Amalgam Containment and Recycling: Attaining Zero Mercury Discharge in Dental Office Wastewater
Legislation:

- Regulations Effective December 31, 2013

- Amalgam Separator; installation and operation; Requirements.
  - Removal Efficiency of not less than 95%.
  - “Dentists who install and use a holding tank and do not discharge amalgam waste.”
  - EPA Federal Proposal

- 3 options: Filter, Collector, Containment.
  - “Holding tank,” means a closed, watertight, sealed structure designed and used to receive and store wastewater. Holding tanks are designed and constructed for ultimate disposal of collected wastewater at another site.
  - Dentists who install and use a holding tank and do not discharge amalgam waste.

- Dental offices are the single largest source of Mercury that enters the Publicly Owned Treatment Works (POTW); they remain the single largest source of Mercury in wastewater.
ISO Certification
ISO Certification

- International Organization for Standardization (ISO) 11143:2008

- Separators target solids.

- They are designed to meet an ISO particle standard.

- They are designed to capture 95% of the solids by weight, not total Mercury, some solid Mercury can still get through as well as all of the Ionic Mercury (Mercury dissolved in the water.).
3rd Party Testing

- State Regulation needed this.
- A Containment system is The Dental Advisors highest rated product EVER!

- Containment does not require any maintenance from the dental office. It is the only hands off system.
  - The **ONLY** requirement of the office is to check the Site tubes weekly. These site tubes indicate the fullness of each tank. If they see any fluid they call the containment company who work with the office to fix the problem.

- Containment Systems are the only system on the market that captures 100%.

- WWTP’s prefer a containment system over the competition because it does not put anything into their city water supply.
  - Often times dentists do not get tested by the plants if they contain.

- 100% of dentists who have containment systems recommend them to others.
Filter/Collection System Research

- Do not capture Ionic Mercury, only solids.
- Fill up sooner than the 6-12 month time frame states.
  - Not annually as Section 9 – Cost of Technologies states.
- Life span of 3-4 years.
  - Over time the plastic deteriorates causing the need for replacement of entire unit.
- Clog Easy, making material flowing out of the system more concentrated.
- The power of new Vac systems can create too much suction (flow Rate) bypassing the filter all together.
- If dentist runs a Wet Vac system they still need to regularly replace the particle filter in front of the Vac.
- Return Shipping Process. To ship out for recycling full unit has to weigh less than 20 lbs. Unit Empty weighs 12+ lbs.
- Automatic Syphon Pump
- Some units are not completely enclosed when emptying allowing stench out into office and staff breathing it.
- Rely on Each office to maintain them Properly
- It is highly difficult to regulate proper maintenance
- Research Shows that long term this is not a cost effective solution.
- How these are “recycled”
Filter and Collection Testing

- Mission of Mercy City of Big Rapids tests.
  - Level of mercury in dental waste taken after a Filter based Amalgam separator.
    - Day 1: 37.7 ppm
    - Day 2: 52.2 ppm

- Collection based amalgam separator.
  - 8-10 hours of settling.
  - Level of mercury in dental waste:
    - 19-20 ppm

- Both of these systems release 200,000+ times the non-detect legal discharge limit.

- We are aware of other organizations that have conducted similar testing that support our findings.
Vacuum Systems

- **Wet Vac:**
  - Majority of Dentists have a system like this.
  - Replacement Filters
    - Weekly to Monthly Replacement
    - Some offices do it far less

- **Dry Vac:**
  - Usually in Larger and newer offices
  - Air/Water Separator
    - Drains daily
    - Flushes system regularly
HG Containment System
History

- The HG Containment system was invented in 2005.
- Since its creation, changes have been made to increase efficiency within the system.
- There are currently around 300 systems located in 4 states and growing.
“This system can guarantee 100% complete removal of all mercury waste”
How it works

• Based on the size of each office they determine what size system and office will need.

• There are 4 standard size tanks.
  • HG30
  • HG60
  • HG90
  • HG120

• There are also custom tanks based on office needs.

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Gallons of Amalgam waste collected in 60' days

SYSTEM SIZES
HG30 = 180 gallon!
HG60 = 180 gallon!
HG90 = 190 gallon!
HG120 = 120 gallon!

CUSTOM SIZES AND TANKS ARE AVAILABLE UPON REQUEST

RECOMMENDED HG CONTAINMENT SYSTEM
HG30" "HG60" "HG90" "HG120"
How it works

- All Tank sizing is based from a two month structure.
  - Contributes to Consistency of the water
  - Also helps the contents stay in liquid form.

- Established Routes Evacuate Tanks every 2 months.
  - The two tank containment system does not require a shut down to empty tanks.
  - The material pumped out is then recycled.
  - **CLEAN** (<0.0002 ppm) water is returned to the water system.
Facility
Recycling Facility

- Precious Metals Dental Waste Recovery Facility
- There is only one company in North America specifically Allendale, MI that is collecting 100% of dental waste and recycling the contents back to clean water.
- This company takes the dental waste recovered from the office extracts metals and other contaminants and eliminates the mercury from the water.
- Containment and recycling of the dental waste has in many cases allowed city municipalities to lift water testing requirements on offices with the AQ system.
- This Recovery Facility is run and supervised by a state licensed Waste Water Treatment Official.
Recycling Facility Process

- Process 1 – Collection of dental waste in large holding tank.
- Process 2 – Transfer to cone shaped precipitation tank.
  - Done with the induction of a specific chemical formulation solely for dental waste.
  - Initiating disinfection protocol.
- Process 3 – Filter Press
- Process 4 – Continued disinfection and oxidation.
- Process 5 – Filtration (Lower Micron Filter)
- Process 6 – Ultrafiltration using proprietary technology.
- Process 7 – Independent water testing before release of water.
Environmental Water Quality Impact

- There are no mercury discharges to the POTW.
- Level of mercury in dental waste with no amalgam separation:
  - 23 PPM
- Level of mercury in dental waste taken from recycled water:
  - <0.0002 PPM (non-detect EPA Method 245)
- In 2014 they recycled nearly 52,000 gallons of water:
  - 1 Gram of Mercury is enough to contaminate 20 acres of lake. Making the fish unsafe to eat. (www.WisconsinEnvironmental.org)
  - Saves almost 91,000 acres of lake from further Mercury contamination.
- As containment technology continues to more widespread use these numbers will only increase.
Environmental Non-Water Quality Impact

- Much less hazardous risk to dental workers.
- Recycling Dental wastewater
- Facilitate better and complete recycle of mercury in the waste industry.
- More complete recording of material contained and recycled.
- Working great with local POTW’s with their mercury minimization plans.
- The HG containment system makes a complete closed loop recycle and zero-discharge standard a reality.
Protecting the environment through green dentistry!