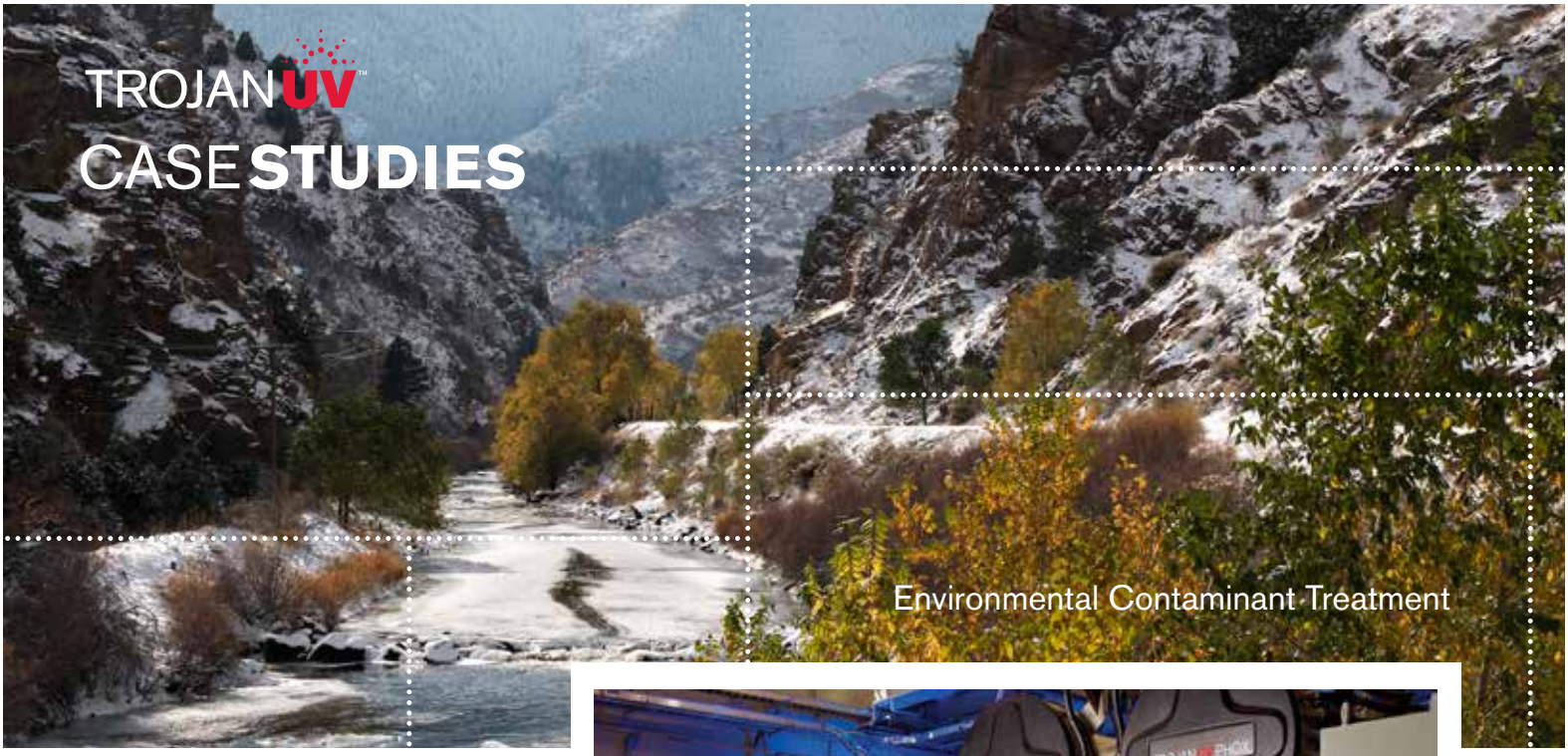
TROJANUV™

CASE STUDIES



Environmental Contaminant Treatment

Treating Trace Contaminants and Disinfecting with UV in Drinking Water

The TrojanUVPhox™ at the Aurora Reservoir Water Purification Facility

In 2008, the City of Aurora took an innovative approach to ensure future sustainability of the city's water. This effort was known as the Prairie Waters Project. The project enabled the City of Aurora to maximize its use of water that it already owns from the South Platte River (pictured above), and added to the city's ability to provide its citizens high quality, pure drinking water. A key component of the Prairie Waters Project was the construction of the Aurora Reservoir Water Purification Facility (ARWPF). This facility uses a multi-step purification process that features a state-of-the-art TrojanUV UV-oxidation and disinfection system.

TREATMENT PROCESSES AT THE ARWPF

Many waterways contain environmental contaminants resulting from agricultural runoff or industrial/municipal wastewater discharge. Possible environmental contaminants include nitrosamines, pesticides, pharmaceuticals, personal care products or other environmental contaminants. To protect residents from these contaminants, the City of Aurora set stringent water treatment goals, and adopted an advanced treatment process at the ARWPF, utilizing multiple purification barriers.

Specifically, the ARWPF utilizes bank filtration, precipitative softening, the TrojanUVPhox UV-oxidation system, biological filtration and granular activated carbon filtration. Testing has shown that this treatment process effectively purifies the water to beyond drinking water standards. UV-oxidation in particular, was selected as a primary treatment process at this facility for its superior disinfection capabilities and for its ability to destroy micropollutants without forming harmful by-products. UV-oxidation acts as a powerful barrier to both pathogens and chemical compounds.

THE TROJANUV SOLUTION

Through proper sizing and by adding a small amount of hydrogen peroxide upstream of the UV system, the TrojanUVPhox acts as a barrier to a variety of compounds. Examples include taste and odor-causing compounds such as MIB and geosmin, pharmaceuticals, pesticides such as atrazine, and nitrosamines such as *N*-nitrosodimethylamine [NDMA]. The system also inactivates microorganisms, viruses, and chlorine-resistant pathogens.

The TrojanUVPhox was selected after a cost-benefit evaluation of potential purification approaches was conducted by the City of Aurora. Other technologies such as ozone were also evaluated. However, UV-oxidation was selected for its ability to:

- Provide superior disinfection of chlorine-resistant microorganisms in a single unit process

CASE STUDIES

- Accomplish treatment of NDMA and other nitrosamines
- Act as a barrier to multiple contaminant classes such as taste and odor-causing compounds, pharmaceuticals, steroids, pesticides and nitrosamines
- Perform treatment without creating disinfection by-products such as bromate

SYSTEM DESIGN PARAMETERS

- FLOW CAPACITY: 50 million gallons per day (7,886 m³/hr)
- DESIGN LOG REDUCTION OF NITROSAMINES: 1.2-log
- OXIDANT: hydrogen peroxide at 5 parts per million
- UV TRANSMITTANCE (UVT): >85% at 254 nm
- DISINFECTION METHOD: UV

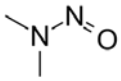
TROJANUVPHOX ELIMINATES THE NEED FOR MEMBRANES

The use of UV-oxidation for contaminant treatment, along with the multi-barrier treatment train, also makes it possible to reduce or eliminate a plant's reliance on reverse osmosis (RO) membranes. RO systems reject 10% to 20% of influent water as a brine waste stream.

This waste stream reduces the amount of water available for use and is difficult to dispose of, especially in landlocked communities such as Aurora. The TrojanUVPhox performs functions similar to that performed by RO, such as treatment of endocrine-disruptor compounds, pharmaceuticals and personal care products and other chemical contaminants, without producing a brine stream. In addition, while nitrosamines and other contaminants can pass through membranes, the UV-oxidation system will act as an effective and reliable barrier to such compounds, especially NDMA.

NITROSAMINES

Nitrosamines, particularly NDMA, are compounds that are formed as disinfection by-products in water and wastewater treatment systems. Nitrosamines cannot be effectively treated with other advanced water treatment technologies such as ozone, activated carbon or RO. Nitrosamines are effectively treated with UV light by way of a process known as UV-photolysis. A variety of regulatory agencies are acting to limit consumers' exposure to nitrosamines. For example, at the federal regulatory level in the U.S., nitrosamines were included on the EPA's second Unregulated Contaminant Monitoring Rule (UCMR2). The State of California has set a Notification Level for NDMA at 10 parts per trillion and a Public Health Goal of 3 parts per trillion.



PROPERTIES OF NDMA

Chemical Formula:	$C_2H_6N_2O$
Molecular Weight:	74.08
Sources of Contamination:	• By-product of drinking water and wastewater treatment • Rocket Fuel • Manufacturing Processes

DEMONSTRATION TESTING

Before full-scale operation was established at the ARWPF, a number of experiments to assess performance using actual source water were conducted. Using bench- and pilot-scale UV-oxidation systems, the log reduction of NDMA, methylisoborneol (MIB), geosmin, microcystin (an algal toxin), atrazine (pesticide), and chlorotetracycline (pharmaceutical) was determined by simulating the expected full scale operating conditions (i.e. full scale UV energy and hydrogen peroxide concentration). The results are given in **Figure 1.**

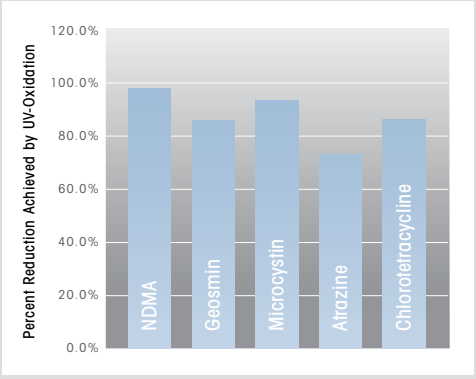


Figure 1. Removal of various organic compounds with UV-oxidation (UV plus hydrogen peroxide, derived from Swaim 2006)

Swaim, P. (2006). Innovative Approaches to Water Purification Using UV-Oxidation. CDROM Proceedings of the Annual Conference of the American Water Works Association, San Antonio, TX. June 11-15, 2006.

Head Office (Canada)
3020 Gore Road London, Ontario, Canada N5V 4T7
Telephone: (519) 457-3400 Fax: (519) 457-3030

Trojan Technologies Deutschland GmbH
Aschaffenburger Str. 72, 63825 Schöllkrippen, Germany
Telephone: +49 (0) 6024 6347580 Fax: +49 (0) 6024 6347588

www.trojanuv.com

For a list of our global offices, please visit **trojanuv.com/contactus**.

TROJAN UV™
A TROJAN TECHNOLOGIES BUSINESS