Are Amalgam Separators Enough?

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Quick Review

Concentration	Converted to mg/L	Common Term
1 mg/L	1	1 ppm
1 µg/L	0.001	1 ppb
1 ng/L	0.000001	1 ppt

Quick Review

Source of Water Quality Standard	Concentration (µg/L)
EPA (Water Quality Criteria)	Acute (Freshwater): 1.4 Chronic (Freshwater): 0.77 Acute (Marine): 1.8 Chronic (Marine): 0.94
Indiana	Acute (Freshwater): 2.4 Acute (Chronic): 0.012
Florida	Class III Freshwater: 0.012 Class III Marine: 0.025

One POTWs Continuing Journey

Security Sanitation District, CO

- Timeframe: 2004 to the present
- POTW: 1.5 mgd
- POTW was under formal enforcement by CDPHE (Colorado) for mercury NPDES violations at the wastewater treatment works.
- Dentists were identified as the significant source of mercury to the influent of the POTW.
- Dentists: 6 – all were required to install amalgam separators and implement BMPs.

One POTWs Continuing Journey

Security Sanitation District, CO

- Mercury effluent violations continued even after the installation of the amalgam separators.
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- The District decided to require advanced treatment for mercury. I put them in contact with SolmeteX who designed and provided polishing columns (ion exchange) that would be installed after the amalgam separators.
- Advanced treatment was initially required for one dentist closest to POTW headworks. The POTW current has 2 dental facilities with these polishing columns installed.

Columns are installed downstream of amalgam separator.

Pictures provided by SolmeteX

Amalgam Separators Installed

Dental Discharge	POTW Influent Mercury ng/L	NPDES Permit Limit: 11 ng/L POTW Effluent Mercury ng/L
Amalgam separator only	140 (35-782) n=32	13.2 (0.90-45) n=96 (54 violations)
Mean Removal Efficiency: 91%		

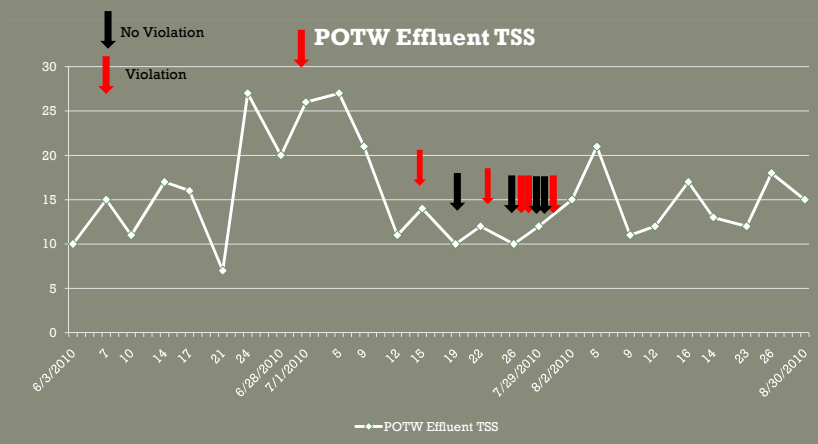
Amalgam Separators + Polishing Columns

Dental Discharge	POTW Influent Mercury ng/L	NPDES Permit Limit: 11 ng/L POTW Effluent Mercury ng/L
Amalgam separator plus polishing unit on two dentists closest to POTW headworks	88 (20 - 281) n=29	9.25 (3.72 - 31.5) n=41 (9 violations*)
Mean Removal Efficiency: 90% This indicates that an increase in removal efficiency did not account for the higher compliance rate.		
* - 6 of the violations occurred during July 2010. Polishing columns at one dentist indicated overloading. See following slides.		

Efficiency of Polishing Columns

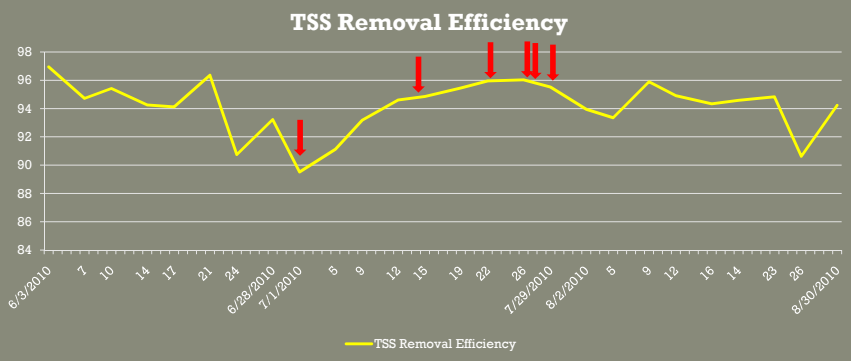
Before Polishing Unit ng/L	After polishing unit ng/L
38,180,000 **N=5** Note: This is how much comes out of an amalgam separator.	**88,333** **N=3** * 2 measurements not included here because data indicated column breakthrough (>9 mg/L coming though column).
Average Removal Efficiency: 99.8+%	
* One dentist had a mercury loading to the polishing column of 22.3 and 13.4 mg/L with an effluent of 9 and 19.5 mg/L, respectfully. The removal efficiencies fell to 60% and <0%. These monitoring results were from March and July 2010.	

Did the POTW Effluent TSS Increase During Violations?



Insufficient Data

Did the POTW Removal Efficiency Change?



Insufficient Data

Conclusions and Observations
A single dental discharge is capable of causing a mercury NPDES permit violation. This is good science. Scale up to larger POTWs.
Amalgam separators alone were not sufficient to reduce mercury concentrations from a dental facility to allow the POTW to comply with mercury NPDES permit limits.
The POTW must ensure that there is a system in place (triggered by effluent mercury increases?) to identify when mercury removal columns fail.
A mandatory mercury control program consisting of BMPs, amalgam separators and advanced treatment was required.

Other Precedents?

If a state or a municipality hears of any other similar laws being contemplated, notify the EPA region ASAP. If anonymity is needed, please contact CWACS (I will always be glad to provide the information).

EPA has allowed many CWA variances for mercury to POTWs in lieu of requiring mandatory mercury control programs to meet NPDES permit limits (e.g. Great Lakes). The variances appear to be granted one step too early.

EPA is set to establish a categorical standard for dental mercury in 2012 by defining Best Available Treatment (BAT) as amalgam separators. Municipalities and states need this leadership and support to stand up to political pressure.

EPA has issued it "Guidance for Implementing the Methylmercury Water Quality Criterion" final (April 2010). This document seems to continue the myth that pretreatment programs cannot achieve mercury reductions through prescriptive requirements (it continues the misguided approach of using voluntary programs through MMPs). See past CWACS newsletters on this.