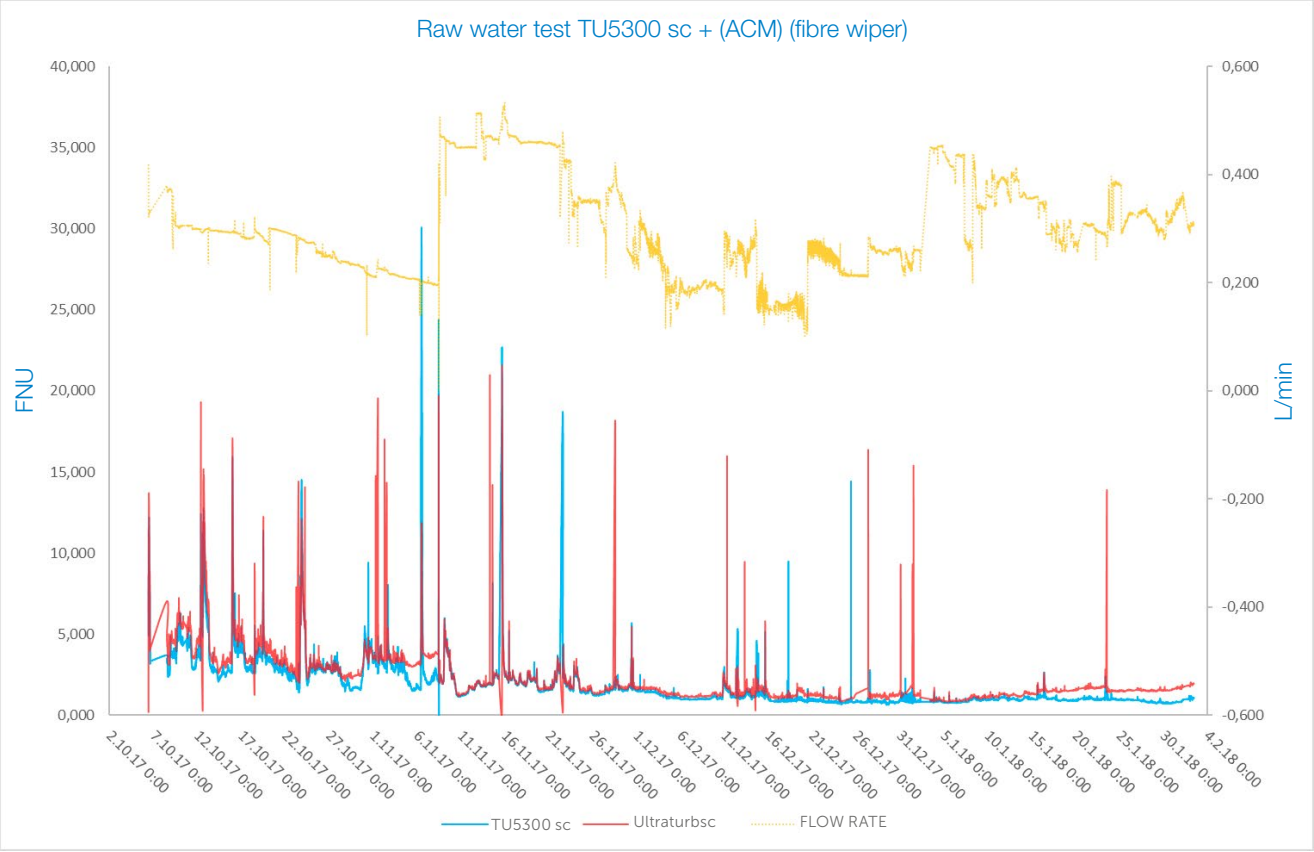

Figure 1: Graphical representation of the test results

As seen in Figure 1, readings between the two analysers trended well during the test on reservoir water within a turbidity span of 0.4 to 35 FNU. The chart also shows readings of the TU5300 sc's flow sensor. Sample loss during the plant maintenance made it more challenging to maintain consistent sample flow. The sample flow to the TU5300 sc was regulated using two regular ¼" (6 mm tubing OD) ball valves. The needle valve supplied with the turbidimeter for installation in the sample outlet to maintain positive pressure in the measurement cell was replaced with a regular ball valve based on preliminary testing. The installation specifics are presented in Figure 2.

Test setup

TU5300 sc

SC 1000 controller

Ultraturb sc

Figure 2: Main settings and representative comparison examples for the test

Table 1: Main test statistics, absolute and relative difference between the two instruments (target is 10% based on industry standards)*

Reservoir Water Test Results

# of compared points = 32106	AVG reference FNU = 2,178
MIN reference FNU = 0,128	AVG difference = 0,367 FNU
MAX reference FNU = 21,536	RSD = 16,9%

* A sum of the specified accuracy for each instrument is only applicable for measuring the same standard, not a real water sample.

During the test, all data were collected and analysed bi-weekly on average. The numerical test results in Table 1 confirmed consistent performance of the TU5300 sc when applied to challenging sample conditions. Additionally, the ACM with fibre wiper eliminated any need for manual interaction with the sample vial – it was clean after the 4-month test, see Figure 3.

The greatest difficulty was to maintain sample flow within the specifications after the frequent sample losses during plant maintenance events. While it presents a manual step, it takes only a few seconds to turn the ball valves off/on twice and then readjust the flow (displayed on the controller screen) to an acceptable value between 0.2 and 0.8 L/min by partially closing the outflow valve.

Figure 3: Photo of the vial after completion of 115 days of testing with fibre wiper. The vial looked completely clean after the test. Several additional vial checks were conducted during the test and the cleanliness was very consistent. In fact, the vial, which was installed on this instrument in October 2017, was working significantly longer in this application with ACM.

Conclusion

The new TU5300sc analyser may be used for measuring raw water successfully, given the turbidity and other major parameters are within specified range and with several conditions:

- The ACM with fibre wiper is implemented.
- The supplied outlet needle valve is replaced with a standard ¼" (6 mm) ball valve (Hach PN 5743700).
- The flow is closely monitored and restored as needed.

Warranty PLUS Service PROGRAM*

With the Warranty PLUS Service Program, your instrument is started up accordingly and you receive total functionality, optimal performance and regular factory-recommended maintenance visits PLUS all necessary wear parts needed during the visit from the very beginning. So not only are you ensuring your Hach instrument is set up correctly, but also that it continues to provide outstanding accuracy while making budget management easier. Our commissioning services assure that your new system is calibrated and delivering accurate data, and that you are trained to keep the system running smoothly between service visits.

* This program can only be purchased along with an instrument and is valid for max 24 months.

NEW! TU5300sc and TU5400sc are now Claros enabled with Mobile Sensor Management.

Claros Enabled

Claros Instrument Management reduces the risk of unexpected downtime and uncertainty in your measurements, so you can be more confident in water analytics across your facility. Know, with confidence, whether changes in your measurements are due to changes in your instrument – or your water.

About the Authors

Vadim B. Malkov (PhD Chemistry) joined Hach in 2002. Originally Dr. Malkov worked at Hach R&D and then moved over to the business organisation. During his tenure at Hach, he led and participated in development of several process analysers and applications. Dr. Malkov has published many papers in scientific and professional journals and presented results of his work at multiple conferences in the United States and abroad. He is currently working at Hach as a Product Applications Manager for Process Solutions Business Unit focused on Drinking Water applications and specifically on disinfection processes and practices.

Vladimir Pavlita has worked with Hach since February 2010 as a Field Sales Representative for lab and process solutions for municipal and industrial customers. In 2017, Vladimir took the role of an Application Development Manager. He provides expert advice on drinking water applications and solutions to the sales teams during customer visits. Vladimir consults customers on a range of topics including remote monitoring, data analysis, error diagnosis, and parameter optimisation to improve the overall process.

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