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# CONNECTION



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## RIDING FOR THE BRAND



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# The Evolution of the Iron Soft Plus Series Self-Sanitizing Water Conditioner

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Issue Contributor

The new ISP Series now available to Culligan dealers was literally eight years in the making. Water-Right's Sanitizer Series was the basis of the next generation self-chlorination water treatment system. Developed for you, this system has all the features of the current system with an enhanced electronic package. The following article was the development process of the self-chlorinating Sanitizer unit, which led to the ISP Series.

The symptoms are known by water treatment professionals and homeowners alike. A foul smell from the tap that lasts for a minute or two, a slimy coating on the inside of toilet tanks and/or unsightly stains on plumbing fixtures. This can be not only an unwanted occurrence, but can represent an unhealthy one as well. These conditions can be signs of iron and/or sulfur bacteria at work within the water system. Though they can occur in any system where bacteria has been introduced into the plumbing, it is considerably more common with well systems where water is vulnerable to contamination at several points, including the ground or the well itself. Unlike municipal settings, the water in these cases may not have been treated prior to entering the home.

In working with health officials in Wisconsin, Water-Right studied water from rural wells and corresponding household plumbing to come up with a solution. We discovered contamination at different times, in both well and the household point-of-use (POU) sources. Interestingly, we also found bacterial contamination at these sources, while the water at the point-of-entry (POE) tested clear.

This was an important discovery. It meant that even a limited introduction of bacteria to the water entering the home allows bacteria to remain and grow in the household plumbing system. The filtering action of water treatment medias within residential water softeners proved to be a source as it was acting as an incubator for bacterial growth.

Chlorination of the media bed would be a viable solution. (See Figure 1, next page) However, resin medias used in most water softeners becomes unstable when exposed to chlorine for extended amounts of time. State officials are already warning manufacturers against the sale/use of chlorine generators in combination with any softener utilizing a polystyrene resin media. One agency cited that "the cross-



linking of synthetic resins is destroyed at an accelerated rate when exposed to free chlorine”.

In addition, other existing means of chlorinating residential water systems have been anything but user-friendly. They can require constant mixing of dangerous chemicals along with use of mechanical devices that may be prone to failure or in need of constant attendance. We felt that these didn't represent the “technological” solution homeowners needed.

Part of the “technology solution” was already in our midst. Water-Right has used a manmade silica crystal as a softener media for the last thirty years, marketed today as Crystal-Right, manufactured by Mineral-Right, Inc. (See side bar). This is the only media of its kind in use today. This multi-purpose crystal media not only removes high amounts of iron and manganese while softening water, it is also impervious to chlorine. In fact, it readily absorbs free chlorine during the regeneration cycle, and washes clean during backwashing.

Through the input of our product development team and state agencies, additional criteria evolved to define the ultimate solution. The chlorine generator needed to operate only during the regeneration cycle when brine was drawn into the media tank. It had to generate a sufficient amount of chlorine to sanitize the media bed, yet not an excess that could possibly produce a harmful amount of chlorine. And it had to remain in the media bed a sufficient amount of time to be effective in destroying iron and sulfur bacteria. (See Fig. 1)

Based on some of the same technology used today in Europe, a device was designed next that could produce chlorine directly from the brine solution using an electrolysis process. This device, known as the chlorine generator, utilizes a set of anode and cathode rods charged by a 9-volt, 900-mA current to free chlorine from the brine solution. Testing showed the distance between the rods directly affected the amount of chlorine generated. Once the ideal position of the rods was

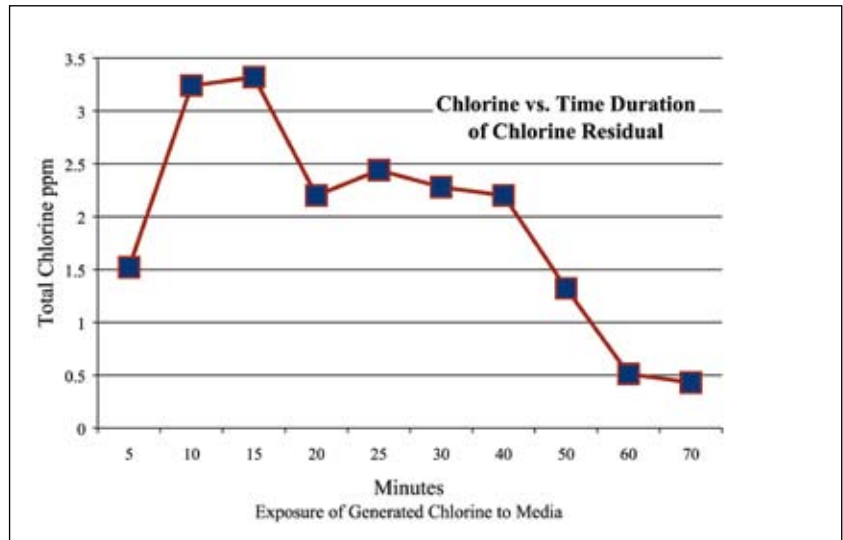


Figure 1

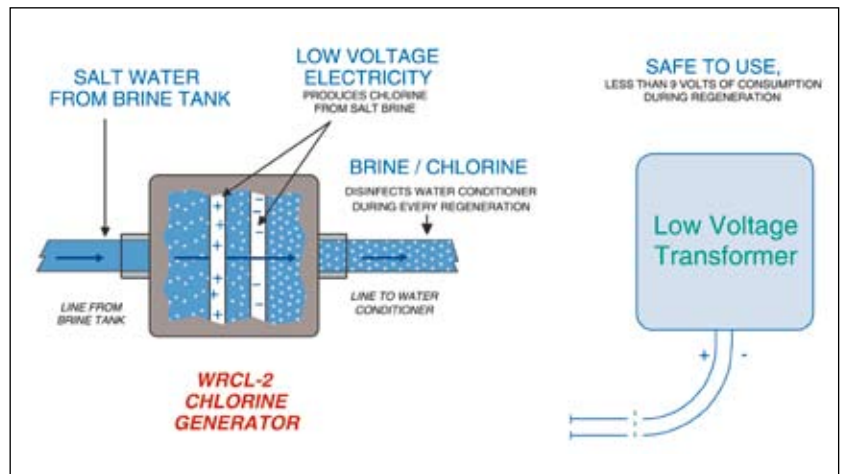
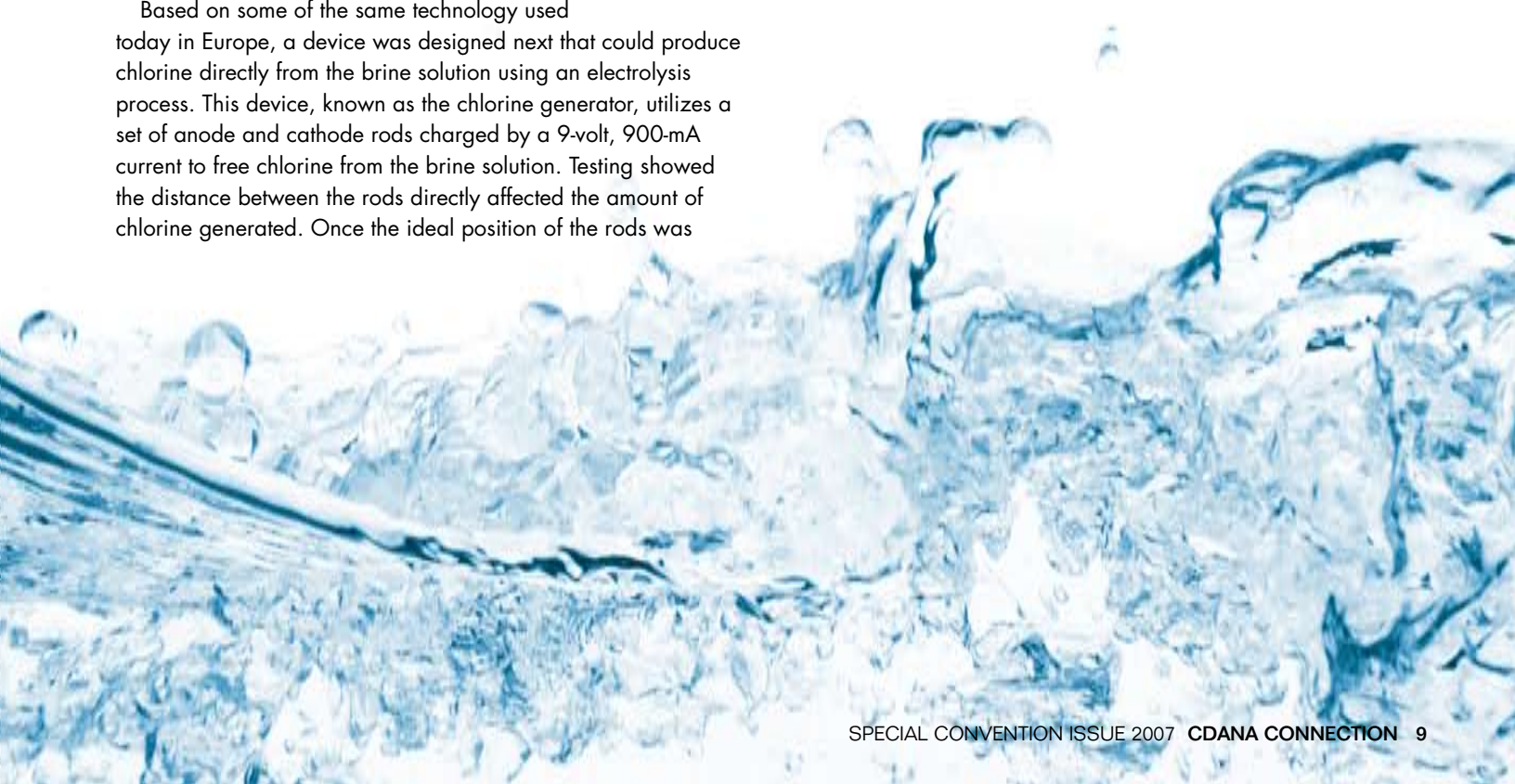


Figure 2



determined, it remained a constant. DC current also proved to be more efficient in generating chlorine than any AC device tested. In addition, the 9-volt DC (VDC) was a "safe" current for use with consumer products. (See Fig. 2)

The brine solution provided a ready source of chlorine. During testing, we concluded that the "free" chlorine generated in-line was more effective in sanitizing the media bed than other types of added chlorine. Though not scientifically proven, it was speculated that the effectiveness of external chlorine additives was diminished somehow through contact with air and other substances prior to actually reaching the media bed.

It was determined that over 20 parts per million (ppm) chlorine generated in a standard 10-inch diameter media tank could be harmful. Less than this was considered insufficient in sanitizing the media bed. Tanks this size typically have an injector rate of approximately a half-gallon per minute (gpm). With the added water from the injectors, chlorine enters the softener tank at 8 to 10 ppm. Exposure time to the media bed is about 60 minutes – again, a calculated time necessary to achieve proper sanitizing.

Government officials also requested that the softener provide a fail-safe warning against system failure – either failure to regenerate or any timer/cycle failure that might cause the system to "stick" in the regeneration cycle and continue generating chlorine indefinitely. These were all "control" criteria. No existing water softener control in the industry had the ability to meet these control requirements. The next piece in the "technological solution" puzzle was still missing.

Voltage decrease during regeneration is directly proportional to the amount of chlorine produced. Thus, if voltage drops far enough, not enough chlorine is being generated (brine solutions

of less than 20 percent will not produce enough chlorine to sanitize the media bed). This indicates a problem. In most instances, lack of brine would be the cause of the problem (usually from low salt in the brine tank). An indicator warning light was added to the control head to alert homeowners. The light indicates to the owner that the chlorine generator isn't working and the brine will be too weak to soften the water during the next regeneration without adding salt to the system.

Since water softeners sit unseen in basements, garages and outside of homes, an additional warning device was added. An audible chirp was added to the control system that would remain active until the user resets the system by unplugging/replugging the power cord.

The control valve operates under 24 volts. The chlorine generator uses 9 volts. A custom step-down transformer supplies power for both needs. This transformer meets UL, CE and other electronic approvals. The entire softener system uses a typical transformer module that plugs into the home's 110-volt AC outlet. The control circuitry board is now patented.

Although this sanitizing technology is relatively new, we have learned a great deal from our efforts and application. The initial Sanitizer offering was not without its problems. Technical "glitches" were overcome in the proceeding months and years. Today's ISP System is a reflection of that development time.

Properly engineered, self-chlorinating systems which contain the Crystal-Right media have a definite benefit and place in your product offering. With over 60,000 sanitizing units treating hardness, iron and manganese along with the associated bacteria and odors in use throughout the world since 1999, the statistics speak for themselves.



**Mineral-Right, Inc.**, a manufacturer of sodium aluminosilicates located in Phillipsburg, KS, was originally a Culligan-owned company. These silicates, manufactured in the early 20's by Emmett Culligan and Fred Lindsay (brother of Lynn Lindsay of Lindsay Company, now Ecowater.) were the first "conventional" water softening medias ever manufactured. It was these materials upon which both companies were founded. Arizona Minerals was purchased by Glenn Gruett and family in 1985, moved to Phillipsburg, KS and renamed Mineral-Right. The company continues to produce medias for the water treatment industry, specialty cartridge manufacturers, petroleum industries and the medical fields.