Wisconsin's Mercury Strategy & Monitoring

Wisconsin DNR identified problems with mercury in the environment as early as the 1970's and has issued fish consumption advisories covering all inland waters. DNR recognizes that to reduce mercury entering the environment, our strategy must cross traditional compliance program boundaries and include air, water, solid waste, and consumer products. Focusing on pollution prevention makes sense.

In May 1996, the Department published a strategy for addressing mercury in wastewater discharge permits that emphasized pollution minimization programs (PMPs) rather than permit limits. That strategy recognized that although we are able to measure mercury at less than 1 nanogram per liter using research methods, the practical aspects of controlling contamination during sampling may compromise our ability to consistently obtain reliable results at these low levels. By placing the emphasis on source identification and control, the focus for mercury analyses was on the influent to the treatment plant rather than the effluent. Mercury analyses with a detection limit of 20 ng/L were generally sufficient for this application. Ultra-trace mercury determinations (detection limits of 1 ng/L or less) were generally not required for characterizing effluents or surface water.

In late 2000, EPA approved method 1631 which is capable of quantifying mercury concentrations at the sub-nanogram per liter level. Since then, the Department revised its mercury strategy for wastewater and formalized it though rule-making. The strategy in s. NR 106.145, Wis. Adm. Code still emphasizes PMPs as a condition of obtaining variances to water quality limits but also requires permittees to test influents, effluents, and biosolids (sludges) for mercury. In addition to specifying the frequencies for monitoring, the sampling and analysis sections of the rule include data quality requirements. This rule gives flexibility in selecting the appropriate analytical procedure or detection limits as long as the mercury concentrations in the sample are quantitative or, if concentrations are below the quantitation limit, the procedure is capable of quantifying mercury concentrations to the lowest water quality criterion found in ch. NR 105. When this rule was published in October 2002, the lowest water quality criterion was 1.3 ng/L. Laboratories providing data in support of this rule must be recognized by the Department for their low-level mercury capabilities under the emerging technology provision in ch. NR 149.

How Much Mercury is Really Present in Our Waters?

All municipal wastewater contains some level of mercury. The concentration of mercury in influents to municipal wastewater treatment plants can vary widely depending on the size and types of discharges to the sewer system. Based on information collected a number of years ago, concentrations ranged from 100 to 800 ng/L (0.1 to 0.8 micrograms per liter). Sources include dental and medical waste, some consumer products (for example, broken thermometers), human wastes (e.g. urine), rainwater infiltration, flush-out of historical deposits in sewers, among others. The largest quantities of mercury are associated with the large plants simply because of their flow volumes. Since that influent data was collected, a number of communities have voluntarily initiated pollution minimization programs.

Due to its behavior, an extremely high percentage of mercury contained in wastewater becomes concentrated in treatment plant bio-solids (sludge). Thus, bio-solids concentration data are good predictors of which plants have elevated mercury loadings.

As detection limits have decreased, we have discovered just how prevalent mercury is in the environment. It is not uncommon to find concentrations of 3 to 5 ng/L in Wisconsin lakes or rivers, significantly above the 1.3 ng/L water quality criterion. We have even found mercury in some of the most pristine lakes in the state. In Lakes Michigan and Superior, mercury concentrations are less than 1 ng/L.

Where does it come from? Researchers attribute most of it to atmospheric deposition. In other words, mercury is not only in our lakes and rivers, but also in the air. This complicates the task of obtaining reliable sample results.