

Q&A | August 21, 2014

A Beginner's Guide To On-Site Sodium Hypochlorite Generation

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Why buy, transport, and store chlorine when you can make your own? Here are nine questions to consider before adopting the practice.

Chlorine is a wonderful, life-saving chemical. It may be taken somewhat for granted today, but chlorine's arrival more than a century ago really did herald a revolution, and it's still going strong. Of course, the use of liquid and gas chlorine also has its drawbacks, including the ongoing repurchase expense and a variety of safety concerns associated with transport and storage.

For many water and wastewater facilities, on-site sodium hypochlorite generation (SHG) may be the best option. This article provides answers to common questions that would be part of any good decision-making process, such as: What are the benefits and suitable applications for an on-site generator? How does it compare to the alternatives? What are the labor and equipment requirements, and how much does it all cost?

I posed these questions to Bob Rebori, president of SCIENCO/FAST, a division of Bio-Microbics, Inc. Along with such companies as Evoqua Water Technologies, MIOX Corporation, Process Solutions, Inc. (PSI), and Severn Trent Services, SCIENCO/FAST is typically on the short list for any operator/engineer considering on-site SHG. The various companies and systems feature distinguishing characteristics to be vetted and explored, but the following Q&A should provide clarity on whether or not SHG is a worthy pursuit for your facility.

What are the advantages of generating sodium hypochlorite on site vs. conventional methods of transporting storing chlorine?

First of all, chlorine gas can be dangerous and expensive. For years, the chlorine disinfection in large municipal water and wastewater plants utilized canisters of chlorine gas, which the process can explode and harm operators. Big canisters of gas have also been a concern with regard to terrorists, who could potentially detonate them in densely populated areas.

Produced on-site for a fraction of the cost of traditional sanitizing products, the SciCHLOR® Generator assures that you will never run out of product or have ongoing/growing freight costs. It takes four truckloads of liquid chlorine to equal one truckload of salt [the prime component for SHG]. And then there's the environmental



impact, should any of those four trucks leak out into the environment.

So safety and cost are two big things, and a third advantage is that it's on-demand. You're only generating the required amount.

What are the applications for on-site sodium hypochlorite generation?

The predominant application is for drinking water, since the world standard is to chlorinate before you send water through a public delivery system. As you know, chlorine has a residual that continues killing things that might enter into the distribution system as the water is delivered to the community.

It's the same for wastewater. If you're using chlorine for disinfection, this is cheaper and easier than gas ... and, again, on-demand.

The third application is for dairies. Sodium hypochlorite sanitizer solution is an excellent product for a wide range of dairy farm animal hygiene applications. As a foot bath, using the solution as a topical solution for hoof treatment will reduce copper sulphate usage by 50 to 75 percent. Applied as a foam udder prep product for pre- and post-milking, the sodium hypochlorite is fast-sanitizing and effective against a wide range of mastitis-causing organisms. Another is agriculture; when they harvest the produce, they spray it right away with a chlorine-based disinfectant to kill any mold or insects. If you can generate it on-site, you can recoup the costs of the SHG system in just a few years.

Some other applications would be for the disinfection of food service equipment, for large commercial laundry services, or for commercial swimming pools.

What are the concerns with on-site SHG?

The solution produced from the SciCHLOR Generator has demonstrated superior bacteria-killing ability and has a wide range of applications. However, a lot of operators are already used to what they know, and they may not want to adopt a new or replacement system in their facilities.

Another concern, depending on the type of SHG system, is the cleaning of the electrolytic cells. It can be quite a chore for older,

more complicated SHGs, but that's not the case with the new SciCHLOR.

How do SHG systems work?

Salty water is sent through an electrolytic cell, which has positive and negative anodes, to create an electronic conversion of water to liquid chlorine, or sodium hypochlorite.

There are several ways you can do that. Most SHG systems have a large bank of cells. The water leaves a brine tank, goes to a large bank of cells, and is converted, for the most part, all at once. There is a lot of heat and gas that's created; it's a severe conversion process with a lot of electricity.

We don't do that. We use smaller cells, which are less expensive and use less electricity. The Electro-Chemical Activation (ECA) process of the SciCHLOR system passes a saline brine solution through the electrolytic SciCELL® unit to generate the sodium hypochlorite. This electrochemical energy conversion is environmentally responsible and produces a highly active, meta-stable sanitizing solution. We recirculate the water for four hours — back into the brine zone, back through the electrolytic cell — until we build up the chlorine concentration that's ideal. We do this four times a day. The cell is designed to be scoured while the water is circulated, so there's less scaling and buildup. And because there's less heat, it reduces the scaling and buildup even further.

We also make an environmentally friendly descaler that's easy to apply into the cell on a regular basis, as opposed to disassembling the cell, descaling, and reassembling the cell.

What are the complete training, equipment, and installation requirements?

Most plants already have their own delivery system, i.e., chemical pumping for whichever disinfectant they're using. Retrofitting is as simple as setting up the machine and hooking it up to a delivery pump to replace the existing system.

Some of our bigger wastewater plant installations, up to 160,000 GPD, have been performed without any cranes or heavy lifting. You can literally lift them out of the container by hand, slide them into the tanks on boards, push them into place, and bolt things together.

The amount of training depends on the complexity of running the specific SHG system. Our company specializes in simplicity. Some other systems have a little more complexity to them in terms of the settings on the control panel, etc. We try to dumb ours down, so to speak, so that you're just choosing between light, medium, or dark toast. It's not nearly as complicated as taking liquid chlorine or gas canisters and trying to dose for disinfection.

What about other disinfection alternatives, such as ozone or UV?

Ozone is expensive, and UV doesn't have the required chlorine residual. UV is often an okay choice for disinfection of wastewater, but it's really not a solution for disinfecting community drinking water due to that lack of residual. UV systems work better after relatively clean water systems, like membrane bioreactors (MBRs).

They really don't like dirty water because it prevents the UV transmittance, and they don't like hard water either because it scales over on the quartz sleeve.

Ozone, besides being expensive, will react with other things in the atmosphere, potentially causing problems for valves and other parts of the water delivery and storage system. I do think that someday ozone will have a lot more capability than it does right now. There are people working on some clever systems, in my opinion.

How effective is on-site-generated sodium hypochlorite as a disinfectant?

The hygiene testing that was completed in 2013 with an 800-ppm sample FAC (free available chlorine) produced from the SciCHLOR Generator killed 100 percent of the Staphylococcus aureus and Escherichia coli (E. coli) organisms within 30 seconds. The proven ECA technology destroys both structural and enzymatic proteins in prokaryotic cells, and has been found to be effective against a wide range of microorganisms such as Listeria monocytogenes and Salmonella enterica (a major concern in poultry facilities), among many other harmful pathogens.

As a strong oxidizing solution, it's a very fast-killing and effective biocide that has been proven to kill a wide spectrum of bacteria and viruses more efficiently, safely, and economically than other disinfection methods. In most water treatment and hygiene applications, a fast kill is important.

How scalable is SHG?

Our smallest unit starts at 10 pounds per day (4.4 kilograms) of sodium hypochlorite, and I think most other SHG manufacturers start at 40 or 50 pounds per day. For our smaller models, like our 10, 20, 40, and 60-pound models, we provide molded systems that are all-inclusive — the brine tank, the sodium hypochlorite tank with the electrolytic cells, and a control panel. The 60-pound unit (27 kilograms) would serve a water plant running roughly 4.8 MGD.

For larger applications, most engineers specify dedicated brine tanks to feed separate banks of electrolytic cells. We make those [brine tanks] at SCIENCO/FAST as well.

How much does SHG cost?

Well, I'll give you the "suggested retail price" of our 60-pound unit, which is \$61,100.

I think the greatest thing that people underestimate, however, is the labor aspect. You've got contractors that are trying to get the job on price, and so they're trying to bring in a lower-cost piece of equipment, regardless of the cost of maintenance and so forth.

Unfortunately, long-term costs are often overlooked at a treatment plant. Not just on sodium hypochlorite generators, but on everything.

Does on-site sodium hypochlorite generation seem like a logical next step for an industry increasingly geared toward efficiency, sustainability, and safety?

We say yes.