



Research, Validation & Scientific Foundation

Built on Established Science. Guided by Research. Proven in Practice.

Hydro2050 is founded on well-established scientific principles in advanced oxidation, oxygen transfer, water chemistry, and ultrafine bubble technology. Rather than relying on novel or untested concepts, Hydro2050 combines proven processes in an innovative way to deliver high-performance, chemical-free water treatment solutions.

The technology harnesses advanced oxidation processes that generate hydroxyl radicals, among the most powerful oxidising agents available for water treatment, alongside ultrafine bubble technology that enhances oxygen transfer and treatment efficiency. These scientific mechanisms have been extensively studied and validated within the global water treatment and environmental engineering communities.

Scientific Foundation of Hydro2050

Hydro2050 is not based on experimental or unproven concepts. The technology integrates several scientific principles that have been extensively investigated through decades of international peer-reviewed research and water industry application.

1. Advanced Oxidation Processes (AOPs)

Hydro2050 utilises hydroxyl radical generation as part of its treatment process. Advanced oxidation processes are widely recognised for their ability to oxidise and degrade organic contaminants, pathogens, odour compounds, and emerging pollutants in water treatment applications. Professor Chris Chow's research includes advanced oxidation as a key water treatment field.

2. Ultrafine and Nanobubble Technology

The Hydro2050 process employs ultrafine bubble technology to improve oxygen transfer efficiency and treatment performance. Nanobubbles and ultrafine bubbles have been extensively studied internationally for:

- Increased dissolved oxygen delivery
- Improved biological treatment performance
- Reduction of algae and biofilms
- Enhanced oxidation reactions
- Water quality restoration

Hydro2050's treatment platform is based on these established principles.

3. Cyanobacteria and Harmful Algal Bloom Management

Research globally has demonstrated that improving dissolved oxygen levels, reducing nutrient availability, and promoting oxidative destruction of contaminants can contribute to healthier aquatic ecosystems and improved water quality.

The scientific work of researchers such as Professor Chris Chow, Dr Arash Zamyadi and Professor Michael Burch, reflects extensive investigation into cyanobacteria, harmful algal blooms, water treatment optimisation, and advanced treatment technologies.

4. Water Reuse and Wastewater Treatment Optimisation

Hydro2050's application in wastewater and reuse systems aligns with significant research activity in:

- Aeration efficiency
- Process optimisation
- Biological treatment enhancement
- Emerging contaminant management
- Sustainable circular water systems

These are established areas of investigation within both Adelaide University and Monash University research programs and other leading international water research universities.

Supported by Research and Independent Investigation

The scientific principles underpinning Hydro2050 align with a substantial body of international peer-reviewed research relating to:

- Advanced oxidation processes (AOPs)
- Nanobubble and ultrafine bubble technologies
- Water oxygenation and remediation
- Wastewater treatment optimisation
- Algae and pathogen reduction
- Emerging contaminant treatment

Hydro2050 continues to support research activities that seek to further validate, optimise, and expand applications of these technologies across agriculture, industrial water management, wastewater treatment, and environmental remediation.

Collaboration with Leading Research Institutions

Advancing Water Innovation Through Scientific Collaboration

Hydro2050 is committed to ensuring that innovation is supported by rigorous scientific investigation, independent validation, and real-world application. Our approach combines established water treatment science with ongoing collaboration across universities, researchers, industry specialists, and student research programs.

Adelaide University - Centre for Sustainable Infrastructure and Resource Management (SIRM)

Hydro2050 collaborates with Adelaide University's Centre for Sustainable Infrastructure and Resource Management (SIRM), one of Australia's leading applied research centres addressing water, infrastructure, and environmental challenges. SIRM undertakes multidisciplinary research in water, environmental restoration, sustainable infrastructure, and resource management.

SIRM is led by Professor Chris Chow, Professor of Water Science and Engineering and Director of SIRM. Professor Chow's research expertise spans water quality monitoring, water treatment, advanced oxidation, membrane filtration, disinfection control, cyanobacteria, distribution systems, infrastructure management, and applied water industry research.

Hydro2050 has collaborated with SIRM on research and validation activities involving:

- Advanced oxidation processes (AOPs)
- Wastewater treatment optimisation
- Water quality improvement
- Emerging contaminant treatment including PFAS investigations
- Industry-focused honours and student research projects associated with Hydro2050 technologies and applications

Monash University - Department of Civil and Environmental Engineering

Hydro2050 engages with researchers within Monash University's internationally recognised Department of Civil and Environmental Engineering, which undertakes research addressing healthy waterways, sustainable water infrastructure, climate resilience, and environmental engineering.

A key area of engagement includes research led by Dr Arash Zamyadi, Senior Lecturer in Water Engineering. Dr Zamyadi's research focuses on water and wastewater treatment, public health, climate impacts on water systems, harmful algal blooms, cyanobacteria, water reuse, and innovative technologies to improve water quality outcomes.

Hydro2050 supports knowledge development in algal bloom mitigation and water quality improvement through engagement with researchers and student projects, including honours-level investigations involving cyanobacteria and harmful algal bloom management. Dr Zamyadi's work is recognised for translating scientific discoveries into practical water industry solutions.

La Trobe University - Ecological Plant and Animal Sciences

Hydro2050 is collaborating with Dr Monica Doblin, Professor in Ecological Plant and Animal Sciences at La Trobe University.

Current areas of investigation include:

- The effectiveness of ozone and nanobubble technologies for cleaning irrigation infrastructure
- Reduction of biofilm within greenhouse irrigation systems
- Improving oxygen delivery to soils and root zones
- Optimising water quality for controlled-environment agriculture

These investigations seek to better understand how highly oxygenated water systems can support sustainable horticulture, greenhouse production, and water-use efficiency in intensive agricultural environments.

University of New South Wales (UNSW) - Algae and Organic Matter Laboratory

Hydro2050 is engaging with Dr Naras Hanumanth Rao, ARC DECRA Fellow and Senior Associate within the Algae and Organic Matter Laboratory at UNSW.

Research investigations include:

- Oxidation of cyanobacterial toxins using ozone and nanobubble technologies
- Treatment of harmful algal bloom by-products
- Advanced treatment approaches for improving water safety
- Understanding mechanisms for toxin degradation in affected water bodies

This work contributes to the growing body of knowledge around treatment technologies capable of addressing one of Australia's most significant emerging water quality challenges: harmful algal blooms and associated toxin risks.

Scientific Advisory Expertise

Hydro2050 also benefits from engagement with leading Australian water scientists including Associate Professor Michael Burch, widely recognised for his contribution to cyanobacteria and harmful algal bloom management. Associate Professor Burch has been described as a world expert in the management of cyanobacteria and has contributed significantly to Australia's understanding of harmful algal blooms and water quality management.

From Laboratory Science to Real-World Outcomes

While research and scientific validation are fundamental, Hydro2050's focus is delivering measurable outcomes in real operating environments.

Applications across agriculture, wastewater treatment, dams, lakes, ponds, and water reuse systems have demonstrated improvements in water quality, oxygenation, contaminant reduction, and operational efficiency. Hydro2050's commitment is to combine scientific rigour with practical implementation, ensuring solutions that are both technically sound and commercially effective.

Learn more here



About Us

Hydro2050 is part of SA2050, an Australian innovation company that focuses on translating proven international technologies into practical, locally adaptable solutions that enhance safety, productivity, and sustainability.

Hydro2050 has extensive experience across multiple industries, research organisations and breakthrough technologies and is committed to industry innovation and exceptional customer service.

Based in Adelaide, South Australia, the driest state on the driest continent, we are acutely aware of the importance of preserving and sustaining water as a critical resource for all stakeholders and users. With an international network, Hydro2050, has partnered with leading water treatment innovators using proven technology to remediate poor quality water and provide clean, healthy water.

www.Hydro2050.com