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Let's Solve Water

UV disinfection in Manukau Harbor

The Mangere wastewater treatment plant at Manukau harbor, Auckland in New Zealand uses primary (mechanical), secondary (biological) and tertiary (filtration and UV) methods to treat domestic and industrial wastewater and storm water. WaterCare, Services Ltd (WSL) is the publicly owned wastewater treatment company that runs the plant. The plant's average volume of treated water is 300,000 m³ per day. The treated water is specially allocated to:

- Restoration and rehabilitation of the foreshore with better Manukau harbor water quality
- Restoration of the coastline and seabed
- Reduction of health risks from consuming shell fish

Following the filtration, the UV disinfection system is the last step of the tertiary treatment process.

The Wedeco UV installation
Wedeco TAK 55 UV disinfection systems were successfully commissioned in 2001. Due to its capacity, and the environmental uses for which it is intended, this plant is the largest and one of the most impressive installations of this type in the world. The UV disinfection systems were designed for a maximum wet weather disinfection flow of 16.5 m³/s with the following inlet parameters for water originating from earlier treatment stages and stormwater events:

- Suspended solids ≤ 15 ppm
- Transmittance 50-60%

The TAK 55 UV disinfection systems were installed with Xylem's low pressure, amalgam UV lamps, rated 300 W each, and operated to achieve the following disinfection targets:

- 2 log reduction on Bacteriophages as indicators of potential viral infection of shell fish
- 4 log (10,000 times) reduction in pathogens together with the secondary BNR (biological nutrient removal) process

In total, 7,776 UV lamps were installed in 12 parallel channels. Three banks with 216 lamps each were installed per channel. The lamps are driven by 3,888 electronic ballasts in total, controlled by a PLC system. The control system enables the UV lamps to operate with a high power efficiency at low flow rates by dimming the lamp power down to 50% of their initial UV light output.

Inside the UV disinfection gallery.

Model:	TAK 55 HP 9-12x3i12W
Number of channels:	12
Number of banks per channel:	3
Number of lamps per bank:	216
Number of lamps per channel:	648
Total number of lamps:	7776

System includes:

- VARIO system for lamp power generation
- Automatic mechanical cleaning system
- Motorized penstock weirs for level regulation

Based on the overall results, the Ecoray® UV lamp trial and energy audit proved to be a successful story for WaterCare.

Thanks to the UV system's regular maintenance, up-to-date components and control, it will continue delivering superior disinfection performance.

Testing Ecoray UV lamps
In December 2009, Xylem approached WaterCare with an offer to test the new and improved Wedeco Ecoray UV lamps. Ecoray lamps are more efficient, environmentally friendly and reliable than the previously installed UV lamps.

Ecoray UV lamps work seamlessly with existing Wedeco TAK 55 UV systems and feature:

- A long-life lamp coating
- Reduced mercury content
- 3rd party verified lamp aging
- Extended dim-mode operation
- Significant power saving potential
- Strength and reliability

The trial started in August 2010 with a complete channel equipped with 648 Ecoray UV lamps. The goal was to simultaneously compare the performance of one channel equipped with the old lamp type and another equipped with the Ecoray lamps - focusing on the lamps' power consumption.

The Ecoray UV lamp trial resulted in significant power savings compared to the old lamp type:

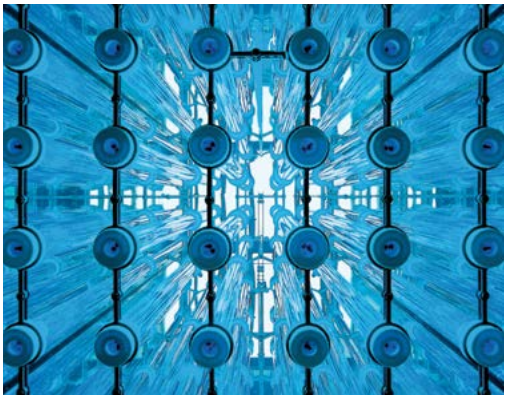
- Operational savings > 10%
- 648 lamps with a zero failure rate over an 8-month operation period
- Reduced maintenance efforts

Thanks to Xylem's expertise, the UV system's operation was further improved by implementing various control optimizations including:

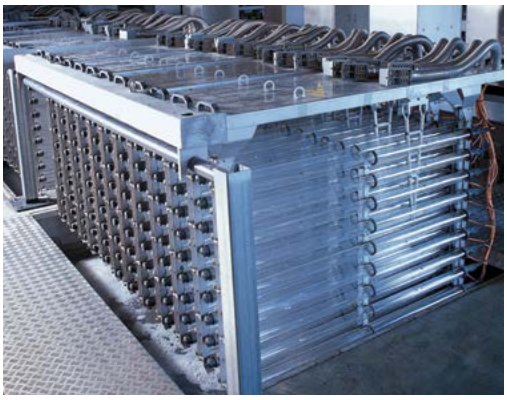
- Improved time delay to switch the assist banks off
- Optimized UVT acknowledgement in dose control
- Minimum ballast power setting adjustment
- Start of the channels with 2 or 3 duty banks (adjustable)

The results of these incremental improvements were additional savings for the customer and more convenient and accurate UV dose control.

12 UV channels over-fall penstock weirs



UV lamp disinfection - under water



Ecoray SLR32143 4p VL
Lamp power: 270 W
Total connected power (incl. ballast) per lamp: 300 W
UV-C output: 125 W
Lamp aging factor: 0.88