




GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
MARQUETTE DISTRICT OFFICE



LIESL EICHLER CLARK
DIRECTOR

TO: Surface Water Treatment Plant Operators

FROM:  Michael Bolf, P.E., Engineering Unit Supervisor
Drinking Water and Environmental Health Division (DWEHD)

DATE: March 4, 2020

SUBJECT: Surface Water Treatment Rule (SWTR) Requirements for
Online Turbidimeter Calibration and Verification

The purpose of this memo is to discuss the Michigan Department of Environment, Great Lakes, and Energy's (EGLE) general instrument requirements for water systems subject to turbidity treatment techniques of the SWTR. In addition, this memo will provide clarification on how these requirements relate specifically to SWAN Turbiwell online turbidimeters. Before detailing the requirements, a brief review of terminology will help avoid potential misunderstanding. Specifically, there's a need to examine the meaning of *calibration* versus *verification* and *primary* versus *secondary* standards.

Definitions

The American Water Works Association (AWWA) Standard C671-16 provides definitions for calibration and verification as follows. Calibration is a procedure that adjusts the accuracy of an instrument by comparison with a standard or reference. Calibrations often make an adjustment to an already established instrument algorithm that is part of the measurement software for a given instrument. Verification is a procedure that checks the accuracy of an instrument by comparison with a standard or reference.

Primary standards are prepared by the user from traceable raw materials, using precise methodologies under controlled environmental conditions (*Standard Methods, 1995*). Because the physical or chemical quantity value is known exactly, primary standards are used to *calibrate* the instrument response with respect to an analyte concentration. Formazin and the stabilized form of formazin are the most common types of primary standard for turbidity. Also available is a commercially manufactured liquid suspension of Styrene divinylbenzene polymer (SDB) such as ProCal. Formazin standards may be user-prepared in the lab or purchased in various stabilized pre-prepared forms such as StabilCal. User-prepared solutions typically do not have a very long shelf life compared to pre-prepared stabilized form of formazin.

Secondary standards are standards that are traced to a primary standard. Examples of secondary standards are liquid latex, SDB, or Gelex solutions that are sealed in a sample container. They may also include solid devices designed for use in a specific

manufacturer's instrument. A secondary standard is used for day to day instrument *verification* and should be checked periodically against a primary standard.

Requirements

Instruments used to measure turbidity for compliance must use an Environmental Protection Agency (EPA) approved method. Based on the state's interpretation of the SWTRs, EGLE allows two options for ensuring turbidity accuracy. The first option is to verify the calibration of each turbidimeter using a primary standard. The second option is to re-set the instrument calibration. Either option must be performed at least once every 90 days using a primary standard (*Guidance Manual for Compliance with the Interim Enhanced Surface Water Treatment Rule: Turbidity Provisions, April 1999*) and following a procedure that conforms to the method approval. If opting to verify the calibration, the instrument must read within $\pm 10\%$ of the primary standard value. Furthermore, a turbidity standard in the range typically measured by the specific instrument should be used. For verification purposes, EGLE recommends a standard of 1.0 NTU for instruments measuring filtered water. If the verification results are greater than $\pm 10\%$, the reason must be investigated, and a calibration must be performed. If opting to calibrate the instrument, a primary standard must be used, and the manufacturer's recommended procedures must be followed. These requirements apply universally, regardless of which turbidimeter manufacturer is being used.

The SWAN Turbiwell user manual indicates that the instrument is factory calibrated and does not recommend re-setting the calibration. To check the factory calibration, SWAN offers a number of different verification methods including the use of a verification kit that inserts into the body of the instrument. EGLE has reviewed the various verification methods offered by SWAN and has determined that if verification with a primary standard is used in lieu of quarterly calibration, then the only method offered by SWAN that will be accepted is the wet verification method. The wet verification method described in the SWAN user manual does not use a verification kit and involves filling the body of the instrument with primary standard. EGLE believes this is the only verification method conforming to the EPA method approval which specifies identical optical conditions as when the unit is in service. It is important to note other SWAN methods using the verification kit may be used as a secondary standard for more frequent accuracy checks.

Other Considerations

EGLE's understanding from discussions with SWAN is the different verification methods may require different firmware versions. Therefore, it is critical to match the intended verification method with the corresponding firmware update. If you have questions whether your instrument has current or matching firmware, you should contact the manufacturer.

SWAN has indicated that a batch of instruments with a defective part has resulted in erroneously low readings. Impacted instruments may not be used for compliance and must be repaired or replaced. SWAN informed EGLE that any Turbiwell that is reading below 0.009 NTU may not be valid and should be investigated. If this is observed, or

you want more information about the defective part, you should contact the manufacturer immediately.

Conclusion

The SWTRs are structured to use turbidity measurements for quantifying pathogen removal. As a result, accurate turbidity measurements are imperative for assessing public health protection, treatment performance, and for determining compliance. Accordingly, EGLE staff reviews turbidimeter maintenance and accuracy during surveillance activities, regardless of instrument manufacturer. Failure to meet the requirements noted in this communication may result in a treatment technique violation. Please contact me at 906-630-4107 or bolfm@michigan.gov if you have any questions regarding this memo.

cc: Mr. Kevin Forsman, SWAN Analytical USA, Inc (via email)
Mr. Rick Liberman, USEPA Technical Service Center (via email)
Mr. Gregg Lundy, EGLE Lab Certification (via email)