

Purves Environmental Inc.

Environmental Research and Consulting since 1993

Study Summary (Abstract): Independent Dental Separator Study (November 5, 2014)

Background:

Amalgam Separators were designed to remove amalgam from the environment and are effectively removing 99+% of the solid metal from the dental discharge. After an exhaustive study of dental office discharges at the street location (manholes), it became clear that very large quantities of mercury were still entering the environment (10 to 1,600,000 ng/L). **These numbers indicated that there was still an issue with mercury entering the environment.** This type of separation assumes that the remaining 1-5% of amalgam (equal to 3400 pounds of dissolved mercury annually) discharging into the environment is not an issue or a hazard. **The data below may change that assumption. In none of the separator studies performed by various states, academic and/or private companies are dissolved mercury examined.** Dissolved mercury is far more dangerous to humans and wildlife than mercury which is bound to solid particles. Dissolved mercury is more readily absorbed by humans and aquatic organisms than mercury bound to solids. Dissolved mercury is converted into Methyl Mercury in the body through normal biological processes. The Methyl Mercury formed is far more dangerous than elemental mercury to humans because it attacks the Central Nervous System (CNS).

Objective:

To determine the effectiveness of Amalgam Separators used to remove Mercury from the environment.

Method(s):

The premise of this study and research was to **accumulate data from operating systems and determine the best separation systems now employed to handle the mercury discharge. It is focused primarily on dissolved mercury.**

Results:

The rate of dissolution reduces over time as the water hits a saturation point. The change of pH from 7.0 will increase the dissolution rate. A pH less than 5 or greater than 9 may increase the dissolved mercury concentration substantially. The pH of the offices studied ranged in a pH of 6.8 to 8.0.

All of the separator manufacturers claim 6 months or more service life on the separator efficiency of 95% minimum. The samples taken for the study assumes that the separators and vacuum systems are maintained as recommended by the manufacturers. Most dental offices do not keep records regarding maintenance of their systems. In most cases they may know when the separator was last changed but system cleaning and maintenance is not available. In this small study, all of the dentist offices claimed the unit had been operating for at least 6 months. The following table is from dental offices that had separators in use for more than 6 months.

Table 3 Office	Total Mercury from the Separator in ng/L	Dissolved Mercury from the Separator in ng/L*	Separator Type
1	17,500,000	7,500,000	Hg5
2	7,290,000	2,530,000	Hg5
3	660,000	452,000	Hg5
4	534,000	378,000	Hg5
5	1,250,000	811,000	Medentex
6	10,200,000	5,210,000	DRNA
7	65,600	36,600	M.A.R.S Biomed

Conclusion(s):

A visual examination of the water from each of the separators demonstrated that the discharge of the water was cloudy with particulate. **The difference in the total to dissolved mercury content strongly demonstrates that not only do the separators not remove all mercury but a significant quantity of dissolved mercury is discharged to the environment.** Under the proposed EPA Guidelines for separators, the problem of mercury entering the environment will not be solved. **The separator in office #7 [M.A.R.S Biomed] is the only unit that is capable of removing both solid and dissolved mercury from the environment.** Their design provides the highest removal rate under normal operating parameters and treats both the total and dissolved mercury.