

Comparison of chlorine and ultraviolet disinfection processes for wastewater treatment

Ryan Smith, University of Tasmania. Anthony Allan, TasWater.

ABSTRACT

Disinfection is a crucial component of any wastewater treatment process. This ensures safety for customers, as well as environmental protection. Effluent should be treated to a high standard for protozoa, viruses, and bacteria to achieve this. Two widely used disinfection methods are either chlorine or ultraviolet (UV) radiation.

Chlorination has been used extensively, though it is often criticised for its safety issues and impact on the receiving environment. It also has a lower log removal than other disinfectants (including UV). However, it does provide a residual chlorine dose, which is ideal for poorer effluent or plants with more piped infrastructure, unlike UV disinfection.

UV disinfection has no direct environmental impact, though it is strongly affected by poor influent quality. For smaller

systems though, UV disinfection can be implemented with adequate pre-treatment, potentially making it a more appropriate solution. For most organisations, this remains underutilised due to limited resources and significant capital costs.

The project focused on creating a cost analysis for both chlorine and UV disinfection methods, with the final aim of providing technical and data-driven evidence supporting one method over another. A study of eight sites (both UV and chlorine) of variable treatment capacities and water qualities has demonstrated that after the capital, maintenance and consumable costs have been accounted for, a Net Present Value assessment indicates less than a 5% difference in costs over 30 years (at current electrical and chemical pricing). This is mainly due to the much higher cost of chlorine maintenance and chemical supply. This supports UV systems and backs the current trend of adopting UV over chlorine for wastewater disinfection

Table 1: Disinfection cost over time for an 18ML/day treatment plant, indicating marginal long-term cost difference between disinfection methods. Similar results were obtained across all eight sites.

