

Problem

Trihalomethanes (THMs) and Haloacetic Acids (HAAs) are disinfection by-products of chlorination in drinking water. The compounds are produced when chlorine reacts with Natural Organic Matter (characterized as NOM and commonly referred to as DOC (Dissolved Organic Matter) or AOC (Assimilable Organic Carbon)) in water. Typically, the greater the DOC present in the water, the greater the chlorine demand, the greater the THM and HAA formation potential. Color in water is typically caused by organic material and indicates the formation potential for high levels of THMs and HAAs. Therefore, removing NOM (TOC or DOC) and color will reduce the THM and HAA formation potential and reduce chlorine demand.

Solution: Remove TOC/DOC

The solution to reduce the THM formation potential is to **remove** TOC/DOC in the water supply prior to chlorination. A critical requirement when removing the TOC in water is to not increase the AOC (Assimilable Organic Carbon - a measure of the microbial regrowth potential and biofilm formation in the distribution line). Technologies such as Ozone should not be used as it reduces the molecular weight of the NOM, which increases AOC, which increases THM and HAA formation potential.

Method: Reducing THM & HAA Formation Potential

The method is to filter out the TOC/DOC using Purifics **Cuf** (Ceramic Ultra Filtration) process, which reduces THM and HAA formation. This also reduces the chlorine demand in the water supply. Coagulants such as Ferric Chloride, Alum or ACH are added directly into the **Cuf** to coagulate the majority of the TOC/DOC. **Cuf** readily removes and highly concentrates the TOC/DOC from the water supply without the need for flocculation. The **Cuf** process significantly reduces the TOC, reduces the chlorine demand and drastically reduces THM and HAA formation potential. The superior features, benefits and cost structures for **Cuf** are detailed in product sheet DOC3019.



Case Study: California

Cuf was applied in California to a potable groundwater containing high color and was compared to the existing process using Ozone/Carbon as shown in the table below. Ozone is used to bleach the color and does not remove TOC but does increase chlorine demand, THMs, AOC, and creates toxic bromate if there is naturally occurring bromide ion, which requires additional downstream treatment.

Parameter	Existing Ozone Process	Cuf Process
Color Removal (Spec 7 cu)	165 cu → 7 cu	165 cu → <5cu
TOC Removal	12 ppm → 11 ppm	12 ppm → 6 ppm
Chlorine Demand	12 ppm	4 ppm
TTHMs Formed (MCL 80 ppb)	40-50 ppb	0.7 ppb – 1.5 ppb
HAAs Formed (MCL 60 ppb)	10-30 ppb	2-3 ppb
Bromate (10 ppb)	80 ppb	Non-detect