Maximum Importance

The maximum use level is a key component in chemical certification

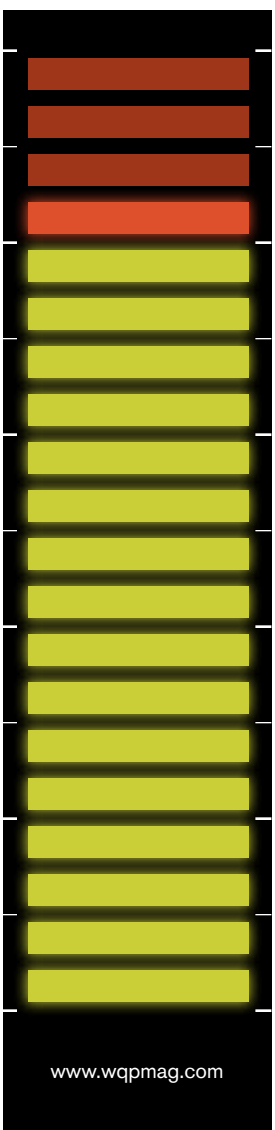
By Amanda Dail

One of the most important aspects of testing and certifying drinking water treatment chemicals to NSF/ANSI Standard 60, the standard for health effects, is the maximum use level (MUL) to which the chemical is certified. The MUL can be compared to the maximum lightbulb wattage on a lamp, established to help prevent a fire hazard, or the weight and chest size ranges on a life jacket, important ratings to help prevent drowning. Dosing treatment chemicals above the MUL may result in long-term negative health impacts to consumers of the finished water product.

NSF/ANSI 60 establishes minimum health effects criteria for direct additives, i.e., the treatment chemical itself as well as its potential contaminants. As defined by this standard, the MUL is "the maximum concentration of a direct additive that has been found to be acceptable under this standard. This refers to the total quantity used in the process train, regardless of the number of application points." The MUL, expressed as milligrams chemical per liter of water, is a required marking of the standard, and if it is not present on the product container itself, it must be on documentation accompanying the product.

Determining the MUL

The MUL for a product is proposed by the certification candidate and frequently is based on the typical use level, the total dose historically used for a product in actual practice. The suggested MUL must be compared with established regulatory values, published risk assessments or available toxicological data for the product and the chemical constituents of the product, with consideration for the total number of potential sources for the chemical. The MUL for a blend of certified treatment chemicals is limited by the MUL of each individual ingredient and its ratio in the final product.



The MUL also is the basis for the evaluation dose used by the certifying laboratory for testing of the chemical for concentrations of chemical and formulation-specific contaminants. The chemical product typically is overdosed, i.e., the chemical is diluted to a strength greater than the MUL based on a multiplication factor, usually 10 times. The prepared solution is analyzed, and once contaminant concentrations are determined, they are normalized to "at-the-tap" levels using the MUL. The concentration for each detected contaminant at the MUL is compared to the single product allowable concentration (SPAC), a limit determined by toxicological effects to human health and the total number of potential sources of the contaminant in treatment and distribution systems. The SPAC frequently is 10% of the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) or Health Canada maximum allowable concentration, but can vary based on the number of sources and availability of regulatory levels.

Interpreting the MUL

If a chemical is dosed at a level greater than the MUL, it could result in one or more contaminant being present

in the finished water at levels greater than the MCL designates as safe. For example, a 12.5% sodium hypochlorite product has an MUL of 65 mg/L, and the concentration of bromate imparted to the finished water based on test results is expected to be 3.2 µg/L. The SPAC for bromate is 3.3 µg/L. If this 12.5% sodium hypochlorite product was dosed at 84 mg/L, a dose equivalent to 10 mg Cl_2/L on a dry basis, the bromate concentration imparted to the finished water would be approximately 4.1 µg/L, more than the SPAC. In the case of bromate, the SPAC is 30% of EPA's MCL of 10 µg/L due to the limited number of expected sources. Therefore, in this example, other sources of bromate, such as ozone disinfection, combined with the bromate contributed from the sodium hypochlorite in excess of the SPAC, could result in a total level of bromate greater than the MCL.

When procuring drinking water treatment chemicals certified to NSF/ANSI 60, it is important to ensure the MUL is available on the product container or documentation and to dose accordingly. The MUL should be verified with each shipment, as the product may change over time. Changes in raw materials, suppliers and/or the manufacturing processes can impact the final product, requiring reassessment and

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potential changes to the MUL. When selecting a new source for a chemical, verifying the MUL is equal to or greater than the MUL for the currently utilized source will help ensure the new chemical can be dosed the same as the previous chemical without imparting unhealthy levels of contaminants into the treated water.

The MUL of a certified drinking water treatment chemical is an important use rating, and is the basis for certification to NSF/ANSI 60 for chemicals intended to be added directly to water. The MUL and the manufacturer's use instructions should be carefully followed to help ensure the minimum health effects requirements for the chemical are met. The certification is no longer valid if the chemical product is not used in accordance with the MUL. The current MULs for certified drinking water treatment chemicals can be verified in the online certification directories of American National Standards Institute-accredited certifiers. WQP

Amanda Dail is staff engineer for UL LLC and represents UL on the NSF Joint Committee on Drinking Water Additives – Treatment Chemicals. Dail can be contacted at amanda.p.dail@ul.com.