Advanced Oxidation Processes for Pesticide Control: Implementation and Business Case Development

Matthew Hobbs¹, Dr Peter Jarvis¹, Prof. Bruce Jefferson¹ and Helen Pickett²
¹ Cranfield University ² Severn Trent Water

Introduction
Water treatment works are at risk of failing the regulations for some pesticides, the most prominent example being Metaldehyde. These pesticides present a treatment challenge as they cannot be completely removed by current treatment technology. Advanced Oxidation Processes offer a treatment solution through the destructive, oxidative power of •OH radicals. Photocatalysis (UV/TiO₂) offers a chemical-free solution to water treatment and further study will demonstrate its feasibility.

Regulation of Pesticides
Discharge Limits

Why does titanium dioxide aggregate?
Alkalinity and hardness ions affect the surface charge of titanium dioxide causing instability

How does particle size affect the reaction rate?
Smaller TiO₂ particles provide greater surface area for catalytic reaction than larger aggregates

Conclusions
AOPs can be used to treat problematic pesticides
UV/TiO₂ is a viable solution, but the energy demand is high
Particle size affects rate of reaction and is affected by alkalinity and hardness
Treatment at increased shear breaks up particles and lowers the energy demand

Titanium Dioxide Aggregation and Particle Size Management in Post GAC Water

Effect of ion concentration on TiO₂ Zeta Potential and Zeta Potential on Particle Size