ASOPE Newsletter

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Keep in Mind Winter Safety!

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Proper Use of Bromide in a Cooling Water Treatment

By David Daniels

Cooling systems that operate under alkaline conditions often use a combination of commercial bleach and sodium bromide to create hypobromous acid. This acid is much more effective than bleach under alkaline pH conditions. However, the misapplication of these chemicals can cause much of the bromide to be wasted. If the two chemicals are reacted properly and fully utilized, plants could reduce their dosages and/or frequency of treatments, saving chemicals and money. One utility was spending over $200K per year on bromides.

Figure 1. Improper application of biocides can result in biofouling.

First, it is important to know something about how bleach is manufactured. Commercial or industrial bleach is commonly purchased in strengths from 10% to 15%. It is manufactured by bubbling chlorine gas through a sodium hydroxide solution. Excess hydroxide is maintained in the final bleach solution to increase the stability of the bleach. Typically, a commercial bleach solution has a pH of 11 to 13. Under these conditions, all the hypochlorite in solution is in the form of hypochlorite ion.

When the concentrated bleach is diluted, it reacts to form hypochlorous acid. The percentage of acid that forms when the bleach is added to the coiling water depends on the pH of the cooling water. The percentage of hypochlorous acid formed at various pHs can be seen in Table 1.

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pH	% Hypochlorous Acid	% Hypobromous Acid
6.5	95	100
7.0	90	100
7.5	50	94
8.0	24	83
8.5	9	60
9.0	3	33
9.5	0	11

Table 1. Percent of HOCl and HOBr at various pH Levels.

It is only in the acidic form, as hypochlorous acid, that the bleach is a potent biocide. The acidic form penetrates the cell membrane and interferes with a variety of cellular processes, killing the cell. Whereas, the hypochlorite ion, apparently never makes it into the cell where it can do damage.

However, the hypochlorite can react with any number of other organic and inorganic compounds including metals. If the cooling water contains amines or ammonia, chloramines are formed. These consume hypochlorite and thus increase the amount of bleach required to produce the desired results. Chloramines have been shown to be poor biocides.

Hypobromous Acid to the Rescue

Hypobromous acid, HOBr, is also a very potent biocide, acting in a similar way to hypochlorous acid; however, it is a weaker acid and therefore remains in its acidic form at a higher pH. Thus, HOBr is much more effective as a biocide at the higher pH.

As can be seen in Table 1, hypobromous acid is still in the acidic form between a pH of 8.0 and 9.5 whereas the percentage of hypochlorous acid remaining in the same pH range is very small.

In ammonia and amine-containing waters, hypobromous acid has the added advantage that the bromoamines formed are much better biocides that chloramines. Hypobromous acid and hypobromite ion is considered less stable than bleach. A potential decomposition product of HOBr is bromate (BrO_3). Bromate is a carcinogen and regulated at a rate of 0.01-ppm in drinking water.

While there are forms of stabilized hypobromous acid (Nalco's Stabrex® is one) and other hypobromous acid-generating chemicals for sale (i.e., BCDHM), typically hypobromous acid is generated on site and used immediately by combining bleach and sodium bromide.

The formation of hypobromous acid from bleach is not as simple as mixing the two concentrated chemicals together. To rapidly form hypobromous acid from bleach and bromide, you must start with hypochlorous acid.

Hypobromous acid cannot be generated in a reasonable amount of time from the hypochlorite ion; the kinetics are far too slow. The good news is that even slight decrease in pH, to say 9, is sufficient to increase the reaction kinetics to a range where flow through a static mixer and a few feet of piping should be adequate to complete the reaction.

Furthermore, there is a limit to the amount of sodium bromide that can be activated by bleach. Research shows that the maximum amount of bromide that can be activated by bleach is approximately 2500-ppm as Cl2.

The preferred bleach/bromide mixing arrangement for optimum bromide usage is to dilute the sodium bromide solution with cooling water (ensuring mixing through a static mixer) then add bleach and mix with a second static mixer. The bleach and bromide flow rates should be set to produce a total halogen level of 1000-ppm to 2000-ppm.

A complete set of instructions regarding the proper setup for adding bleach and bromide can be found at www.wateradditives.com. Look under the LiquiBrom® chemicals for more detailed instructions or contact M&M Engineering for assistance in properly configuring your biocide treatment program.

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DOE Signs Cooperative Agreement for New Hydrogen Power Plant

Hydrogen Energy California to Construct IGCC Plant for Clean Power

Washington, D.C. — The U.S. Department of Energy (DOE) has signed a cooperative agreement with Hydrogen Energy California LLC (HECA) to build

and demonstrate a hydrogen-powered electric generating facility, complete with carbon capture and storage, in Kern County, Calif. The new plant is a step toward commercialization of a clean technology that enables use of our country's vast fossil energy resources while addressing the need to reduce greenhouse gas emissions.

HECA, which is owned by Hydrogen Energy International, BP Alternative Energy, and Rio Tinto, plans to construct an advanced integrated gasification combined cycle (IGCC) plant that will produce power by converting fuel—a blend of 75 percent coal and 25 percent petroleum coke—into hydrogen and carbon dioxide (CO_2). The hydrogen will be used to fuel a combustion turbine, enabling net generation of 250 megawatts of electricity, enough power for more than 150,000 homes.

Approximately 90 percent of the CO_2 produced from the gasification process, or about 2 million tons per year, will be transported via pipeline to the Elk Hills oilfield, less than four miles away. There it will be sequestered in the same underground formations that have trapped oil and gas for eons. By choosing oilfields as the CO_2 injection site, oil production will be increased in a process known as enhanced oil recovery (EOR), and the CO_2 will be safely sequestered from the atmosphere. According to the California Governor's Office, "This project . . . will not only create green collar construction jobs, but it will avoid greenhouse gas emissions and further propel us toward a clean energy future."

Still other benefits will be realized from the new-concept plant:

- The proposed plant will maximize use of non-potable water for its power production needs, preserving California's limited fresh water sources.
- The EOR operation will enable additional domestic oil production, which contributes to our national energy security.
- The new plant will boost the local economy by creating 1,500 construction jobs and 100 permanent operational positions.

The project is part of the Clean Coal Power Initiative (CCPI), a cost-shared collaboration between the federal government and private industry to increase investment in low-emission coal technology by demonstrating advanced coal-based power generation technologies prior to commercial deployment. The project will be cost-shared and administered by DOE's Office of Fossil Energy and the National Energy Technology Laboratory.

The estimated capital cost for the project is approximately $2.3 billion. The federal cost-share is limited to $308 million, or just under 11 percent of the total project costs. The project consists of three phases: project definition (phase I), design and construction (phase II), and demonstration (phase III).

Sequestration of 2 million tons per year of CO2 is slated to begin by 2016.

Supplied By the Department of Energy

Limited EPA Study finds Low Level of Concern in Samples of Recycled Tired from Ballfield and Playground Surfaces

WASHINGTON - The U.S. Environmental Protection Agency has released results of a limited field monitoring study of artificial-turf playing fields and playgrounds constructed with recycled tire material or tire crumb. The study was intended to gain experience conducting field monitoring of recreational surfaces that contain tire crumb. EPA will use the information to help determine possible next steps to address questions regarding the safety of tire crumb infill in recreational fields.

“The limited data EPA collected during this study, which do not point to a concern, represent an important addition to the information gathered by various government agencies,” said Peter Grevatt, director of EPA’s Office of Children’s Health Protection. “The study will help set the stage for a meeting this spring, where EPA will bring together officials from states and federal agencies to evaluate the existing body of science on this topic and determine what additional steps should be taken to ensure the safety of kids who play on these surfaces.”

Recycled tire material, or “tire crumb,” is used in many applications, including as a component in synthetic turf fields and playground installations. In response to concerns raised by the public, EPA conducted a limited “scoping study” of tire crumb, which consisted of collecting air and wipe samples at three locations near EPA laboratories at Raleigh, N.C., Athens, Ga., and Cincinnati, Ohio. Sampling also was conducted in the Washington, D.C. area.

The limited study, conducted in August through October 2008, found that the concentrations of materials that made up tire crumb were below levels considered harmful. However, given the limited nature of the study (limited number of constituents monitored, sample sites, and samples taken at each site) and the wide diversity of tire crumb material, it is not possible, without additional data, to extend the results beyond the four study sites to reach more comprehensive conclusions.

The study confirmed that most of the methods tested were accurate, reproducible and appropriate for measuring concentrations of tire crumb constituents and therefore can be used in future studies.

Study findings

- Particulate matter, metals and volatile organic compound concentrations were measured in the air samples and compared with areas away from the turf fields (background levels). The levels found in air samples from the artificial turf were similar to background levels.
- No tire-related fibers were observed in the air samples.
- All air concentrations of particulate matter and lead were well below levels of concern.
- More than 90 percent of the lead in the tire crumb material was tightly bound and unavailable for absorption by users of the turf fields.
- Zinc, which is a known additive in tires, was found in tire crumb samples. However, air and surface wipe monitoring levels of zinc were found to be below levels of concern.

EPA is aware that studies by other agencies were undertaken or completed while this survey was under way. EPA is planning a 2010 meeting with federal and state agencies to review all new study data and determine next steps.

Supplied By the Department of Energy

I thought because of the large number of schools we work with this would be an interesting article. LGT.

Winter Safety

Employees who work outside in the Winter have a number of challenges, from just staying warm to dealing with brittle tools. And those who drive for their jobs need to use a whole new set of techniques to navigate safely.

Over the years employers have also noticed that their employees are missing more and more time from work due to "off-the-job" accidents. Many of these accidents occur during the winter, as employees do things that they are not familiar with or haven't done since last year. Fortunately, most of these accidents can be prevented.

MARCOM's updated DVD/video program on "Winter Safety" shows employees how to plan ahead, look for potential hazards and avoid dangerous situations that occur during the Winter season... whether they're on or off the job.

Topics covered in the program include:

- Dressing for cold weather.
- Working in the cold.
- Walking and driving in ice and snow.
- Holiday activities (decorating, parties, alcohol consumption).
- Christmas trees (selecting, transporting and setting up).
- Using string lights, extension cords and outlets safely.
- Fires, fireplaces and chimneys.
- Using candles.
- Fire extinguishers

Marcom's updated DVD/video program is currently available in English only. An updated Spanish program will be released in 2010. In the meantime, our existing Spanish program is still available.

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ASOPE Crossword Puzzle 0110

http://asope.org/ASOPE Crossword 0110.html