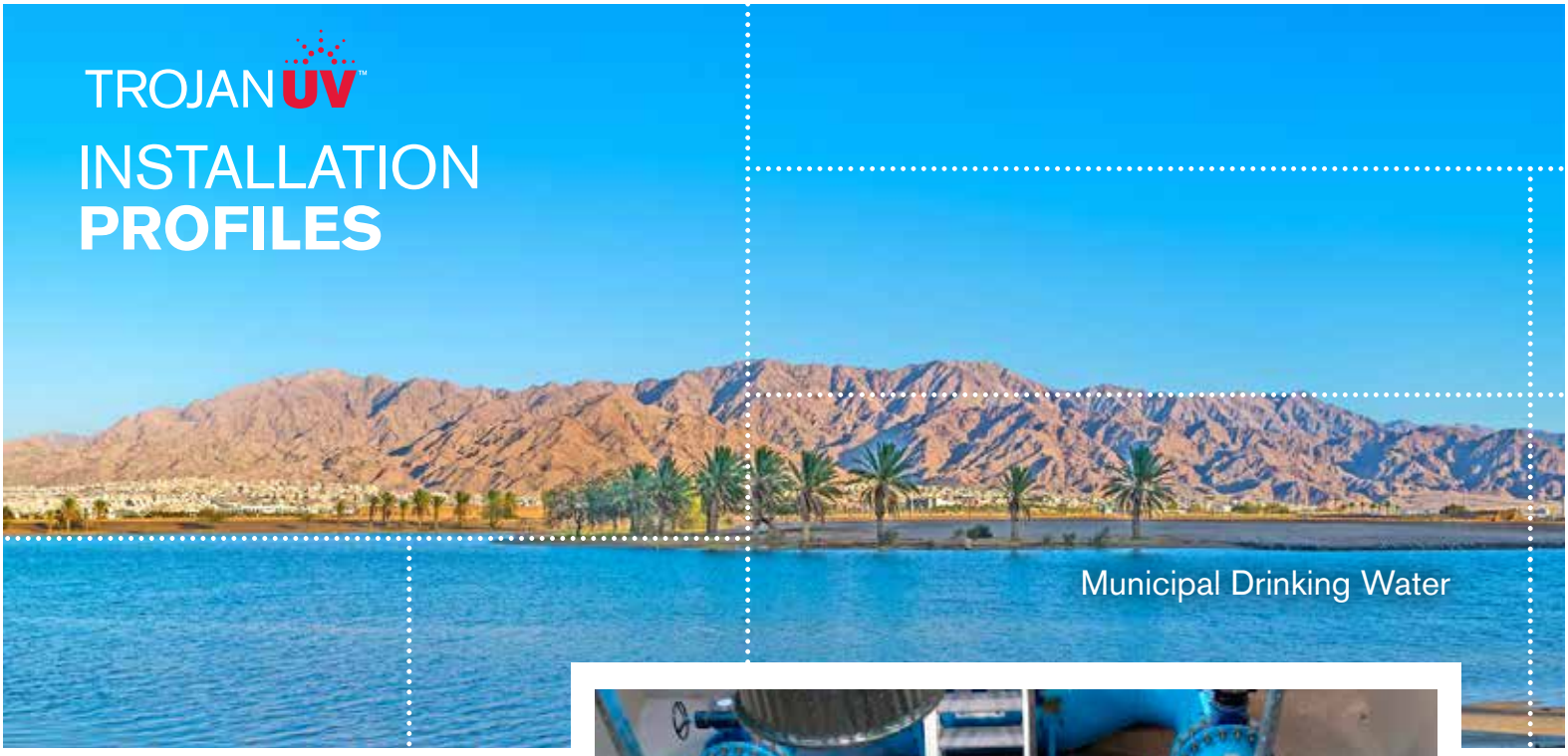
TROJAN UV

INSTALLATION **PROFILES**



Municipal Drinking Water

Disinfecting with UV in Drinking Water

UV Disinfection – Zai Water Treatment Plant, Miyahuna Water, **Jordan**

PROJECT BACKGROUND

Cryptosporidiosis is a gastrointestinal disease caused by species of parasitic protozoa called *Cryptosporidium*. Several species of *Cryptosporidium* exist in nature. However, water-borne illness is generally caused by *Cryptosporidium parvum* or *Cryptosporidium hominis*. During the oocyte spore phase of this pathogen's life-cycle, individual oocysts are capable of surviving for long periods of time outside a host organism and can survive in water. When ingested by a host, symptoms of infection can include gastrointestinal upset and fever. Immuno-compromised are at particular risk and infection in such individuals can result in death.

Cryptosporidium is a threat to public health due to the resistance of oocysts to chlorine-based disinfection methods. Many jurisdictions have put regulations in place to ensure both efficient monitoring of surface waters, and installation of additional treatment barriers at treatment plants that detect *Cryptosporidium*.

DISINFECTION OF *CRYPTOSPORIDIUM* WITH UV TECHNOLOGY

Cryptosporidium oocysts are resistant to chlorine due to thick walls surrounding their intra-cellular structure. However, UV can penetrate these walls (Fig. 1) and damage the genetic structure (DNA) in the cells, rendering the organism incapable of multiplying and causing infection. This method of disinfection is commonly referred to as inactivation.

UV treatment is expressed in terms of UV dose and it is recognized that a UV dose of 40 mJ/cm^2 results in greater than 4-log (99.99%) of most pathogens including *Cryptosporidium*.

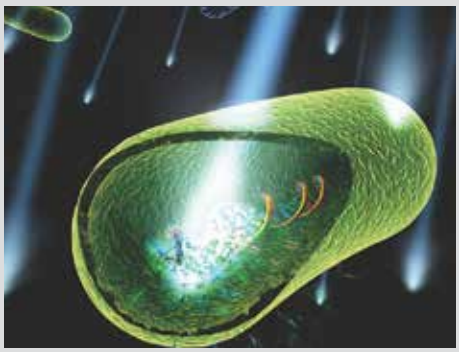


Figure 1. UV light passing the cell wall and damaging the genetic material of a pathogen

INSTALLATION **PROFILES**

BIOASSAY VALIDATION

Calculating UV dose can be done in several ways. Bioassay validation (Fig. 2) is one example of UV system performance testing in which UV dose is measured by taking samples of live microorganisms both before and after exposure to UV-light through the UV system undergoing testing.

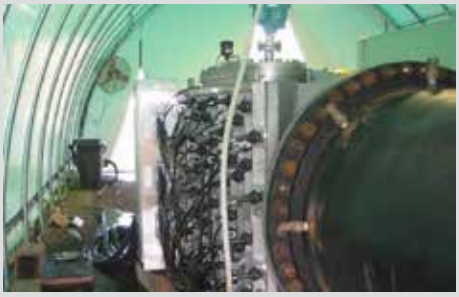


Figure 2. UV disinfection system undergoing performance evaluation through bioassay testing

Several internationally-recognized approaches for bioassay validation exist, and testing UV systems using live microorganisms in this manner ensures that any internal components of a UV system which might influence UV dose delivery are taken into account when evaluating how a UV system performs.

INSTALLATION: ZAI WATER TREATMENT PLANT, AMMAN, JORDAN

The King Abdullah Canal is the primary source of drinking water for Amman. It receives its water from Lake Tiberias (also known as the Sea of Galilea) and the Yarmouk River. Over 100 kilometers long, the canal is uncovered and exposed to run-off. It was classified by the Jordan Ministry of Health as a Category 3 Water Source. The Zai Water Treatment Plant, which takes raw water from the canal, was required by the Ministry to install UV treatment to treat *Cryptosporidium* and *Giardia* (another potential pathogen) as a result of this Category 3 classification.

Miyahuna Water operates the Zai Water Treatment Plant. During the design of the UV treatment installation at Zai, Miyahuna recognized that using UV systems that have been pre-validated through bioassay testing was the best way to ensure reliable UV dose delivery. As a result, Miyahuna purchased four (4) TrojanUVSwift™ UV disinfection systems. These systems were pre-validated using bioassay guidelines published by the United States Environmental Protection Agency (USEPA), to deliver a bioassay proven UV dose of 40 mJ/cm^2. This level of treatment was selected for the Zai facility, as well as two additional treatment plants operated by Miyahuna Water (Fig. 3), to provide a 3-log inactivation of *Cryptosporidium*.

CONCLUSION

UV disinfection is an attractive option for drinking water disinfection and should be evaluated as a barrier to pathogens by water treatment plants trying to reduce dependence on chlorine disinfection or trying to treat chlorine-resistant pathogens such as *Cryptosporidium*. UV systems pre-validated using globally-recognized bioassay guidelines deliver the most reliable UV treatment. For the Zai Water Treatment Plant and other treatment facilities operated by Miyahuna Water, the delivery of a UV dose of 40 mJ/cm^2 was considered suitable for a greater than 3-log removal of *Cryptosporidium* for the city of Amman.

Treatment Plants	Treatment Details	TrojanUV Products Installed
Zai WTP	• Peak Design Flow: 12,240 m^3/hr • Delivered UV Dose: 40 mJ/cm^2 • UV System: TrojanUVSwift™ 6L24 • Number of UV Systems: 4	
Ras Al Ain WTP	• Peak Design Flow: 500 m^3/hr • Delivered UV Dose: 40 mJ/cm^2 • UV System: TrojanUVSwift™SC D12 • Number of UV Systems: 2	
Ruseifah WTP	• Peak Design Flow: 287 m^3/hr • Delivered UV Dose: 40 mJ/cm^2 • UV System: TrojanUVSwift™SC D06 • Number of UV Systems: 3	

Figure 3. Details of Miyahuna Water UV installations in Jordan

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**.

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