

Rock On

With Certified Systems

By Mark T. Unger

It's a lazy Saturday morning at the Unger house. Mom is at work, and she left me and the kids (ages 11, nine, seven and five) a giant list of chores to complete while she is away. The problem is, we do not have much enthusiasm or energy to get them done—so what do we do?

You guessed it: We head to the stereo and blast a little heavy metal to get us moving. The fast-paced riffs, frantic drum lines and angry vocals fuel us and become the soundtrack of our next few hours of dusting, vacuuming and straightening up the house. Whether it's energizing a lazy Saturday morning or getting fired up before the big game, I am a fan of heavy metal.

Many homes around the world have a different kind of heavy metal pumping through them. Unfortunately, there are no guitars, drums or angry vocals, but instead silent, invisible health hazards—like arsenic, barium, cadmium, chromium, copper, lead, mercury and selenium—that are found in the water supply. Consuming water contaminated with these heavy metals can bring potential health hazards, such as skin and hair damage, circulation system problems (numbness in extremities and high blood pressure), kidney and liver



problems, and even cancer.

These metals are naturally occurring but can enter water systems through pollution and even through the degradation of pipe and plumbing components. One thing is certain: If you own a home that has water contaminated with heavy metals or know someone who does, you are not a fan of heavy metal.

The good news is that homeowners have many options for point-of-use and point-of-entry filtration products that can protect them from these heavy metal nuisances—but this also can leave them with many questions. How do they know the manufacturer websites and product packages are not just telling them what they want to hear? How do they know the

reduction claim on the box was not based on a special test in a lab that does not apply to most water supplies? These questions are not easily answered, but ensuring that the product you buy is certified to NSF/ANSI Standard 53 can offer peace of mind.

Heavy Metal Reduction Claims

NSF/ANSI Standard 53 - Drinking Water Treatment Units Health Effects is the industry standard for filtration systems that make claims

for the reduction of heavy metals. This standard contains detailed protocols to establish reduction capacity and performance of filtration systems. These protocols were created with consideration to the various types of water supplies across the U.S., and build safety factors into the designs of systems to ensure that public health and safety are not compromised.

I would like to focus on the challenge water used for testing products designed to make heavy metal reduction claims. Table 1 illustrates the challenge water concentrations used for the test protocols, as well as the maximum effluent concentration allowed to make the various heavy metal reduction claims in NSF/ANSI 53.

The maximum effluent concentrations listed in the table all are less than or equal to the maximum contaminant levels (MCL) established in the U.S. Environmental Protection Agency's (EPA) National Primary Drinking Water Regulations. Products that can reduce a heavy metal to below its MCL over the life of the filter help instill confidence that safe water is coming out of a consumer's tap.

One confusing note about filtration systems certified to NSF/ANSI 53 (and the other drinking water treatment standards, for the most part) is that the manufacturer of the system requests which reduction claims it wants tested for certification. Products may or may not be tested against the entire battery

Understanding the science behind heavy metal filtration certification

Table 1. Heavy Metals Testing Influent & Effluent Concentrations

Contaminant	Influent Challenge Concentration (µg/L)	Maximum Effluent Concentration (µg/L)
Arsenic V (Pentavalent)	50 or 300*	10
Arsenic III (Trivalent)	50 or 300*	10
Barium	10,000	2,000
Cadmium	30	5
Chromium VI (Hexavalent)	300	100
Chromium III (Trivalent)	300	100
Chromium (Total)	300 (150 of each species)	50 (for each species)
Copper	3,000	1,300
Lead	150	10
Mercury	6	2
Selenium	100	50

*For marketing purposes, the standard allows for a choice of influent challenge depending on the intended end use of the filter. Note that the allowable effluent concentration remains 10 µg/L regardless of the influent concentration.

of regulated metals; it is really up to the manufacturer to decide whether the filter is designed to reduce a specific metal and whether it is a marketable claim. A system certified only for cadmium does not mean it has failed the other metals tests or that it is inferior to a product that has two, three, four or even all 11 metals claims.

A product with more certified claims does provide assurance that, if all of the claimed metals are contaminating your water, you will be protected. The simple takeaway is that a product with a reduction claim (or claims) has been tested and successfully passed the requirements of NSF/ANSI 53 for that claim (or those claims).

Water Condition Considerations

EPA National Secondary Drinking Water Regulations recommend allowable limits for many contaminants that cause taste and odor issues. One of these recommendations is the range for pH—6.5 to 8.5—that is typical across the U.S. Contaminants like regulated metals behave differently in various water conditions. For example, a heavy metal is found in an ionic (or dissolved) state at pH 6.5, but can begin to take a particulate form as the pH reaches 8.5.

This poses a problem for filtration systems designed to reduce regulated metals from a water supply. A system made up of metal sorbent and/or cation exchange media may reduce lead in the ionic form, but allow all or some particulate lead to pass through and render the water unsafe to drink. For that reason, systems evaluated for heavy metals reduction claims are tested at both the pH 6.5 and 8.5 versions of the test. Only filters that pass both pH challenges are able to make a certified claim.

The challenge water used for testing goes beyond the metal of concern and the pH of the water. Individual metal challenge water (with the exceptions of arsenic III and V) has specific ranges and/or limits for alkalinity, hardness, polyphosphates, total dissolved solids, temperature and turbidity. The challenge tanks for arsenic reduction require monitoring for magnesium, calcium, nitrate, silicate, phosphate, temperature, turbidity, free available chlorine (for arsenic V only—its presence is used to keep the arsenic from reducing to the arsenic III state) and dissolved oxygen (for arsenic III only—if dissolved oxygen is present, arsenic III is oxidized to arsenic V). These influent characteristics are

controlled throughout the chemical reduction test.

If heavy metals are present in a home's water, a system certified to NSF/ANSI 53 can reduce those metals and ensure the only heavy metal pumping through the house is coming from the stereo speakers. The Water Quality

Assn. can help in determining what is in a home's water and which products are certified to help achieve safe drinking water.

Stay tuned for next month's column, when we will delve into how these filtration products are tested and sampled according to NSF/ANSI 53. *wqp*

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