

Technology for Water Treatment



WATER MANAGEMENT TECHNOLOGY THAT OFFERS EFFECTIVE PURIFICATION, DISEASE PREVENTION AND MAINTENANCE SAVINGS HEADS A SELECTION OF SPINOFFS IN PUBLIC SAFETY

In the United States there are an estimated 500,000 water cooling towers, employed by industry, hotels, office buildings, hospitals, universities and other activities to remove excess

heat from heat exchangers and air conditioning/refrigeration condensers. Tower tanks and plumbing must be kept clear of "scale" and corrosion, and free of such pollutants as algae, viruses and bacteria.

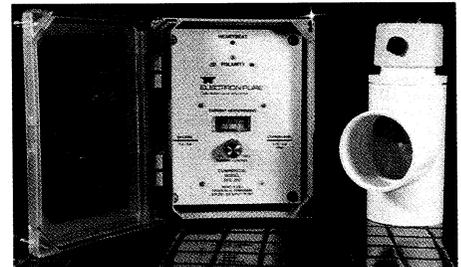
There are, in addition, countless swimming pools, spas, decorative fountains, ponds and other water facilities that must similarly be cleansed. Until recently, the standard method of controlling pollution was by use of chemical disinfectants. But stricter government rules regarding discharge of chemicals into public water supplies, and attendant increased cost of compliance with environmental rules, have sparked growing interest in non-chemical water treatment systems.

NASA technology offers two different, highly effective approaches to cleansing water facilities without use of chemicals. A number of companies have acquired licenses from NASA to use these technologies and provide chemical-free water management systems and services for the broad and growing market.

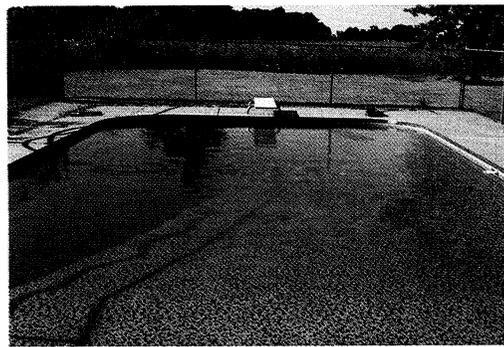
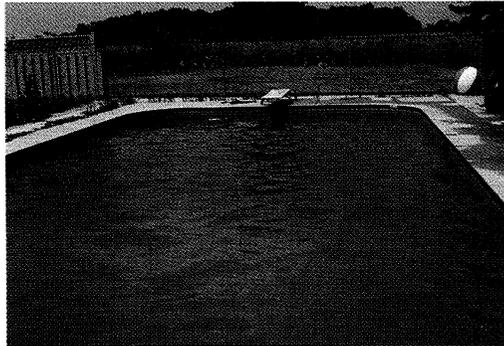
One of the NASA technologies is based on the use of ozone to reduce biological growths and provide corollary benefits of corrosion and scale control, plus water and energy savings; that type of system is detailed on pages 112-113. The other method is based on a mid-sixties development by Johnson Space Center: a small, lightweight electrolytic generator that dispensed silver ions in the potable water supply of the Apollo spacecraft and thus eliminated bacteria in the water.

The Automatic Pool Sanitizer produced by Electron Pure®, Ltd., Cookeville, Tennessee is an example of the latter type of system. The basic Automatic Pool Sanitizer

This 650,000 gallon pool at the University of Tennessee (Knoxville) is kept clear of algae, bacteria and odor by the Electron Pure water management system shown at right. The system is a commercial model derived from technology developed for NASA's Apollo lunar spacecraft in the mid-sixties.



These before/after views attest to the efficacy of the Electron Pure Automatic Pool Sanitizer. In the upper photo is a clearly polluted residential pool in Lansing, Michigan; in the lower photo is the same pool three days after the spin-off ionization system was installed.



consists of two copper/silver electrodes placed in a chamber mounted in the recirculation system of a pool or spa or other water supply. A microprocessor sends signals to the chamber to dispense ions of copper and silver as the water passes through the chamber. The copper destroys the algae, eliminating the need for a chemical algicide; the silver kills the bacteria, eliminating the need for chlorine.

Electron Pure manufactures a number of different models of the Sanitizer ranging from the SPA-1000, which treats up to 1,000 gallons of water in residential hot tubs or spas, to the EPC-500, designed for commercial pools containing as much as 500,000 gallons. The company also produces customized units for any size body of water, including cooling towers with several million gallons capacity.

In addition, the company manufactures the Hydro Cooling Tower Conditioner (HCTC), which combines the Electron Pure ionization system with a Superior® Water Conditioner, along with a pump, a centrifugal solids separator and a timer. The HCTC prevents formation of scale and corrosion in cooling towers and removes any existing scale buildup. It offers exceptional savings in water usage while eliminating algae and bacteria and operating free of maintenance and free of chemicals.

Electron Pure was formed in 1988 to exploit the copper/silver ionization technology and the company has experienced impressive growth in a short time. There are now more than 100 Electron Pure distributors in the United States and others in 20 foreign countries serving hotels, universities, hospitals, boat builders, theme parks, YMCAs, industrial customers and thousands of residential pool owners.

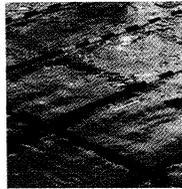
The company has a file of testimonials from satisfied customers. A sample, from the chief engineer of Cookeville General Hospital, Cookeville, Tennessee: "This system will provide a saving of about \$3,500 a year in chemical cost, eliminate the hazard of handling the toxic water treatment material, and stop the dumping of spent chemicals into the sewer system." ● (Continued)



Electron Pure president Dennis Ivey (left) and Cookeville (Tennessee) General Hospital chief engineer Carmel Lee examine the clarity of the water from the hospital's 700-ton cooling system.

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Technology for Water Treatment (Continued)

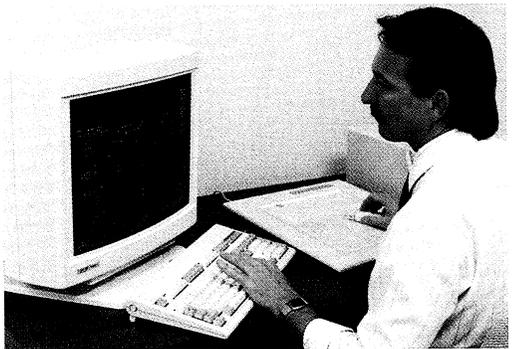


Although the technology was not fully developed, ozone has been used for more than 100 years to treat drinking water and wastewater. It removes odor, prevents mold, mildew, fungi and algae growth, and eliminates LDB (Legionnaires' Disease Bacterium) and other bacteria.

In the late 1970s, NASA's Jet Propulsion Laboratory (JPL) conducted a research program investigating the potential of ozone as an alternative to chemicals for treating cooling water towers; JPL was particularly interested in ozone's ability to prevent buildup of scale and corrosion, the most costly maintenance problems in cooling tower operation. JPL successfully developed a non-chemical system that not only curbed scale, corrosion, bacteria and algae but also offered additional advantages in water conservation, elimination of "blowdown" (toxic chemical discharge), improved cooling tower performance and operating cost savings.

In the JPL system, ozone — an electrically-charged form of oxygen — is produced from air or water by an on-site generator and introduced to the cooling tower water. As the ozone and water mix, organic impurities are rapidly oxidized. The dissolved ozone travels through the cooling circuit, where it "passivates" metal surfaces, attacks slime or bacterial deposits, removes scale and prevents its further buildup.

NASA patented this technology in 1980 and in subsequent years licensed a number of companies to market the technology commercially. Some of them are now experiencing rapid expansion as more cooling tower operators are turning to ozone-based water treatment under the impetus of rising chemical costs and more stringent environmental regulations concerning chemical discharges.



A National Water Management draftsman draws up plans for a cooling tower ozonation system. The company is a licensee for NASA-developed ozone-based water treatment technology.



Extensive testing of water samples in National Water Management's laboratory supports the company's ozonation of cooling towers.

An example is National Water Management Corporation (NWM), San Jose, California. NASA licensee NWM has installed its Ozone Advantage™ systems at some 200 cooling towers in more than 100 sites. The company estimates that its customers, many of them Fortune 1000 companies, will collectively save 350 million gallons of water and eliminate 500 million pounds of chemicals this year.

NWM has a number of success stories to tell. An example: the company was awarded a contract by Rockwell International's Digital Communications Division (DCD), Newport Beach, California to install Ozone Advantage systems at four DCD cooling towers. For the first six months of operation, savings — from elimination of chemicals, lower energy requirements, reduced water consumption and labor saved — amounted to \$96,000. DCD projected that cumulative savings for the first two years would top \$300,000.

"The cost of National Water Management ozonation system and services is no greater than the cost of multichemical water treatment," company literature states. "Ozonation also brings the added benefits of dramatic water savings and the elimination of chemical storage

and discharge, benefits that are becoming increasingly important in today's environmentally conscious world." ●

™Ozone Advantage is a trademark of National Water Management Corporation

National Water Management provides water treatment for these ammonia condensers at a Pillsbury Company food processing plant in Watsonville, California. It is estimated that the ozone-based system will save Pillsbury annually nine million gallons of water and \$87,000 in combined energy, water, chemical and manpower savings.



Another National Water Management installation, this one treating cooling tower water at the Everex electronics plant in Fremont, California; the ozonation system is shown at lower right.

