Mercury Use in the Dental Industry

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Background

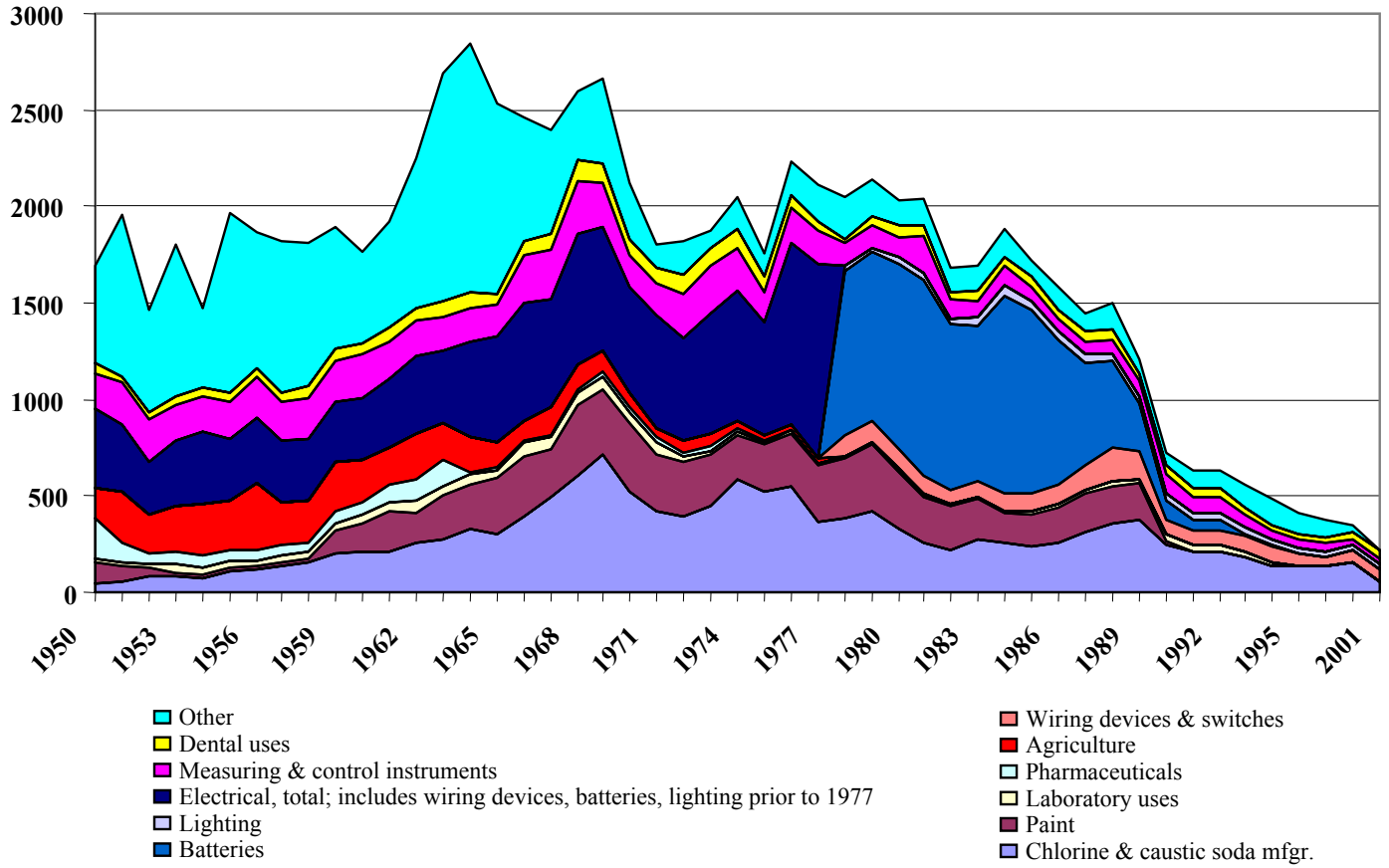
- Amalgams containing mercury have been used as the primary dental restorative throughout Europe and the U.S. for over 100 years.
- 71 million amalgam restorations performed in 1999.
- The use of amalgam in the U.S. has decreased by about 58% since 1978.
- Dental amalgam is approximately 50% mercury by weight.

Why the Focus on Dentists?

- Municipal studies have shown a large percentage of mercury in POTW influent from dental offices (upwards of 50%)
- EPA Test Method 1631 (promulgated in May 1999) took mercury detection limit from 0.2 μg/L → 0.0005 μg/L (0.5 ng/L)
- Water Quality Standards as low as 0.012 μg/L and pretreatment standards as low as 0.03 μg/L

U.S. Mercury Consumption

By end use; metric tons



Source: U.S. Bureau of Mines: EPA (2001)

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Use, Source Term, and Capture

- Approximately 150,000 private-sector dentists in the U.S.
- About 76% of dentists report using amalgam
- In 1999, 71 million amalgam placements and 91.5 million removals
- Average amalgam contains 450 mg Hg → use of 35.2 tons/year
- Estimated mercury loading to wastewater = 29.7 tons
- Approximately 78% captured by chairside traps and vacuum filters
- Greater than 95% of mercury entering POTWs is transferred to grit solids or biosolids
- 22% of biosolids are incinerated nationwide

Summary of Use and Discharge to Surface Water

	Tons
Hg used by dental industry in U.S.:	35.2
Hg discharged to dental facility wastewater systems:	
Amalgam placements:	2.4
Amalgam removals:	27.3
Total:	29.7
Hg captured by chair-side traps and vacuum filters (~78%):	23.2
Hg discharged to POTWs:	6.5
Hg captured by POTWs (~95%)	6.2
→ Hg captured in POTW grit chamber solids (25%):	1.6
→ Hg captured in POTW biosolids (75%):	4.6
Hg discharged in POTW effluent:	**0.3**
Hg in incinerated biosolids (22%):	1.0
→ Hg captured by SSI emissions controls (79%):	0.8
→ Hg emitted from SSIs (21%):	0.2
Hg emissions from SSIs deposited in the U.S. (33%):	**0.1**
Estimated Total Hg Discharges to Surface Waters:	**0.4**

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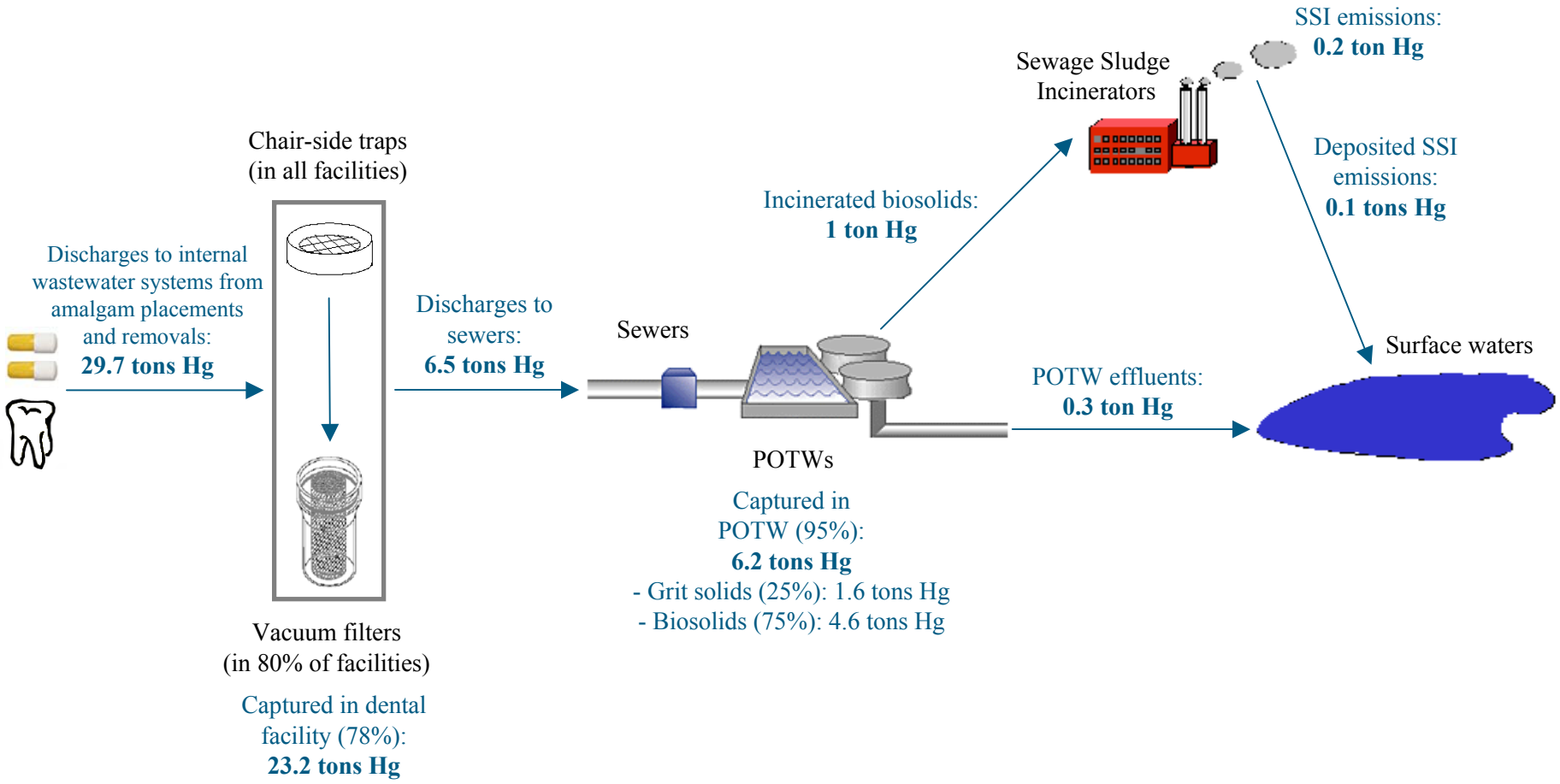
Summary of Use and Discharge to Surface Water



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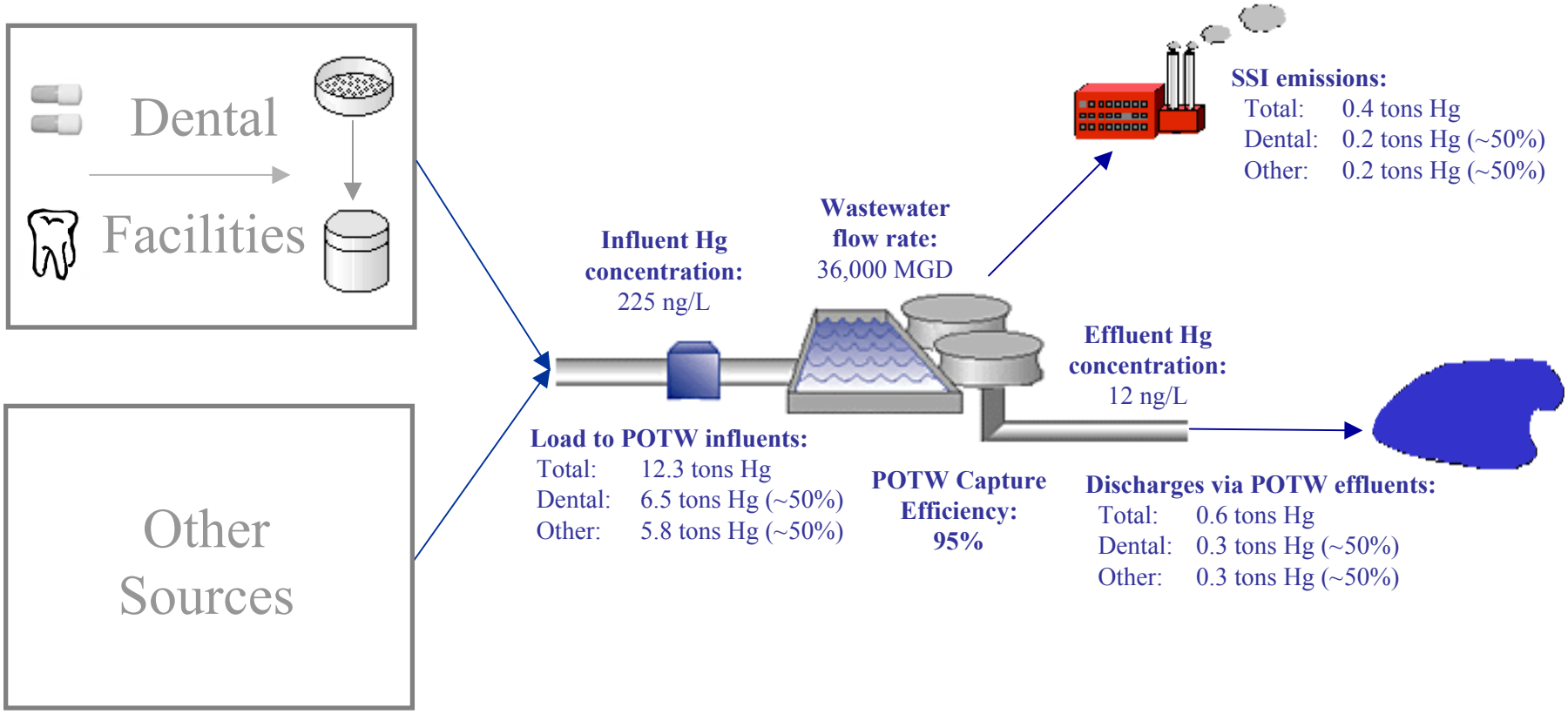
Summary of Use and Discharge to Surface Water



A Few Examples of Separator Laws

- Wichita, Kansas
  - Among the first municipalities to require use of separators.
  - BMPs were required in September 2000; separators in October 2002.
- King County, Washington
  - Regulations effective July 2003 require dentists to either install approved separator or demonstrate compliance with discharge limits via sampling.
- Maine
  - Bill requiring use of separators was passed in May 2003.
  - "Grandfathered" separators must achieve 95% efficiency; others 98%.
- Rhode Island Narragansett Bay Commission (NBC)
  - Sewerage authority that serves 40% of Rhode Island.
  - Has required use of separators or demonstration of compliance via sampling.
- Connecticut
  - Law requires use of ISO11143 separators in all dental offices by July 2003.

Summary

- The U.S. dental industry uses approximately **35.2 tons Hg/yr**.
- The dental industry discharges **6.5 tons Hg/yr** to POTWs.
- The discharge of dental-related mercury to the environment via POTW effluents and SSI emissions is estimated as **0.4 tons Hg/yr.**