

within the distribution system, (3) have the plan approved by the Primacy Agency, and (4) implement the plan as approved by the Primacy Agency. Minimum components of the management plan would include periodic scheduled flushing of all dead end pipes and storage vessels through which water is delivered to customers, and hydraulic flow control procedures that routinely circulate water in all storage vessels within the distribution system.

EPA believes that the BATs proposed for wholesale systems are not appropriate for consecutive systems because each of these BATs, when applied to water with DBPs, raises other concerns. GAC is not cost-effective for removing DBPs. In addition, dioxin, a carcinogen, may be formed during GAC regeneration if GAC has been used to adsorb chlorinated DBPs. Nanofiltration is only moderately effective at removing THMs or HAAs if membranes that have a very low molecular weight cutoff and very high cost of operation are employed. Therefore, GAC and nanofiltration are not appropriate BATs for consecutive systems.

### 3. Request for Comment

EPA requests comment on the proposed BATs including the BAT for consecutive systems.

#### *G. MCL, BAT, and Monitoring for Bromate*

##### 1. What Is EPA Proposing Today?

EPA is proposing today that the MCL for bromate for systems using ozone remain at 0.010 mg/L as an RAA for samples taken at the entrance to the distribution system as established by the Stage 1 DBPR and as provided for under the risk-balancing provisions of section 1412(b)(5) of the SDWA. EPA's proposal is consistent with the recommendation of the Stage 2 M-DBP Advisory Committee, which considered the potential that reducing the bromate MCL could both increase the concentration of other DBPs in the drinking water and interfere with the efficacy of microbial pathogen inactivation. In addition, as required by the SDWA and as recommended by the Advisory Committee, EPA will review the bromate MCL as part of the 6-year review process and determine whether the MCL should remain at 0.010 mg/L or be reduced to a lower level. As a part of that review, EPA will consider the increased utilization of alternative technologies, such as UV, and whether the risk/concerns reflected in today's proposal remain valid.

Because EPA is not revising the Stage 1 DBPR bromate MCL, EPA is not proposing a revised BAT for bromate. The Stage 1 DBPR BAT for bromate is defined as control of ozone treatment processes to reduce production of bromate. EPA also determined that it was not necessary to regulate bromate in non-ozone systems that use hypochlorite.

Finally, EPA is proposing to modify the criterion for a system that uses ozone (and therefore must monitor for bromate) to qualify for reduced bromate monitoring from one sample per ozone plant per month to one sample per plant per quarter.

##### 2. How Was This Proposal Developed?

a. *Bromate MCL.* Bromate is a principal byproduct from ozonation of bromide-containing source waters. As described in more detail later, making the bromate MCL more stringent has the potential to decrease current levels of microbial protection, impair the ability of systems to control resistant pathogens like *Cryptosporidium*, and increase levels of DBPs from other disinfectants that may be used instead of ozone.

EPA estimates that the 1 in 10,000 excess lifetime cancer risk level for bromate is 0.005 mg/L. EPA proposed and ultimately finalized an MCL of 0.010 mg/L in the Stage 1 DBPR, primarily because available analytical detection methods for bromate could only reliably measure to 0.01 mg/L (USEPA 1994b). Analytical methods for bromate are now available to quantify bromate concentrations as low as 0.001 mg/L. Due to the availability of lower detection methods for bromate, as part of the Stage 2 M-DBP Advisory Committee deliberations, EPA considered revising the MCL to 0.005 mg/L or lower.

As a disinfectant, ozone is highly effective against a broad range of microbial pathogens including bacteria, viruses, and protozoa. Moreover, ozone is one of the few disinfectants available in water treatment that is capable of inactivating *Cryptosporidium*, a protozoan which can cause severe intestinal disorders and can be deadly to those with compromised immune systems. The oxidizing properties of ozone are also valuable for treatment objectives like control of tastes and odors and removal of iron and manganese. In contrast, chlorine, the most common disinfectant and oxidant in water treatment, is substantially less effective for controlling *Cryptosporidium*. Chlorine dioxide, while capable of providing low levels of inactivation for *Cryptosporidium*, typically cannot be used at high doses

without violating the MCL for chlorite, a byproduct of chlorine dioxide. UV light is highly effective against *Cryptosporidium* and *Giardia* and most viruses, but has not been used extensively to treat drinking water in the United States.

As of early 2000, there were 332 plants of various sizes using ozone (Overbeck 2000) and 58 plants that were planning to install ozonation (Rice 2000—personal communication: email 7/14/2000). A significant percent of current ozone plants use ozone for some portion of their disinfection objective (Rice, 2000—personal communication: email 7/14/2000). An ozone system that could not meet a 0.005 mg/L bromate MCL would have three primary options: decrease the ozone dose; switch to a different disinfectant; or install an advanced filtration process such as membranes, sometimes in combination with the first two options. Of these three options, the third is likely effective but very expensive, while the first two create the risk either of reducing microbial protection for a wide range of microbial pathogens, or of increasing formation of DBPs other than bromate.

In an attempt to achieve a lower level of bromate, some systems might be driven to reduce the applied ozone dose to the minimum necessary for regulatory compliance or switch to other treatment processes. Many systems currently achieve more disinfection than is required by the SWTR and if a system were to simply lower the ozone dose, protection from pathogens may be compromised. In addition, since inactivation of *Cryptosporidium* requires much higher ozone doses than *Giardia* inactivation, systems cannot achieve *Cryptosporidium* inactivation with low ozone doses.

If a system were to lower the ozone dose and supplement with an additional disinfectant, or switch entirely to a different disinfectant, the system may not achieve the same level of microbial protection as is afforded by ozonation. Also, other potentially harmful byproducts from the different disinfectant would be produced.

During the Stage 2 M-DBP Advisory Committee discussions, the TWG evaluated the impact of reducing the bromate MCL from 0.010 mg/L to 0.005 mg/L as an annual average. The TWG concluded that many systems currently using ozone or predicted to install ozone to inactivate microbial pathogens would have significant difficulty maintaining bromate levels at or below 0.005 mg/L. In the Information Collection Rule survey of systems serving greater than 100,000 people, all of the ozone plants had annual average