ENVIROTECH

EnviroAqua CONSULTANTS INC.

BROMAX 7.1

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Water talk: Stabrom 909 and Bromax 7.1

Bromine based biocides provide effective, broad spectrum microbiological control, at a relatively quick kill rate, and at a low cost.

Chemistry

When Bromine gas is added to water, it generates hypobromous acid and hydrogen bromide, by the following action:

$$Br_2 + H_2O \rightarrow HOBr + HBr$$

It is the hypobromous acid (HOBr) that provides the effective general purpose biocide, especially when thepH is alkaline (8 to 9+).

Both bromine and chlorine react with nitrogen containing impurities like amines, urea, proteins and amino acids to form bromamines and chloramines. Chloramines (combined chlorines) are not as effective as biocides as chorine, so therefore, chloramines are typically considered undesirable, from a water treatment microbiological control standpoint. Thus when using chlorine to treat a system, we will often rely upon Free Chlorine readings vice Total Chlorine readings for chemical control. But Bromamines are very effective biocides, and so when controlling dosages we will typically control on the Total Bromine residual. The method most commonly employed is the DPD Method, which can be expressed as either chlorine or bromine. To convert from mg/L Chlorine to mg/L Bromine, multiply the chlorine reading by 2.25.

Stabrom 909 and Bromax 7.1

Single drum, liquid, stabilized bromines Bromine chemistry has been extensively used in cooling water applications for many years because of its effectiveness in alkaline waters. For many years bromine was only available in a solid tablet or crystal form, or it could be generated by ratio feeding a combination of sodium bromide with a source of chlorine such as sodium hypochlorite. Then after several attempts, manufacturers were able to manufacture a liquid stabilized bromine product in one drum.

EnviroAqua Consultants has carried Albemarle Stabrom 909 for several years. Until recently, this was the best option for a one-drum approach to stabilized bromine on the market. Now EnviroAqua Consultant has decided to bring on Envirotech's BroMax 7.1. Both, are registered microbiocides, approved for use in all of the standard cooling water applications our customers deal with. While Stabrom 909 and Bromax 7.1 are similar, we have found some advantages to the Bromax 7.1, and will be eliminating the Stabrom 909 from our line. The Stabrom 909 will be available until sometime this summer, at which time we will begin to phase it out. Please begin this phase-out process with your customers now, so that you do not run into supply issues in the future.

What is the difference between Stabrom 909 and Bromax 7.1?

Stabrom 909 and Bromax 7.1 have minor differences in composition, but they are essentially the same products in application. The obvious difference is that Stabrom 909 is 6.7% active (expressed as chlorine), while Bromax 7.1 is 7.1% active (expressed as chlorine). Aside from the higher activity, Bromax 7.1 also comes with a more competitive price. Overall the Bromax 7.1 price will be lower than the price for an equivalent package of Stabrom 909.

What are some of the advantages of stabilized bromine over other forms of bromine/chlorine?

- Liquid Stabilized Bromine exhibits better stability than bleach. At 80oF, a solution of 13% Bleach will lose more than 25% of its activity in the first 30 days, whereas only 1.0% of the Bromax 7.1 activity is lost. The rate of degradation increases with temperature, so that almost all bleach is degraded after 30 days at 100oF, whereas over 85% of the Bromax 7.1 remains in its active form.
- Bromax 7.1 is considerably less reactive with typical scale and corrosion inhibitors used in cooling water formulations than sodium bromide and bleach combinations. Ingredients such as AMP, HEDP and tolytriazole are readily degraded by sodium bromide, but stabilized bromine exhibits relatively little reaction with these ingredients.
- Stabilized bromine is less reactive to system contaminants that consume other oxidizing biocides such as organics, nitrogen-containing compounds etc. Therefore more of it is available to work against the micro-organisms you are treating for.
- Stabilized bromine is less toxic than bromine derived from

sodium bromide and chlorine. It has a toxicity reduction of 14.5x on daphnia, 2.6x on rainbow trout, 12.1x on sheephead minnows and 21.5x on mysid shrimp.
- Stabilized bromine reduces exposure risk. It is not a poisonous gas, does not cause dusting like tablets and is not a skin sensitizer like some nonoxidizers.
- Stabilized bromine is easy to feed. It comes in a ready to use liquid form, does not require a separate oxidant and does not require high maintenance feed equipment.

Bromax 7.1 versus Sodium Bromide & Bleach combination

One common method of feeding bromine is to feed sodium bromide (NaBr) in conjunction with sodium hypochlorite bleach (NaOCl). These two materials are fed to a common point where the NaOCl oxidizes the bromide ion to yield a mixture of hypobromous acid (HOBr) and hypobromite ion (OBr-). Many water treaters familiar with this technique indicate that there are several challenges:

1. This method requires two separate sets of pumps, tanks and injection points.
2. Many applications of this technique rely upon a special mixing chamber designed to facilitate the reaction of the two chemicals. This is then injected into the system.
3. If the two reactants are fed to the system separately, significant portions of the chlorine can react with system components prior to reacting with the NaBr. Corrosion rates can be problematic.
4. The NaOCl can react with organic water treatment anti-scalants and corrosion inhibitors, causing chemical overuse or failures in inhibitor packages.
5. NaOCl solutions deteriorate rapidly, and so delivery pumps must be continuously adjusted to compensate and ensure the correct proportions of reactants.
6. When ORP control is employed, exhausted concentrations of NaOCl cause rapid use of both reactants without the subsequent HOBr formation and biocidal action.

Bromax 7.1 versus Solid Bromine Donors (Hydantoins)

Another common method of feeding bromine is to feed them combined with hydantoins. These halogenated hydantoins are fed as tablets or granules. The most common form of hydantoin used is the BCDMH found in Halogene T-30. There are other, similar forms including DBDMH. These solid forms hydrolyze in water, releasing bromine in the microbiocidal active hypobromous acid form (HOBr). Many water treaters use these, and are familiar with common challenges:

1. Hydantoins are sparingly soluble. This causes the tablets to be very slow dissolving, leading to difficulties in providing sufficient halogen, quickly enough, for adequate microbiological control.
2. Many tablets lack physical integrity, causing dusting issues. This dusting can lead to problems with handling and exposure, as well as chemical control issues.

The disadvantages of both the dual component approach and the solid alternative leave room for a third chemical system that can overcome these limitations. Thus a single feed, liquid, stabilized bromine like Bromax 7.1 can be far more convenient and easier to use and control than the dual component approach, while providing quicker kill rates than common solid chemicals.

Bromax 7.1 is registered for use in:

- Commercial and industrial recirculating cooling water systems
- Cooling ponds and reservoirs
- Decorative fountains
- Air washers
- Industrial pasteurizers
- Heat transfer systems (such as evaporative condensers, once-through cooling water systems) Feeding of Bromax 7.1 stabilized bromine

Feeding:

- Can be fed using a peristaltic or diaphragm pump.
- Bromax 7.1 is an off gassing and, like bleach, can cause gassing problems in feed lines and pumps.
- To reduce gassing, reduce the length and increase the diameter of the suction line, use a pump with a degassing head, keep the suction line as cool as possible and the stroke adjustment as high as possible.
- The formulation is highly alkaline, and can cause the precipitation of calcium carbonate, if fed into a bypass line of a cooling tower (controlled in the alkaline range). Therefore feed Bromax 7.1 to the cooling tower sump, at a point of good mixing, or to the header where rapid dilution can occur.
- Theoretical dosage of 2 fl oz to 1000 gallons of water gives 3.4 ppm of total bromine. System demand will determine the actual dosage.
- For both slug feeding and continuous feeding, achieve a level of 1.0 to 15 ppm total halogen as Br2 , or as needed to maintain control.
- Dosages may vary based on system contamination.
- Monitor the program using the DPD total chlorine test. Use the total chlorine test to modify the dosage.

Other Considerations:

- Bromax 7.1 should not be mixed in its neat form with any other products such as bleach, stabilizers, strong acids, strong oxidizers, reducing agents, metals and organic materials and scale and corrosion inhibitors.
- Bromax 7.1 is compatible with PE & PP; PVC, Viton (PVDF), Teflon (PTFE) & Kynar; chlorobutyl rubber, vinyl tubing; Derakane 411-45 and 470-36; Hypalon and Titanium.
- Bromax 7.1 is incompatible with steel, including stainless, copper & brass, polyurethane, neoprene, nylon, Plasite 9570, silicone rubber, Buna-N rubber and EPDM.
- Its storage life is 6-12 months if stored at room temperature.

How does it compare in cost to other biocides?

- It is slightly more expensive, on an active basis than chlorine, hydantoins, bromine derived from a two-drum approach, but it has considerable advantages to these products.
- It is less expensive than almost all non-oxidizers.

CONCLUSIONS

- Bromax 7.1 is a more cost-effective offering than Stabrom 909, which should round out your product line.
- Use it in systems that require a simple one-drum liquid product.
- Bromax 7.1 is Highly Effective, Simple to use, Flexible and Safe.

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