

TROJAN^{UV}[™]



ADVANCED WATER TREATMENT SOLUTIONS





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COMPANY BACKGROUND

From the water we drink and the wastewater we produce, to the processed water we use in our industries and in agriculture, *water is a precious resource* that touches every person on the planet in one way or another every single day.

As the world's population increases, so too does the demand for this commodity. Given the fact that only one per cent of the world's water is fresh water and that only a small percentage of that is drinkable, the challenges in *maximizing this resource* for current and future generations are abundantly obvious.

▶ **TROJAN TECHNOLOGIES – MATCHING NEW MARKETS WITH NEW SOLUTIONS**

For more than a quarter of a century, identifying key market opportunities and matching proven solutions to water-related environmental problems has been the hallmark of Trojan Technologies. Since 1977, the company has led the change to water disinfection systems that use environmentally responsible, cost-effective ultraviolet light in place of chemicals.

Today, Trojan is recognized around the world as the leader in advanced UV water treatment technology and is committed to aggressively leveraging its proprietary expertise in a growing number of key market sectors. These markets include municipal drinking water, municipal wastewater, environmental contaminant treatment and residential applications, as well as the ultra-purification of water used in food and beverage manufacturing, pharmaceutical processing, and semi-conductor applications around the world.

Trojan's success is evident in more than 4,000 municipal UV disinfection facilities operating in over 50 countries – the largest installed base of UV systems in the world.

As a wholly-owned subsidiary of Danaher Corporation of Washington, D.C., Trojan designs, manufactures and sells UV systems for municipal wastewater and drinking water facilities, as well as for the industrial, commercial and residential markets. The company also provides UV treatment for the removal of certain chemicals from water. Headquartered in London, Ontario, Canada, the company also has offices in the U.K., Germany, Netherlands, Spain, and the U.S.

Trojan services a growing customer base around the globe through an extensive network of dealers and representatives. This strong distribution network allows us to provide unparalleled levels of service and support to customers regardless of where they are located.



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COMPANY BACKGROUND

▶ MEETING CURRENT AND EMERGING NEEDS

All Trojan systems are designed to meet specific regulatory requirements around the world, including the U.S., Canada, Great Britain, New Zealand, Australia and Germany. In addition to meeting and exceeding these requirements, UV disinfection creates minimal by-products and is extremely safe for both UV system operators and the public.

Trojan's advanced manufacturing facilities ensure a high level of quality control at every stage of the process, from initial design to final installation. In 1998, Trojan received the ISO 9001-1994 designation – an internationally recognized model for quality assurance in design, development, production, installation and service.

▶ FIRST IN OUR FIELD

Recognized as being the most experienced and knowledgeable professionals in the industry, Trojan scientists and engineers have introduced many of today's global innovations in UV technology:

- The first application of UV technology to disinfect reclaimed wastewater to stringent limits
- The first incorporation of electronic ballasts into low-pressure UV lamp disinfection technologies
- The first commercially successful medium pressure UV lamp system (TrojanUV4000™) for high volume and lower quality wastewater treatment
- The first integrated chemical and mechanical cleaning system for both low and medium pressure UV lamp systems
- The first electronic ballast with extended control capacity for medium pressure UV lamps in any application
- The first underwater UV lamp testing facility in the industry
- The first large scale, monochromatic lamp-based UV system for the treatment of *N*-nitrosodimethylamine (NDMA)
- The first installation of UV-oxidation for the control of taste and odor-causing compounds and disinfection in municipal drinking water (Cornwall, Ontario, Canada)

Our track record for innovation has set us apart and with more than 180 Trojan patents granted or pending, we are well positioned to continue leading the way to safer, more efficient water disinfection techniques.



▶ MUNICIPAL WASTEWATER

Recognized as a safer, more cost-effective, and environmentally responsible alternative to chlorination, UV has become the preferred choice for wastewater disinfection.

Trojan UV systems offer municipal wastewater treatment plants a safe, practical, and economical alternative to chlorination. Today, Trojan has more UV disinfection systems in operation around the world than anyone else – treating more than 19 billion gallons a day (3 million m³/hr) – demonstrating the high regard in which Trojan's proven products and service are held in the industry.

TROJAN **UV**4000**PLUS**™

Our most advanced wastewater system, the TrojanUV4000Plus™ builds on the innovative design established by the original TrojanUV4000™ - the first commercially successful medium pressure, high-intensity UV lamp system specifically designed for handling high volume and lower quality wastewaters. Engineered and built for maximum dependability, the TrojanUV4000Plus™ incorporates automatic chemical/mechanical cleaning (ActiClean™) technology. The System is typically designed for municipalities with populations over 50,000.



TROJAN **UV**3000**PLUS**™

Designed using the latest UV technology, the TrojanUV3000Plus™ uses cost-saving amalgam lamps. These high output lamps are automatically dimmed when flow demand drops or when the water clarity increases. This feature significantly extends lamp life and reduces operating and maintenance costs. The TrojanUV3000Plus™, which also features Trojan's exclusive ActiClean™ chemical/mechanical cleaning system, is typically designed for municipalities with populations between 25,000 and 500,000.



► MUNICIPAL DRINKING WATER

Trojan offers the most advanced UV systems in the world for safeguarding drinking water from harmful microorganisms, including *Cryptosporidium* and *Giardia*.

UV offers a proven solution and safe alternative to chemical disinfection as a primary disinfectant, which can produce harmful by-products and UV also has the benefit of not compromising the taste, color or odor of water.

Trojan has quickly capitalized on this growth market. In fact, Trojan is proud to have been selected by the New York City Department of Environmental Protection (DEP) to be the supplier of ultraviolet (UV) drinking water disinfection equipment as part of New York's new Catskill/Delaware UV disinfection Facility. The current design calls for Trojan to supply 56 units, which will be capable of treating a total of up to 2.2 billion gallons per day, making this Trojan's largest project to date and the largest UV drinking water facility in the world. The UV system will ensure that bacteria and microorganisms in the water are rendered harmless, so they cannot cause disease. The treated water will be supplied to a population of over nine million people in the city and surrounding area.

Trojan was selected after a rigorous validation process including the design and manufacture of one full-size UV system, which underwent performance tests at an independent test facility. The New York City DEP also conducted an evaluation of the total life cycle costs of each proposed system, and found the Trojan system to be the most economical.

Trojan has also been selected to supply UV equipment for the largest UV installations in Canada (Victoria, Canada) and Europe (Rotterdam, Netherlands).

Not only are Trojan's Municipal Drinking Water contracts growing in scope and size, there is increasing diversity in how the innovative UV systems are being integrated with existing chemical and non-UV disinfection treatments. A key reason is that government legislation is changing the way communities look at safeguarding their drinking water supplies. Municipalities are responding by supplementing their systems with other forms of disinfection in a strategy known as "multi-barrier protection." Based on efficacy and environmental-safety, Trojan UV technology is extremely well positioned to continue capturing significant market share.

Another key consideration is cost. Trojan UV costs are about $\frac{1}{5}$ that of ozone disinfection and $\frac{1}{10}$ the cost of membrane filtration – the two key technologies competing with UV in the multi-barrier treatment market.

TROJAN UVSWIFT™

The TrojanUVSwift™ Municipal Drinking Water system provides a flexible platform that allows for upgrades to meet new or more stringent requirements, such as changes in flow rate, regulatory requirements, disinfection redundancy demands, or changes in intake water quality. With one of the smallest reactor dimensions in the industry, the TrojanUVSwift™ offers important cost advantages over other larger UV systems for retrofit applications in existing drinking water treatment plants as well as new plant construction.



TROJAN UVSWIFT™ SC

Originally designed for smaller communities (SC), the TrojanUVSwift™SC allows regions with flow volumes of less than 10 million gallons per day to safeguard their drinking water supply against *Cryptosporidium* and *Giardia* and other harmful microorganisms. Although the TrojanUVSwift™SC system itself is small, the market is significant – in North America, Europe and abroad. The advanced, high efficiency reactor of the TrojanUVSwift™SC outperforms other UV reactors by up to 30 per cent and is compact enough to retrofit into most existing drinking water supply lines. The TrojanUVSwift™SC has the added benefit of a lower capital cost than other disinfection technologies. It is also extremely affordable and easy to operate.



► ENVIRONMENTAL CONTAMINANT TREATMENT (ECT)

UV-oxidation has emerged as a powerful tool in the water treatment toolbox for the simultaneous treatment of environmental contaminants and disinfection. Because conventional treatment technologies often fail to remove emerging contaminants such as pesticides, taste and odor-causing compounds, and industrial contaminants from water, the application of UV-oxidation is growing rapidly. Carefully designed and optimized Trojan UV-oxidation systems for ECT cost-effectively destroy these compounds safely and efficiently on a large scale, while simultaneously disinfecting. In addition, to complement Trojan's UV solutions for ECT and through its subsidiary US Peroxide, Trojan also offers turnkey technology solutions and total chemical management programs for hydrogen peroxide and other plant chemicals. These programs and services are applied in wastewater collection, system odor/corrosion control, soil/groundwater remediation applications and industrial waste treatment applications.

Behind the growth of the ECT arena is a growing awareness of chemical contaminants in the world's water supply. Recent research has shown that a wide variety of potentially harmful contaminants exist at trace concentrations in streams, lakes, rivers, and groundwater throughout the world. These contaminants include both anthropogenic compounds such as industrial byproducts, pesticides, and pharmaceuticals and naturally-occurring compounds such as algae-bloom-related algal toxins and taste and odor-causing compounds. Many of these contaminants have both carcinogenic and endocrine-disrupting effects at extremely low concentrations. The market potential of utilizing ultraviolet (UV) light, often the only economical way to remove specific environmental contaminants, is significant. Trojan leads the way in harnessing UV light for the safe, effective treatment of environmental contaminants. Using UV technology, Trojan destroys micropollutants such as atrazine, trichloroethylene (TCE), *N*-nitrosodimethylamine (NDMA) and 1,4-dioxane in contaminated water. In doing so, Trojan works to both restore critical sources of drinking water through treatment and to enhance the water supply by playing a key role in the treatment of wastewater intended for indirect potable reuse. Trojan applies its UV solutions for ECT in a variety of growing markets, including:

- Drinking water treatment
- Water recycling and reuse
- Groundwater remediation
- Industrial discharge and process water treatment

Trojan offers the revolutionary TrojanUVPbox™ and the TrojanUVSwift™ECT for the treatment of environmental contaminants.

TROJAN **UV**PHOX™

The patent-pending TrojanUVPhox™ (**UV-Photolysis and Oxidation**) is a groundbreaking, pressurized reactor that utilizes Trojan's low energy, high output UV lamps. Through the extensive use of computational fluid dynamics modelling and other computer simulation tools, Trojan has optically and hydraulically optimized the reactor to provide extremely efficient and cost-effective UV treatment. Its unique design allows for the use of multiple reactors in series, giving it an extremely compact footprint. As an added benefit, the TrojanUVPhox™ provides disinfection as well, leading to further cost savings.

One of the premier indirect potable water reuse facilities in the world, operated by the Orange County Water District (OCWD) of Orange County, California, has installed the TrojanUVPhox™ as the UV solution for the treatment of NDMA in wastewater destined for aquifer recharge. When completed, the Groundwater Replenishment System will employ the largest quantity of UV treatment equipment ever assembled for one project to treat up to 100 million gallons per day of wastewater to a quality that exceeds drinking water standards.



TROJAN **UV**SWIFT™ECT

The TrojanUVSwift™ECT employs sophisticated controls to optimize the treatment of environmental contaminants. The broad light spectrum of light emitted in the TrojanUVSwift™ECT makes it extremely well suited for the treatment of certain contaminants, particularly some pesticides and taste and odor-causing compounds found in surface waters. It's ultra-compact footprint and large flow capacity makes it an excellent reactor for use as part of a multi-barrier system in large municipal applications (hundreds of millions of gallons per day). In such an application, the TrojanUVSwift™ECT destroys contaminants such as pharmaceuticals and taste and odor-causing compounds while providing disinfection of microorganisms such as *Cryptosporidium* and *Giardia*.

The PWN Water Supply Company in North Holland installed the TrojanUVSwift™ECT to provide a barrier to contaminants while providing disinfection. Completed in 2004, the 25 million gallon per day system is the largest UV oxidation drinking water facility in the world treating contaminants with UV light.



► INDUSTRIAL APPLICATIONS

Effective December 2, 2005, Danaher Corporation acquired Aquafine Corporation of Valencia, California. Aquafine joined Danaher's Environmental Group and operates as a strategic business unit of Trojan Technologies.

Trojan Technologies' industrial/commercial (I/C) business is now integrated into Aquafine's operations in Valencia, making it the center of excellence for the I/C business. This combined entity is uniquely positioned to offer the marketplace the best available technologies, to conduct leading edge research, to develop innovative product offerings, and to offer highest quality customer support.

The combined I/C product lines and capabilities of Aquafine and Trojan have been rationalized to provide the best solution to the market and to position the company for future growth.

With the incorporation of Trojan's latest technology, the TrojanUVLogic™ (an Aquafine product), the Aquafine family of UV solutions meets the exacting needs of a diverse range of ultra-pure water users, including the food and beverage industries, pharmaceutical companies and microchip manufacturers. In addition, Trojan's full range of proven UV products are also available to serve this market. Based on an intimate knowledge of UV applications and a depth of experience in robust product design and manufacturing, Aquafine provides UV solutions worldwide for TOC reduction, Chlorine and Chloramine destruction, ozone destruction and disinfection in the following sectors of the industrial market:

- **Process water:** Food, beverage and cosmetic industries
- **Ultra-Pure Water:** Electronic, semi-conductor, optical and pharmaceutical industries
- **Aquaculture:** Fish hatcheries, grow-out facilities, and shellfish cultures
- **Cooling Water:** Cooling towers found in any kind of industrial facility
- **Marine:** Disinfection of drinking water and wastewater on marine vessels
- **Commercial applications:** Fountains, swimming pools, aquariums, and car washes
- **Wastewater:** Disinfection in the food, beverage, microelectronics and other industries

► CONSUMER APPLICATIONS

Effective against pathogenic viruses, bacteria, and protozoa, UV disinfection is now the preferred choice for water disinfection.

Compact in size and easy to install, the TrojanUVMax™ series of high-performance disinfection systems is designed for homes, cottages, schools, restaurants, and nursing homes. Unlike virtually all other private water supply treatment technologies, Trojan UV systems provide effective elimination of harmful microorganisms such as *Cryptosporidium*, *Giardia*, and *E. coli*.

TROJANUVMAX™



