

Approaches and Benefits to Online Water Quality Monitoring

Matt Umberg, U.S. EPA

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SEPAOutline

Topic 1: What is Online Water Quality Monitoring (OWQM)?

Topic 2: What approaches have been used to implement OWQM?

- Topic 3: What benefits have been realized from OWQM?
- **Topic 4: Conclusions**



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Topic 1: What is OWQM?





Sepa OWQM Overview







Topic 2: What approaches have been used to implement OWQM?





EPA Data Generation

Potential Monitoring Locations

Utility facilities

- Storage tanks
- Pump stations



City/town facilities

- Fire stations
- Police stations



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Large water users

- Hotels
- Bottling plants



Stand-alone installations

 Public right-ofway





SepaData Generation

Parameters and Instrumentation

Utility ID	Customers	CL ₂	рН	Turbidity	SC	Spectral	тос	NH ₃
Utility 1	700,000	\checkmark	\checkmark	N	V		V	
Utility 2	600,000	\checkmark	V	N	V			
Utility 3	600,000	\checkmark						
Utility 4	400,000	\checkmark	\checkmark		V	Ŋ		\mathbf{V}
Utility 5	400,000	\checkmark	\checkmark		$\mathbf{\overline{\mathbf{A}}}$			
Utility 6	< 200,000	\checkmark	\checkmark	Ŋ				
Utility 7	< 200,000	\checkmark	\checkmark		\checkmark			
Utility 8	< 200,000	\checkmark	\checkmark	N				
Utility 9	< 200,000	V	V	V				

CL₂: Chlorine residual Spectral: Multi-spectrum UV absorbance NH₃: Ammonia SC: Specific conductance TOC: Total organic carbon



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Information Management & Analysis

Data Analysis

Utility personnel have manually reviewed data to identify anomalies.



Thresholds have been set to automatically generate alerts.



Software-based algorithms have automatically generated alerts.

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Information Management & Analysis

Data Visualization

Data has been incorporated into existing SCADA displays.

Analyzer Alarms						Intrusion Alarms				ChemScan	
	Turb	Cl2	pН	Cond	Temp		Filters	Turb	Alarm	Total Ci Meet Ci Total Nill Free Nill 2.51 2.45 0.41 0.11	Aruskyz
lant #3		2.59	7.48	42	21.84	Treating Station 3	Filter 1	0.034	0		intrus
fant #6		2.56	7.74	.41	21.18	Treating Station 6	Historical		~	Finished Water	Com
orth Saluda	0.60		6.92	22	18,46	North Saluda	Historical	0.030	0	Pre-CI Pst-Ci	Tack
able Rock	0.92		Incest.	11	19.12	Roper Mits Reservoir	Filter 3	0.030	0	2.40 2.62	Diset
AF Plant	0.65	1.1.1	6.79	24		Cedar Rock	Historical		-		- 108.10
oper Mtn		2.38	7.78	38	21.12	Wham Road	Filter 4	0.027	\bigcirc	pH FI Turb	Duk
edar Rock		2.61	7.95	50	15.48	Cliffs Valley	Ciltor 5	0.026	0	8.09 0.70 0.030	HOU
Impsonville Tank		5.00	14:00	154	39.36	Upper Plans Mitn (Tower)	Historical	0.020	0		Partic
Tham Road	0.05	1.85	7.98	68	26.98	Paris Min (Lake Cir)	Filter 6	0.031	0	Combined Filter	AR AM
lifts Valley Tank	0.04	1.87	7.86	37	24.04	White Horse PS	Historical	0.027	õ	Turb pH CI2	Pueno Se
oner Paris Mtn		2.07	8.26	44	23.12	Travelers Rest PS	Historical	0.001	0	0.034 7.26 2.35	
kamont Reservoir	0.04	2.00	8.54	45	25.16	Lowndes Hill Tank	Filter 8	0.047	0		Linky H
Conduce Pridge	0.03	2.49	7.26	40	21.42	Crestwood PS	Historical	0.025	~	DAF Effluent	SCADA
White Horse Tank	0.00	2.61		31	21.72	Hittandale PS	Historical	0.035	0	Turb-1 Turb-2 Turb-3	
Homest Second		2.54	7.56	44	21.86	Mountain Park	Filter 10	0.029	0	0.076 0.089 0.111	
Itamora Reservoir	0.02	2.04	7 70	48	24 28	Blue Bonnet	Historical		-	Consulation of	
Owndes Hill Tark	0.03	2.20	0.50	24	20.94	Stone Creek	Filter 11	0.030	0	TTONH TRAN TRAN	
tillandale Res	0.04	2.48	0.00	47	20.01	Old Laboratory		0.000	0	6.84 6.78 6.72	
Nountain Park PS		2.36	Test and	47	22.40		Historical	0.020	0		
lue Bonnet Tank	-	2.17	8.09	41	25.44						
				Transma			Status Value			Description	
Ack Time In Time Last Node		TADE WARE OFFELIVEST LVL		A74 32.00 7.5 MG 0			TASTE RESERVOIR NO T LEVIL				
# 106 Z1 18 67	2 00 02	E4 673 1	FOX	HRAPS	SUC P	RES	LO	17.70 H	IR&PS S	UCTION PRESSURE	
1010254 573 08 02 54 075 FIX CHE			CHEMS	CAN_TO	TAL_NH4	LO 0.41 Chem Scan total ammonia					
J 06-21-57 66		57 669 1	TOX .	INTRUS	ION AL	ARM.	CER IN	CELOU NI	CERTIFICATION		
E				Futer An	a In "A A	MMONIA ANALYZERS, B	C,CHLORINE, S	Sort: Time	In, Desce	ending	_
atat Alarms 22			-			and an a second s					

Data dashboards have displayed data spatially and graphically.

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SepaAlert Investigation





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Topic 3: What benefits have been realized from OWQM?





Examples of OWQM Benefits

- Support regulatory compliance
 - Revised Total Coliform Rule
 - Disinfectants and Disinfection Byproducts Rules
 - Lead and Copper Rule
 - Ground Water Rule
- Detect distribution system events
 - Nitrification
 - Equipment failure
 - Treatment process upsets
 - Pipeline breaks/scouring
 - Red water/particulate matter events

• Optimize system operations

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- Chemical dosing rates
- Storage tank operation
- Unidirectional flushing
- Aquifer storage recovery processes
- Detect system contamination
- Learn about system
 - Determine water quality trends
 - Determine WTP reach and blending characteristics
 - Update system models



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Support Regulatory Compliance

Revised Total Coliform Rule

• Chlorine residual data and Heterotrophic Plate Count (HPC) testing has been used to identify possible contamination.

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EPA

Support Regulatory Compliance

Disinfectants and Disinfection Byproducts Rules

• Bromide, chlorine residual, pH, temperature, and TOC data has been used with models to predict DBP formation potential.

• Chlorine residual and temperature data has been used to optimize storage tank operation and minimize travel time.

A DBP model allowed a utility to eradicate a chronic THM issue and save over \$500,000 in GAC regeneration costs during the first year it was used.



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Support Regulatory Compliance

Lead and Copper Rule

• Data can be used to calculate Langelier Index values to provide an indication of the corrosivity of water.

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Aggressive Water Event



Identifying an aggressive water event saved a utility \$20M in early pipe replacement costs.



EPA Detect Distribution System Events

Plant PLC Failure



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A PLC failure, which impacted a pilot ion exchange process, was discovered before major damage was done or contaminated water was consumed.



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Plant PLC Failure



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Detect Distribution System Events

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Nitrification Event



Detecting the onset of nitrification allows personnel to isolate and flush the affected areas of a system.



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Topic 5: Conclusions





EPA Conclusions



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- implement OWQM.
- Utilities have realized a wide range of benefits, including supporting regulatory compliance, as a result of using OWQM data.
- Allowing utilities to use OWQM data for compliance monitoring could reduce the burden of collecting grab samples for regulations such as the Total Coliform Rule and Surface Water Treatment Rule.
- If OWQM data is to be used for compliance monitoring, water quality instruments must be properly maintained and generating quality data. A proper data management plan must also be in place.







For More Information:

Contact Information

Matt Umberg EPA Water Security Division (513) 569-7357 umberg.matt@epa.gov

Relevant Links

https://www.epa.gov/waterqualitysurveillance

General Email Address

WQ_SRS@epa.gov

