

# Sustainable Water Disinfection

By Beth Kennedy

**B**ased on technology that has been around for decades, onsite generation of chlorine and other oxidant species is achieved by applying an electrical current to a solution of food-grade salt and water. While onsite generators (OSGs) also are used industrially and commercially to provide disinfection for swimming pools, cooling towers and sanitation for clean-in-place operations, the largest application of OSG technology is in municipal drinking water disinfection.

## Safe, 'green' onsite chlorine generation

Many water municipalities are moving away from more traditional chlorine delivery systems such as chlorine gas, concentrated sodium hypochlorite and bulk calcium hypochlorite, turning instead to OSG systems as a safer, "greener," more cost-effective disinfection method.

### How It Works

Incoming water first goes through a softener, then splits into two lines. One line flows directly into the electrolytic cell where the electricity is applied. The

other is used to fill the brine tank. This tank stores a concentrated salt solution that is injected into the softened water stream entering the electrolytic cell.

The electrolytic cell, where the oxidant is produced, is the heart of any OSG. Electrolytic cells consist of two electrodes—the anode and cathode—arranged so that both make contact with the mixed water and brine solution. When the OSG is activated, a voltage is applied to the cell so that current flows through the cell, causing chemical reactions to take place at the surfaces of both electrodes that eventually produce the disinfectants.

Once the oxidant solution leaves the electrolytic cell, it is stored temporarily in an oxidant tank until it is metered into the water being treated. A byproduct of electrolysis, hydrogen gas also is produced inside the electrolytic cell, and the hydrogen is safely removed from the cell and oxidant storage tank through vents.

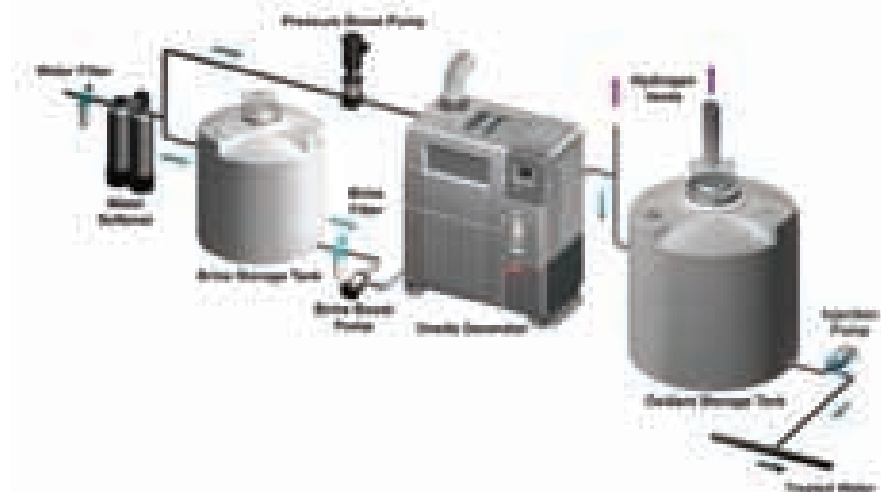
Benefits associated with onsite generation include improved operator safety, environmentally greener applications and cost savings.

### Improved Operator Safety

Traditional chlorine-based methods of water disinfection can pose a variety of safety concerns to the operator. Chlorine gas is probably the most hazardous—and most common—source of chlorine used by water treatment plants. First used in World War I as a weapon, chlorine gas is a powerful, toxic irritant to the respiratory system. Another common form of chlorine used for disinfection is industrial-strength sodium hypochlorite, bleach, a 12.5%-by-weight solution, which is caustic.

OSG systems use only water and salt and produce nontoxic, noncaustic oxidant solutions with a chlorine content that typically contains less than 0.8% free

Figure 1. Onsite Process Generation Flow



available chlorine. Compared to those using traditional forms of chlorine disinfection, treatment plants that use OSG systems typically face less oversight from state health agencies, require less safety training for operators and have less of an insurance liability issue.

#### Greener Applications

Onsite generation is a more sustainable option compared to traditional chlorination methods. Transporting just salt instead of chemicals to the treatment plant reduces carbon emissions. For example, it can take more than four deliveries of 12.5% sodium hypochlorite solution to produce the same amount of chlorine as one delivery of salt. Reducing transportation requirements reduces the carbon footprint of the plant because less fossil fuel is needed to supply it with disinfectant. Additionally, onsite generation eliminates the waste of empty chemical containers.

#### Cost Savings

Because it is unnecessary to continuously purchase expensive chlorine chemicals, OSGs typically produce chlorine at a much lower

cost than traditional delivery methods. Additional savings are realized by decreased safety-related and transportation costs, including potentially lower insurance premiums. Although OSG systems may present a significant upfront capital equipment cost, most water plants realize a return on their investment in OSG equipment within two to three years. [www](#)

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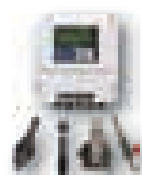
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