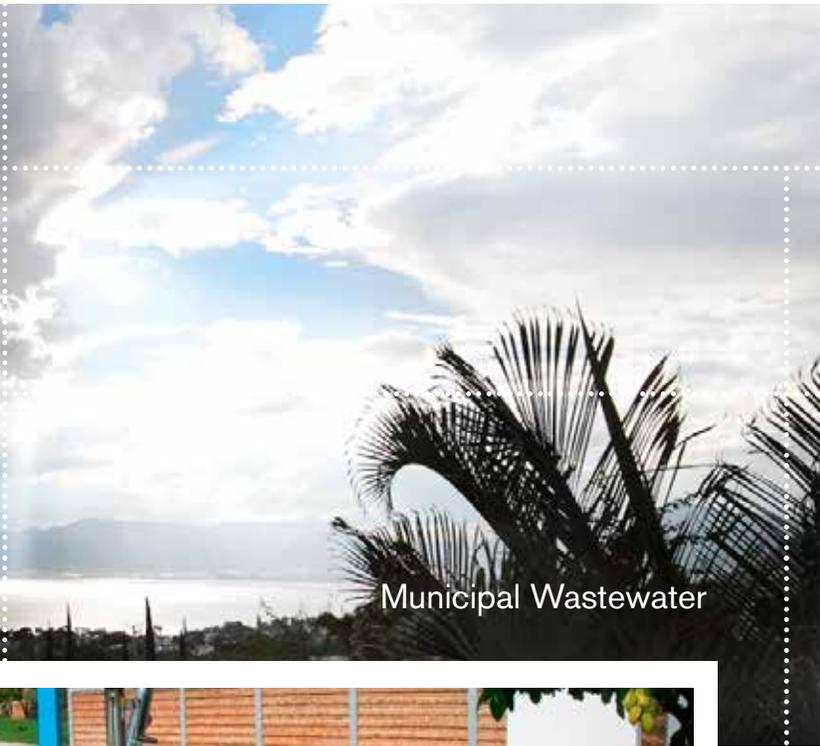
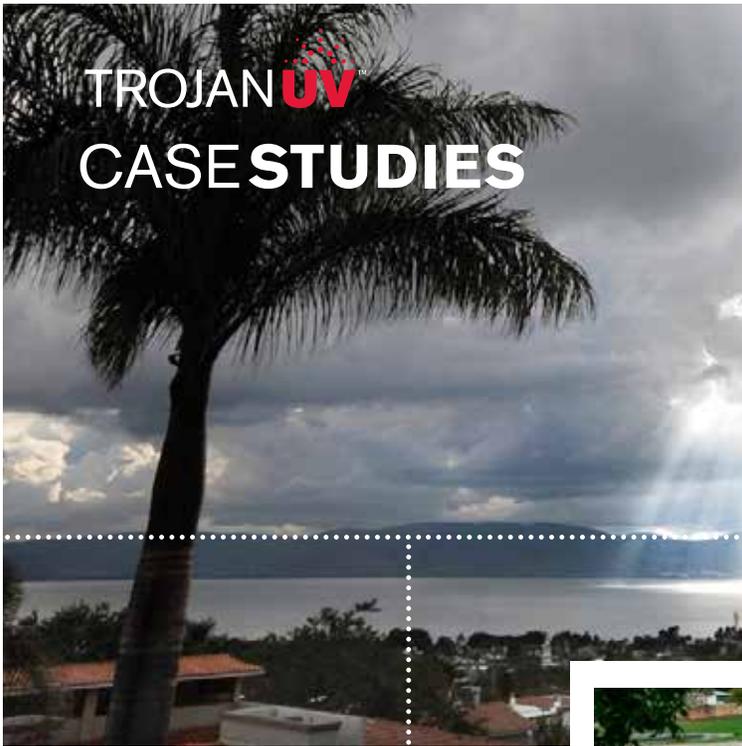


TROJAN^{UV} CASE STUDIES



Municipal Wastewater

**image courtesy of Steve Miller Photography*



Trojan UV Solutions: Safeguarding Public Health With UV Disinfection

Wastewater Disinfection – SAN JUAN COSALA (Lake Chapala), Mexico

PROJECT BACKGROUND

Lake Chapala is the largest natural freshwater lake in Mexico. It's the main source of drinking water for Guadalajara and home to a wide array of fish and migratory birds. It has also evolved into a growing oasis for tourism and recreation. However, there were many stresses facing this dynamic water source. Its average annual evaporation (1,910 mm) greatly exceeds annual precipitation (781 mm in average) and the treatment and quality of wastewater being discharged into it had come under increased scrutiny.

The State Water Commission of Jalisco (CEA Jalisco) is responsible for several municipal wastewater (activated sludge) treatment plants discharging into Lake Chapala. Prior to 2011, the majority of plants – including the one in San Juan Cosala – were disinfecting with chlorine gas. However, the growing concerns over toxic chemical

residuals and disinfection by-products negatively impacting the aquatic life prompted CEA Jalisco to consider adding a dechlorination process.

Although adding dechlorination to the treatment process would significantly lower the risk of discharging toxic chlorine into the lake, CEA Jalisco still had safety concerns; operators would still be dealing with hazardous and volatile chlorine gas and neighboring communities would still be at risk should a chlorine leak ever occur.

EVALUATING DISINFECTION ALTERNATIVES

For the San Juan Cosala plant, CEA Jalisco evaluated disinfection using sodium hypochlorite and also considered moving away from chemical disinfection entirely and

converting to ultraviolet (UV) disinfection.

Sodium hypochlorite is a diluted liquid form of chlorine. It is a clear, yellow liquid that is corrosive. It is not as volatile or toxic as chlorine gas, nor does it have the same disastrous potential in the event of a spill or release. However, just like chlorine gas it too can create disinfection by-products and would require a dechlorination step.

Alternatively, UV disinfection is an inherently safe, physical process that instantaneously disinfects microorganisms as they pass by UV lamps submerged in the wastewater effluent. It is effective against chlorine-resistant *Cryptosporidium* and *Giardia* (pathogens in surface water sources that can ultimately find their way into drinking water supplies). The UV disinfection process adds nothing to the water but UV light, and therefore, has no impact on the chemical composition of the water.

CASE STUDIES

As a result, CEA Jalisco considered and evaluated three options:

1. Adding a dechlorination step after their existing chlorination process.
2. Replacing chlorine with sodium hypochlorite disinfection as well as adding a dechlorination step.
3. Converting to UV disinfection and eliminating chlorination and dechlorination chemicals altogether.

CEA JALISCO CHOSE UV

Following an extensive evaluation process, CEA Jalisco selected the TrojanUV3000Plus™ – an open channel system with horizontal low-pressure high output lamps.

Many factors were considered during the decision-making process, including:

- ActiClean™ lamp sleeve cleaning
 - Cleaning occurs automatically while the lamps are disinfecting, and maintains at least 95% transmittance, ensuring sleeves are clean and the system is consistently delivering accurate dose
- Proven local installations
 - See **Figure 2** for a list of ten TrojanUV3000Plus installations in Mexico
- Reputable local representative offering technical expertise and services
 - Integrated service network throughout Mexico streamlines equipment support, troubleshooting and maintenance

EASY RETROFITTING

When converting from chlorine to UV, existing chlorine contact tanks are often used for a retrofit. This is the approach CEA Jalisco took; not only does it reduce construction costs, it also enables surplus portions of old chlorine contact tanks to be used for water storage, bypass and other purposes.

The first UV installation was completed in 2011. When the entire project is completed, a total of six CEA Jalisco wastewater treatment plants discharging to Lake Chapala will be using the TrojanUV3000Plus disinfection system.

SYSTEM DESIGN PARAMETERS

- **PEAK DESIGN FLOW:** 40 L/s (0.9 MGD)
- **UV TRANSMITTANCE (UVT):** 60%
- **DISINFECTION LIMIT:** 1000 FC/100mL
- **SECONDARY TREATMENT:** Conventional Activated Sludge

ANNUAL O&M COST SUMMARY

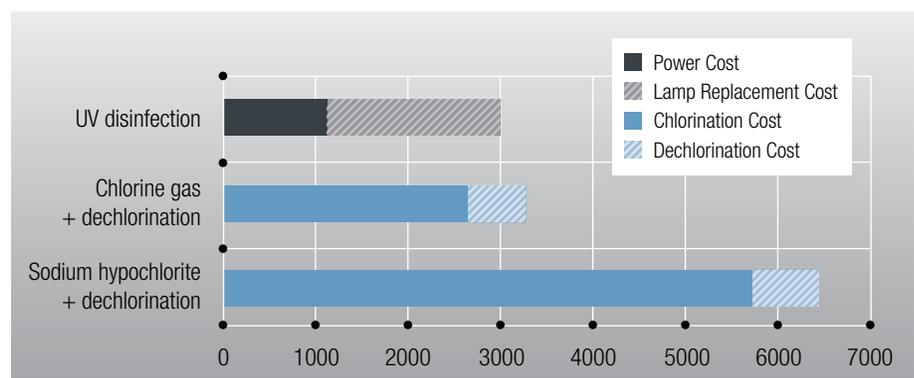


Figure 1. Annual operating and maintenance costs of disinfection alternatives (based on approximate 2012 USD currency and costs)

Figure 1 shows the economic alternatives analysis. For UV, the operating costs consist of electricity and lamp replacements. For chemical disinfection, the operating costs are predominantly the purchase of chlorine and dechlorination chemicals. Any disinfection alternative evaluation should also take into account the non-economic factors that can heavily weigh into the decision-making process. These factors typically include, but are not limited to, safety, ease of operation, reliability, space requirements and environmental impact.

GROWING INSTALLATION BASE



Figure 2. The TrojanUV3000Plus is installed in many treatment plants throughout Mexico. Here are ten of them.

- | | |
|---|---|
| 1. El Ahogado (Guadalajara) – 4050 L/s (92.5 MGD) | 6. La Morita – 254 L/s (5.8 MGD) |
| 2. Puerto Vallarta, Jalisco – 1600 L/s (36.5 MGD) | 7. Guanajuato – 220 L/s (5.0 MGD) |
| 3. Monte de Los Olivos – 460 L/s (10.5 MGD) | 8. Nogales, Sonora – 220 L/s (5.0 MGD) |
| 4. PTAR Cedazo, Queretaro – 300 L/s (6.9 MGD) | 9. Jalpa de Mendez – 205 L/s (4.7 MGD) |
| 5. Santiago – 275 L/s (6.3 MGD) | 10. PTAR Valle de Bravo – 152 L/s (3.5 MGD) |

TOP FIVE MISCONCEPTIONS

THE TOP FIVE MISCONCEPTIONS ABOUT UV (AND OUR RESPONSES TO THEM)

UV is expensive.

The lifecycle cost for UV is typically lower compared to chlorination/dechlorination. Although the initial capital cost for UV equipment may be higher, plants do realize operating savings with UV compared to chemical disinfection, thus resulting in net payback of the UV equipment over a few years.

UV is complicated and we don't understand how it works.

UV disinfection is a relatively simple technology to grasp. And you can easily educate yourself through online research (trojanuv.com) or by attending relevant conferences and workshops. We're honored to be asked to speak at various conferences around the world and also host free UV workshops from time to time – ask us when we'll be in your area next.

UV requires too much maintenance.

Our UV systems operate automatically, and the primary maintenance procedure is lamp replacement (which usually happens every 18 months or so). Most of our customers also opt for our patented ActiClean lamp sleeve cleaning system. This automatic system eliminates fouling, reduces manual maintenance and increases efficiency. And remember, you don't have any of the worries associated with a chlorine system – no safety certifications, chemicals management or equipment corrosion.

Operators are not skilled enough to operate UV.

No special skills, licenses or education required. And our authorized service technicians provide operators with in-depth training, troubleshooting techniques and maintenance protocol. We also have local service representatives in Mexico should onsite support ever be needed.

UV is not as effective as chlorine in low quality water applications.

Our UV disinfection systems are installed around the world, effectively treating all types of challenging water qualities, including combined sewer overflows (CSO), storm and sanitary sewer overflows (SSO), primary and blended effluents. There are several case studies available at trojanuv.com. We encourage you to have a look.

North America **T.** 519.457.3400 **F.** 519.457.3030 www.trojanuv.com
Europe (please contact our UK office) **T.** +44 (1905) 771117 **F.** +44 (1905) 772270