

PVC PIPE ASSOCIATION TECHNICAL BRIEF

LEACHING OF VINYL CHLORIDE MONOMER (VCM): NOT AN ISSUE FOR AWWA PVC WATER PIPE

Polyvinyl chloride (PVC) is produced from vinyl chloride monomer (VCM) through a process known as polymerization, where VCM is transformed into a white powder called PVC resin. Polymerization is a one-way reaction that has the same effect as frying an egg: once it is fried, it cannot change back. As a result, PVC resin does not revert back to VCM.

VCM REDUCTIONS IN PVC RESIN MANUFACTURING

In the 1970's, it was determined that VCM was a hazardous material. As a result:

- The U.S. Occupational Health and Safety Administration (OSHA) placed restrictions on occupational exposure to VCM.
- The U.S. Environmental Protection Agency (EPA) established limits on VCM emissions.
- The North American PVC industry redesigned its manufacturing processes to reduce VCM exposures and emissions.

LEACHING AND VCM IN DRINKING WATER

In the pipe industry, "leaching" is the migration of a substance from inside a pipe wall into the conveyed liquid. In order for PVC pipe to be used for potable water applications, the trace amounts of residual vinyl chloride monomer (RVCM) in the pipe material must not be leachable to the EPA-specified maximum allowable concentration (MAC) of $2\mu\text{g/L} = 2$ parts per billion.

NSF LETTER ON STANDARD 61 CERTIFICATION

A letter written by NSF in 2011 describes their drinking-water certification program:

NSF/ANSI Standard 61 "Drinking Water System Components – Health Effects" was developed in 1987 at the request of the U.S. EPA. The purpose was to establish health-based maximum contaminant limits for chemicals migrating from products that contact public water supplies. The standard covers all types of materials used in drinking water systems (including PVC).

VCM is mentioned as follows:

Vinyl Chloride Monomer: All PVC pipe, fittings and materials are tested at least twice per year for residual vinyl chloride. Samples are selected randomly by NSF auditors during unannounced inspections of each production facility. Levels of RVCM must pass the toxicology evaluation.

[Click here](#) for a copy of the letter.

NSF STANDARD 61 - MORE STRINGENT THAN EPA REQUIREMENTS

For PVC pipe to be certified, residual VCM measured in chemical-extractant testing of the pipe must be below 0.2 parts per billion. This value is one-tenth the allowable level set by the EPA. In effect, certification to NSF 61 applies a safety factor of 10:1 to the EPA requirements.

LEACHING OF VCM NOT AN ISSUE FOR PVC WATER PIPES

Not only does PVC pipe meet the requirements set by the EPA and by NSF Standard 61, but it consistently tests "Non-Detect" for vinyl chloride monomer per the Agency for Toxic Substances and Disease Registry.

A recent Environmental Product Declaration for PVC pipe, certified by NSF International, confirms the safety of PVC water pipe. The EPD states:

No known chemicals are released into the water system. No known toxicity effects occur in the use of the product.

The subject of VCM leaching from PVC water pipe is raised periodically by competitive materials. This is an unfounded allegation, since VCM migration is not an issue for PVC pipes.

References: "Environmental Product Declaration for PVC Water and Sewer Pipe," NSF International (2015); "Health Effects Monitoring of PVC Pipe and Fittings," Brown, J. (2011); "Life Cycle Assessment of PVC Water and Sewer Pipe and Comparative Sustainability Analysis of Pipe Materials," Sustainable Solutions Corporation (2017); NSF Standard 61 "Drinking Water System Components – Health Effects," NSF International (2015); "Toxicological Profile for Vinyl Chloride," Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services (2006).