

INNOVATIVE DEVELOPMENTS IN THE SIMULATION OF ULTRAVIOLET DISINFECTION SYSTEMS

Dr Simon Leefe

Technical Director, Wilde Analysis Ltd

ABSTRACT

ATG UV Technology designs and manufactures UV disinfection systems & integrated UV treatment packages for municipal, industrial, petrochemical and aquatic applications. The process works by passing contaminated water over one or more ultraviolet lamps. The proportion of microorganisms killed by the radiation depends on the received dose. This, in turn, depends on both the distribution of radiation intensity, the flow pattern, the water quality and the target microorganism. The basic technique for simulating this multi-physics problem, involving flow, radiation and dose-response kinetics is well-established and gives reasonably good agreement with measured data.

Model validation is particularly important to ATG, because:

- it enables them significantly to reduce the volume of expensive physical acceptance testing by replacing a large proportion of the test matrix with simulation
- it provides confidence in the simulation-derived insights necessary to optimise new product designs
- since UV reactors are sensitive to inlet flow distribution and are typically located in compact pipework in a treatment plant, simulation allows ATG's Applications Engineers confidently to evaluate to regulator's requirements the disinfection performance of an installed system prior to acceptance testing

Wilde has been working with ATG on the improvement of model fidelity. This presentation demonstrates the improvements afforded by two innovative developments: extension of traditional particle-tracking techniques to account for spectral content; and a completely new more flexible alternative to the particle-tracking method, which lends itself readily to automated equipment optimisation.