HRSD

Cleaning wastewater every day for a better Bay.

On-line Analyzer Use for Regulatory Compliance

Stacie Crandall
Chief, Laboratory Division
scrandall@hrsd.com
757-460-4217

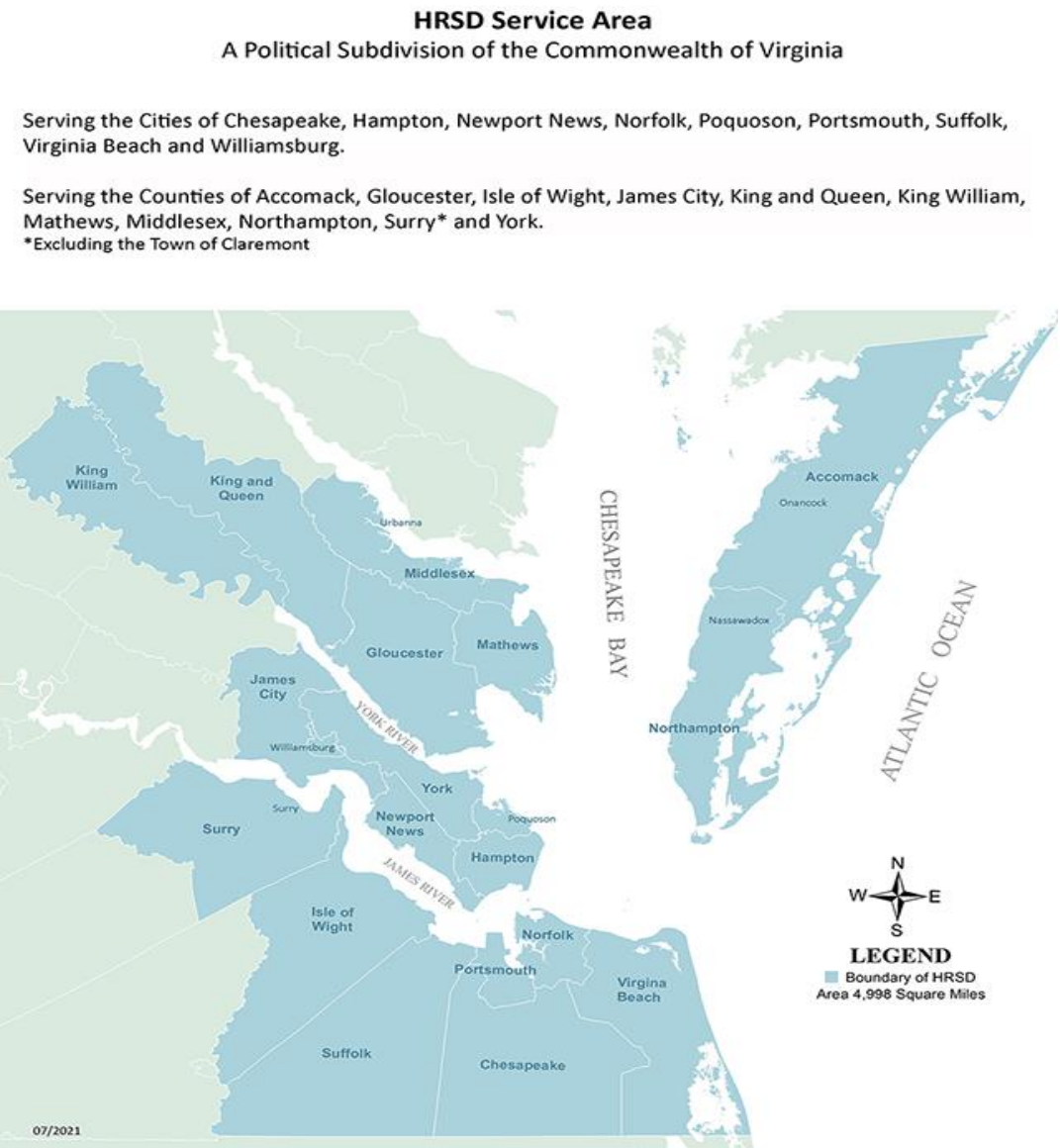
In April of 2022 HRSD obtained approval of a Limited Use Alternative Test Procedure (ATP) to use the HACH CL-17 for on-line regulatory total residual chlorine (TRC) analysis at the Nansemond Treatment Plant

Topics

- Background
- Permit Overview
- Proposal and Study
- SOP and Training Overview
- Limited Use ATP Process
- Lessons Learned
- Next Steps
- Current Efforts with Standard Methods Joint Task Group

Background

Background



- Provides service to 20 cities and counties of southeast Virginia and the Eastern Shore
- Service area of nearly 5,000 square miles with a population of more than 1.9 million.
- 8 major treatment plants and 8 smaller plants
- Combined treatment capacity of 225 million gallons per day (mgd)

Nansemond Treatment Plant Permit Overview

- Nansemond Treatment Plant
  - Located in Suffolk, VA
  - Treats up to 30 mgd of wastewater
  - Discharges to James River
    - Oyster fisheries
    - Chesapeake Bay tributary
  - Struvite Facility- enhanced nutrient removal
  - SWIFT Research Center
    - Produces up to 1 mgd for Potomac Aquifer Recharge

Current Nansemond TP Permit

A. ADDITIONAL TOTAL RESIDUAL CHLORINE (TRC) LIMITATIONS AND MONITORING REQUIREMENTS

1.a. The permittee shall monitor the TRC at the outlet of the chlorine contact tank, prior to dechlorination, every two hours by grab sample.

b. No more than 36 of all samples taken after the chlorine contact tank, prior to dechlorination, shall be less than 0.50 mg/1 for any one calendar month.

b. The facility shall operate the chlorination facilities in a manner, which will ensure continuous disinfection. The permittee shall notify the DEQ in the event TRC sample collected prior to dechlorination is less than 0.50 mg/1 for 3 or more consecutive readings or the TRC sample collected is less than 0.10 mg/1.

Current Nansemond TP Permit

- Samples collected from contact tank every 2 hours to ensure permit limit for **minimum** TRC achieved
- HACH Pocket Colorimeter
  - Verified daily using gel standards
  - Quarterly QC (single-blind) analyzed to ensure analytical system is functioning properly
  - Operators perform demonstration of capability annually
    - Written test
    - Duplicate analysis of single blind certified reference material

Proposal and Study

Proposal

- Allow the HRSD Nansemond Wastewater Treatment Plant to submit 2-hour TRC measurements collected by on-line instrumentation in lieu of lab analysis. Reduce operator burden to parallel instrument verification (1x/day) for QC

- Values contributing to the Discharge Monitoring Report submission would represent the minimum TRC measured by the CI-17 during each 2-hour time period

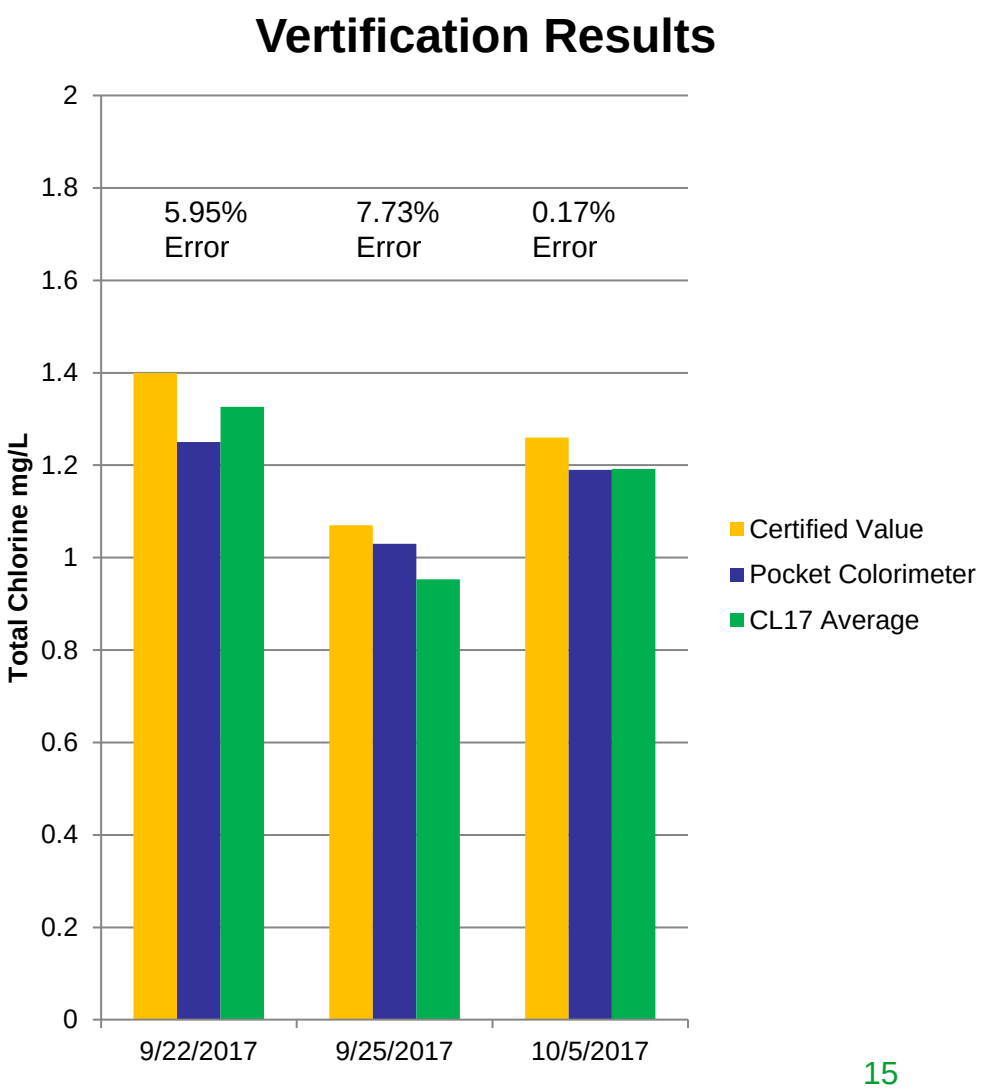
Comparison of Methods

- Lab analysis: operator collects grab sample, zeros HACH Pocket Colorimeter using blank sample, then adds powdered DPD reagent and measures TRC

- Cl-17 analysis: instrument pumps sample into test chamber, zeros using blank sample, then adds liquid DPD reagent and measures TRC

- Study goal was to use the CL-17 on-line analyzer to obtain data comparable to pocket colorimeter
  - Same chemistry- DPD colorimeter
  - Compared regulatory grabs analyzed every 2 hours with value obtained at same time by colorimeter
  - Used Pocket colorimeter to analyze QC samples and perform daily validation

- Study Findings
  - Initiated parallel data collection in April 2016
  - Identified need for instrumentation modifications
  - Developed maintenance schedule
  - Implemented procedures for monthly reagent changing
  - Designed and built plumbing system to ensure flow rate was appropriate for instrumentation
  - Evaluated and finetuned screens to minimize clogs
  - Developed initial proving period for new or replacement instruments


Vertification Results
Total Chlorine mg/L
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
5.95% Error
7.73% Error
0.17% Error
9/22/2017
9/25/2017
10/5/2017
Certified Value
Pocket Colorimeter
CL17 Average

SOP and Training Overview

SOP and Training Overview

- Detailed SOP critical to the ATP Process
  - Communicates details of procedure
  - Replaces the “method”
  - Stand alone document for performance of procedure
- Training
  - Video interactive training created
  - All operational staff trained before implementation
  - Recorded through written documentation
  - Used as a reference after initial training for refresher or clarification review

SOP Overview

- Test Application
- Definitions
- Safety
- Apparatus, Glassware and Reagents
- Sample Handling
- Reagent Handling
- Pocket Colorimeter Verification
- Quality Control (CL-17 daily validations)
- Analytical Procedure
- Data Handling
- Data Reporting
- Corrective Action and Troubleshooting
- Clean-up
- Initial Proving Period

Limited Use ATP

(40 CFR Part 136.5)

- Began working with EPA, VA DEQ, HACH and other stakeholders in 2016
  - Multiple site visits
  - Instrument Configuration
  - Multiple presentations and meetings
  - Installation of back-up instrumentation
  - Moved and plumbed instruments to enclosure for improved area to perform daily validation
  - Implemented procedures for handling equipment failures and proving period for back-up instrumentation

Submission:

(1) Name, Address, Facility Name, Permit Number, Issuing Agency, Outfall Serial Number

(2) Pollutant or Parameter

(3) Justification

(4) Detailed description including references to applicable published studies

(5) Data comparison between proposal and approved method

Submitted to VA DEQ 11/04/21

Justification:

- Narrative
  - Improvements in operational efficiency by employing an online analytical system
  - Explanation of data management procedures
  - Explanation of how HACH Cl-17 operations meet requirements of methods submitted as part of the reference list

Justification Documents:

- EPA METHOD 334.0: DETERMINATION OF RESIDUAL CHLORINE IN DRINKING WATER USING AN ON-LINE CHLORINE ANALYZER
- Standard Methods 4500-Cl (Chlorine Residual) G: DPD Colorimetric Method
  - Same Chemistry as HACH Cl-17 online analyzer and Pocket Colorimeter in use
- HACH Method 8167 (Chlorine, Total)

Detailed description including references to applicable published studies:

- HACH CL-17 Users Manual
- Explanation of how HRSD SOP meets Quality Control requirements of 40 CFR Part 136.7
- HRSD SOP
  - Quality Control
  - Data handling procedures (report 2-hour minimum reading to meet monitoring requirements)

Data comparison between proposal and approved method:

- Explanation of daily meter verification procedure
- 30-day testing procedure
  - Comparison of HACH Colorimeter 2-hour reading with result generated by CL-17 during noon operator rounds
    - Acceptance criteria: values must be within +/- 0.20 mg/L or $\leq$ 30% difference
    - Testing period was from June 15-July 14, 2021, with 100% pass rate

Limited Use ATP Approval Process

The Regional ATP Coordinator will review the application and notify the applicant and the appropriate State agency of approval or rejection of the use of the alternate test procedure…

- Began working with Regional ATP Coordinator Early 2022
- 2 meetings with EPA Regional ATP Coordinator after submission
  - Additional data submitted to show summary of excursions during testing period
  - SOP Overview of validation/verification clarification

Limited Use ATP Approval Process

- Received final approval from VA DEQ April 4, 2022

- Implemented for regulatory compliance March 1, 2023

Lessons Learned

Lessons Learned

- On-line does not mean “hands-off”
  - Daily validation
  - Maintenance
  - Reagent Changes
  - Strainer inspection
- Data Management is complicated
  - Instantaneous measurements
  - Random low results and zeros
- Back-up Systems are necessary
  - On-line Systems
  - Manual or colorimeter

Standard Methods Joint Task Group (JTG) for Online Analyzers

- Charter
  - Analyze existing data to establish reasonable and practical performance expectations regardless of the measurement technologies related to data validation and QC criteria for regulatory monitoring
  - Establish event or trend detections that trigger a calibration and performance validation while in service
  - Document practices for qualification of those data not meeting established performance criteria.

- Membership
  - Stacie Crandall, HRSD (Chair)
  - Utility Representatives (Drinking Water and Wastewater)
  - EPA
  - Contractors (Corona Environmental, GDIT)
  - Manufacturers
  - Standard Methods
  - Other Stakeholders (permitting and regulatory authorities)

- Current Activities
  - Developed Guidance Document establishing definitions and terminology (Corona Environmental)
  - Focus on immediate holding time parameters
    - Chlorine
    - pH
    - Dissolved Oxygen
  - Expanding membership to include additional manufacturers
    - Evaluate and compile existing performance data
    - Develop data quality objectives for on-line instrumentation

- Next Steps
  - Workshop in September to review current validation process and data availability for existing technology
  - Looking for additional members
    - On-line analyzer and data users
    - Permitting or regulatory agencies
    - Manufacturers
- Monthly meetings
  - Contact Stacie Crandall (scrandall@hrsd.com) if interested

Conclusions

Conclusions

- Engage Permitting authorities/regulatory agencies early in the process for Limited Use ATP requests
- Ensure testing is complete, and data quality objectives can be met for data uses
  - Regulatory Reporting
  - Process Monitoring
- Look beyond single use for widespread applications of innovative practices of methods
  - Development of JTG
  - Benefits to other users

HRSD

Questions?

Stacie Crandall, HRSD

scrandall@hrsd.com

757-373-4568