

INTERNATIONAL
ASSOCIATION
FOR THE PROPERTIES
OF WATER & STEAM

IAPWS

ANNUAL 20
MEETING 22

THE 2022 IAPWS WORKSHOP

THURSDAY DECEMBER 1ST 2022 | NOVOTEL, ROTORUA

A one day workshop combined into the 2022 IAPWS meeting. This workshop consists of presentations and discussions relating to the future of industrial steam in New Zealand from fossil, geothermal, biomass and electrical boiler systems from users, suppliers, researchers and others involved in industry.

Concluding with a one hour drinks and canapes.

Who should attend? Engineers, scientists, operators, vendors and managers who work with, manage, design or maintain industrial steam plants.

THE FUTURE OF
INDUSTRIAL STEAM
IN NEW ZEALAND,
ELECTRICAL BOILER
SYSTEMS, BIOMASS
BOILERS AND
GEOTHERMAL STEAM
TRANSFORMER SYSTEMS

WWW.IAPWS2022.ORG

ROTORUA, NEW ZEALAND
27TH NOVEMBER - 2ND DECEMBER



NEW ZEALAND

Association for the Properties of

WATER & STEAM

The New Zealand Association for the Properties of Water and Steam (NZAPWS) was established in 2012 to bring together producers and users of steam (fossil, industrial and geothermal) and associated industries and academic researchers in New Zealand to share experiences and knowledge.

Members include fossil and geothermal electricity generators, industrial steam users and food/dairy processors, water treatment equipment and services providers, related water/steam hardware suppliers, Universities and the Measurement Standards Laboratory of New Zealand.

NZAPWS provides a link to the International Association for the Properties of Water and Steam (IAPWS) and forms the New Zealand branch of IAPWS.

NZAPWS hosts an annual meeting for the sharing of information and networking between NZAPWS members.

In 2022 the NZAPWS annual meeting will be a one day workshop combined into the 2022 IAPWS meeting.

The workshop will involve presentations and discussions relating to the future of industrial steam in New Zealand from fossil, geothermal, biomass and electrical boiler systems from users, suppliers, researchers and others involved in industry.

PROUDLY BROUGHT TO YOU BY



THE 2022 IAPWS **WORKSHOP** PROGRAM

THURSDAY DECEMBER 1ST 2022

8:30	–	8:45	Welcome to NZAPWS Future of Steam Workshop	David Addison NZAPWS Chairperson
8:45	–	9:05	Update on IAPWS TGDs	Barry Dooley IAPWS Executive Secretary
9:05	–	9:15	Introduction to electrode boilers in NZ, projects, issues and solutions	David Addison Principal Consultant, Thermal Chemistry Limited
9:15	–	9:35	Orsted 's (Denmark) Experience and Issues with Electrode Boilers	Monika Nielsen SIAPWS Chairperson / Lead Chemistry Specialist, Orsted, Denmark
9:35	–	9:55	Synlait Electrode Boiler Project	Alan Beuzenberg Energy and Utilities Manager, Synlait
9:55	–	10:15	Mataura Valley Milk Electrode Boiler Project	Robert Barrack Technical Director, Process Systems, Aurecon-t
10:15	–	10:40	MORNING TEA	
10:40	–	11:00	Electrode Boilers verses Resistive Element Boilers. The Pros and Cons of each	Brendon Stephenson General Manager, Energy Plant Solutions
11:00	–	11:20	WoolWorks Electrode Boiler Project	Anita Zunker Engineering Manager, PEI Group Limited
11:20	–	11:35	Decarbonising steam generation by electrifying your existent fossil fuel boiler – technology and case studies	Fabiano Gatto General Manager - Spirax Sarco New Zealand
11:35	–	11:55	OPEN DISCUSSION: Electrode boilers in NZ and water/steam related issues	Electrode Boiler Discussion Panel Electrode Boiler Presenters
11:55	–	12:15	Geothermal Industrial Steam Opportunities at the Kawerau Steam Field	Robbie Watt General Manager - Geothermal, Ngati Tuwharetoa Geothermal Assets Ltd
12:15	–	13:00	LUNCH	
13:00	–	13:20	Computational fluid dynamics (CFD) and non-linear finite element analysis (FEA) modelling for Industrial Boilers	Paul Bosauder Principal Engineer and Director, Sequence
13:20	–	13:40	Fonterras Future for Steam	Tony Oosten Energy and Climate Manager, Fonterra
13:40	–	14:00	Fonterra Stirling Biomass Boiler Project	Ian Hall Senior Engineering Project Manager, Fonterra
14:00	–	14:20	Coal Boiler to Biomass Conversion Considerations	Ian Brownlie Project Engineering Team Leader, Windsor Energy
14:20	–	14:25	AUSAPWS Update	Justin West AUSAPWS
14:25	–	14:35	Application of IAPWS TGDs to solve industrial steam plant problems - Dissolved Oxygen Case Study	Justin West Industrial Water Services - Australia
14:35	–	15:00	AFTERNOON TEA	
15:00	–	15:20	OPEN DISCUSSION: Future of Steam in NZ	All Presenters
15:20	–	15:40	Industrial boilers analyser considerations	Mar Nogales Swan Analytical Switzerland
15:40	–	16:00	Considerations for Future Utility Systems Combining Biomass and Electrode Boilers	Dr Marty Atkins Senior Lecturer, School of Engineering - The University of Waikato
16:00	–	16:20	Water as a Working Fluid in Industrial Heat Pumps	Dr Tim Walmsley Senior Lecturer, School of Engineering - The University of Waikato
16:20	–	16:40	Formation Mechanism and Microscopic Structure of Corrosion Protective Coating for Steam Piping by Film-Forming Amine	Dr Ken Yoshida Associate Professor - Tokushima University
16:40	–	17:00	New Generation Film Forming Substances for Industrial Applications	Bill Snodgrass Product Application Engineer, Veolia Water Technologies and Solutions
17:00	–	17:20	Industrial applications for FFS in NZ	Marty Templeton Managing Director, Visentia
17:20	–	17:30	Closing Remarks	David Addison NZAPWS Chairperson
17:30	–	18:30	NZAPWS SOCIAL HOUR sponsored by Waltron	

THE 2022 IAPWS WORKSHOP SPEAKERS

DAVID ADDISON

NZAPWS Chairperson, Principal; Thermal Chemistry

David Addison (B.Sc. (Tech), Chemistry, M.Sc. (Tech), Materials Science, University of Waikato, New Zealand) is the principal power plant chemistry consultant of Thermal Chemistry Limited (New Zealand), where he works with utility organisations worldwide helping to resolve complex water/steam cycle chemistry issues.

David Addison has worked in the power industry since 1997 and has been involved in all aspects of power station chemistry for both conventional (coal and gas), combined cycle gas turbine units, industrial steam plants, cogeneration plants, electrode boilers and geothermal power plants

David Addison has presented and chaired sessions at numerous international cycle chemistry conferences and user groups and has had multiple papers and articles published on water/steam chemistry across all plant types.

He is the current chairperson of the New Zealand Association for the Properties of Water and Steam (NZAPWS), the chairperson of the Power Cycle Chemistry (PCC) group of the International Association for the Properties of Water and Steam (IAWPS), a member of the International Advisory Board (IAB) for the PPCChem journal and is involved in the development of international cycle chemistry guidelines.



MARTIN ATKINS

Senior Lecturer, School of Engineering - The University of Waikato

Dr Martin Atkins is a Senior Lecturer in Chemical and Process Engineering at the School of Engineering at the University of Waikato. His general field of research is in energy systems engineering with a particular focus on developing and using Process Integration methodologies for optimising industrial energy systems and emissions reduction.

He is a key researcher in Project Ahuora. He has collaborated in large research programmes examining energy and emissions reduction potential in the dairy and pulp and paper industries. He has close linkages with large industrial energy users, particularly in the dairy, pulp and paper sectors.



ROBERT BARRACK

Technical Director; Process Systems Aurecon

Robert Barrack is a Senior Process Engineer and Technical Director at Aurecon NZ and is based in Aurecon's Christchurch office.

After graduating from Canterbury University Robert spent 2 years at the NZ Refining Company before heading to the UK to gain consulting experience working for Foster Wheeler & John Brown Engineering.

Returning to NZ he joined Process Developments Ltd and spent 30 years delivering projects for New Zealand's manufacturing industry including the rapidly expanding Dairy Industry.

Over this time, he developed expertise in the design and delivery of engineering projects, including process design, equipment sizing & selection, procurement & contracts, plant construction, plant commissioning and project management.

He specialised in utilities plant for Industrial manufacturing plants and heat recovery systems to reduce energy demands and GHG emissions.

Over the last 5 years Robert has focused on building expertise in the implementation of key technologies available to reduce client's energy demands and GHG emissions, including electric boilers, biomass boilers, heat pumps, heat recovery systems and process plant efficiency.

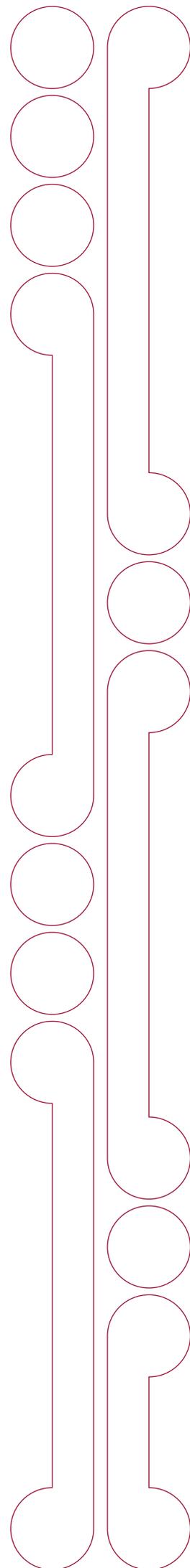


PAUL BOSAUER

Principal Engineer and Director, Sequence

Paul specialises in computational fluid dynamics (CFD) and non-linear finite element analysis (FEA). Paul brings well over two decades of CFD and FEA simulation experience. He holds NAFEMS registered Professional Simulation Engineer (PSE) advanced accreditation for both fluid and stress analysis as well as a current CPEng (Mech) registration with the practice area description (PAD) of computer-based flow and stress analysis for the design, code verification, and fitness for service (FFS) assessment of industrial and process plant and equipment.

Paul provides leading-edge delivery of CFD and FEA consulting services to customers around the globe. He brings significant experience from a wide range of industries, problem types, and analysis tools to each project he delivers or supervises. In addition to the practical application of numerical simulation, Paul has authored and presented professional education short courses, led business development for new technology fields, and maintained front-line technical support of advanced engineering analysis software.



THE 2022 IAPWS **WORKSHOP** SPEAKERS

IAN BROWNLIE

Project Engineering Team Leader; Windsor Energy

Ian Brownlie has over 22 years' experience in the engineering industry after graduating from Auckland University with a degree in Electrical Engineering. Over the last 14 years he has worked for Windsor Energy (formally RCR Energy) where he has become an expert in all things combustion through a wealth of experience in; commissioning and performance testing energy plant (from large biomass boilers to smaller gas fired equipment), tuning new and old equipment to ensure optimal performance, and more recently carrying out fuel and combustion trials on old coal boiler plants to assess and prepare for conversions. This reputation has meant Ian is regularly the first port of call to help solve boiler plant problems, often just over the phone.

Ian's role as Project Engineering Team Leader at Windsor means he is also heavily involved in managing equipment specification, assembling O&M manuals and control specifications, and various aspects of the design and construction of a range of energy plants.

Recent notable projects Ian has worked on include the Fonterra Te Awamutu Coal to Pellets conversion where he was heavily involved from project feasibility to its successful execution. Ian is passionate about sharing his knowledge and especially likes to chat about new science innovations so don't be afraid to ask him questions.



DR BARRY DOOLEY

IAPWS Executive Secretary, Senior Associate; Structural Integrity Associates

Dr. Barry Dooley is a Senior Associate with Structural Integrity Associates (SI) specializing in failures in power plants, flow-accelerated corrosion, tube and heater failures, steam turbine damage and failure, materials, and cycle chemistry. Before joining SI he was with EPRI and Ontario Hydro.

Dr. Dooley is the author or co-author of over 290 papers in the areas of metallurgy, power generation, boiler and HRSG tube failures, FAC, cycle chemistry, steam turbine failures, and life extension and assessment of fossil plants.

Dr. Dooley is the Executive Secretary for the International Association for the Properties of Water and Steam (IAPWS). In September 2006, he was made an Honorary Fellow of IAPWS.



IAN HALL

Senior Engineering Project Manager; Fonterra

Ian is a senior engineering project manager at Fonterra with over 10 years' experience making impactful change through capital projects. Coming from a trade background and having completed his PMP qualification, Ian combines theory with real life application to develop optimised solutions, navigate technical issues in his projects with class and succeed in the dynamic economic environment of today. Notably, Ian is passionate and understands the importance of people and the role they play in not only the successful delivery of his projects but the ongoing performance of the solution when the project team leaves site.

Some of Ian's key accomplishments include a 40 meter catamaran 'Island Passage' built in the Port of Nelson and now near completion, Fonterra Stirling Biomass Boiler. Ian is located in the Southland District and enjoys his fishing and hunting in his spare time.



FABIANO GATTO

General Manager, Spirax Sarco New Zealand

Fabiano Gatto is the General Manager for Spirax Sarco NZ, a British multinational company specialised in steam management systems. Electrical Engineer by trade and with a MBA in International Business, he is a seasoned business leader within the industrial space. With 16 years' experience helping, engaging, and leading our people within multinational organisations, having worked for WEG, ABB, NSK and TECO.

Married and a father of 2, enjoys a BBQ, classical movies, and music.



MONIKA NIELSEN

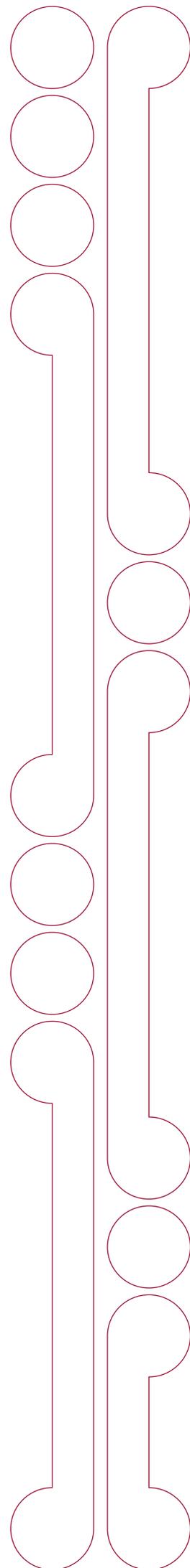
SIAPWS Chairperson, Lead Chemistry Specialist; Orsted Denmark

Monika Nielsen is a Lead Chemistry Specialist in the multinational power company Ørsted in Denmark.

Monika has been working in Ørsted since 2006, starting just after graduating from the Technical University of Odense as a Chemical Engineer, and in 2011 she changed position in Ørsted and started working in the area of water steam chemistry and power plant chemistry. She now works as a lead specialist in water steam chemistry and water treatment, and supports the nine thermal power plants operated and owned by Ørsted in Denmark.

Since 2012 Monika has participated in IAPWS activities both in the Nordics (SIAPWS) and Internationally, and in 2016 she became a member of the IAPWS PCC Working Group.

In 2019 she co-founded and was elected chairperson of the Danish branch of SIAPWS, and since 2021 she has been the chairperson of the SIAPWS Nordic organization (Denmark, Sweden, Finland, and Norway).



THE 2022 IAPWS **WORKSHOP** SPEAKERS

MAR NOGALES

Sales Engineer, Swan Analytical Switzerland

Mar Nogales (M.S. Chemical Engineering, Granada University - Spain) is working with SWAN Analytical since 2020 as Product Line Manager for Power Industry. In 2011 she joined SWAN Systems as Sales Engineer, in charge of bids for water-steam sampling and analysis systems for new power plants and for refurbishment projects. Mar started her career as a Commissioning Engineer for sampling and analysis systems and demineralized water treatment plants with Iberdrola Engineering & Construction.



TONY OOSTEN

Energy and Climate Manager; Fonterra

Tony a University of Canterbury Chemical and Process Engineering graduate has 13 years in the international Pulp and Paper industry working in New Zealand, Malaysia, Canada, and currently 14 years in the New Zealand Dairy industry working for Fonterra. Tony brings to Fonterra a depth of experience on boiler operation, energy efficiency and renewable fuels. Currently working with a team of energy engineers across New Zealand responsible for delivering the Fonterra sustainability targets of a 30% emissions reduction by 2030, elimination of coal combustion by 2037 and for Fonterra to be net zero by 2050



BILL SNODGRASS

Product Application Engineer; Veolia Water Technologies and Solutions

Bill currently holds the position of Product Application Engineer, with responsibilities for providing technical support to the Veolia Water Technologies and Solutions team across ANZ. With ~ 40 years of industrial water treatment experience Bill has filled numerous roles including Account Management, Commercial and Industry Specialist in the Water Treatment Industry. Bill's expertise lies in managing applications on large industrial sites, implementation of cost saving projects as well as development of remote monitoring and diagnostic initiatives for water treatment applications.



BRENDON STEPHENSON

General Manager; Energy Plant Solutions

Owner of Energy Plant Solutions, a company specialising in the design, manufacture, installation, commissioning, and servicing of industrial energy plant. Brendon has 31 years' experience relating to industrial boiler plant including natural gas, hydrogen, oil, biomass, high voltage electrode boilers, resistive element boilers, geothermal re boilers and air heaters. He has extensive experience in plant design, automation, manufacture, installation, commissioning, operator training, servicing, after sales support and troubleshooting.

Energy Plant Solutions installed the first large hydrogen fired boiler in New Zealand and the first two large 11kV electrode boilers in Australasia. They have now also designed their own range of electric resistive element boilers with solid state switch gear. In 2014 Energy Plant Solutions won the Large Business and the Innovation awards at the 2014 EECA awards.



MARTY TEMPLETON

Managing Director; Visentia

Marty Templeton brings 25 years' experience in industrial water treatment services to Visentia, which includes application expertise in cooling water, steam cycle and process water treatments. He has experience across many market segments including food & beverage, wood processing, refrigeration, metals, chemical and power industries.

Prior to co-founding Visentia, Marty has worked in various roles including leadership, sales, marketing and technical, in two different organisations and in five different countries. This includes 2+ years' experience in strategic marketing and has worked for 5 years in the UK & Ireland, with a specific focus on Legionella Risk Management in a heavily regulated market.

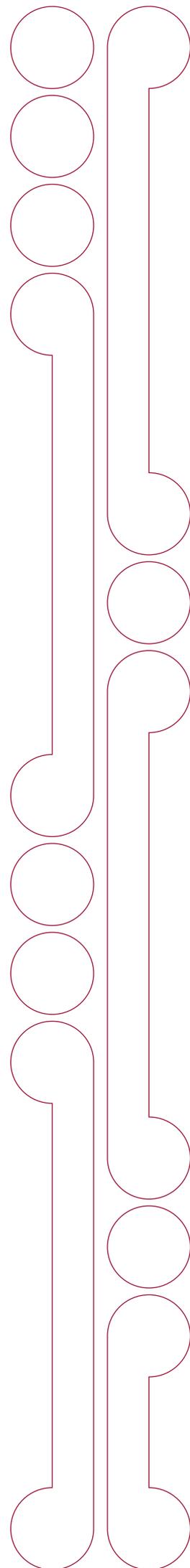
Marty has a positive and enthusiastic outlook in life, and excels in vision, leadership, and people management. He is an out of the box thinker, who enjoys the opportunity to help customer operations, whether it has to do with quality, productivity, efficiency, safety, environmental, or the challenge of finding a way to do more for less.



ROBBIE WATT

General Manager - Geothermal, Ngati Tuwheretoa Geothermal Assets Ltd

Robbie Watt is the General Manager - Geothermal of Ngati Tuwheretoa Geothermal Assets Ltd, with over 15 years of successful experience delivering large-capital energy projects in Australia and New Zealand. In the last six years he has overseen the large growth of the Ngati Tuwheretoa Geothermal Assets business to become a world class supplier of renewable geothermal energy.



THE 2022 IAPWS **WORKSHOP** SPEAKERS

TIM WALMSLEY

**Assistant Director of Ahuora - Centre for Smart Energy Systems;
Senior Lecturer School of Engineering, The University of Waikato,
New Zealand**

Dr Walmsley is an Assistant Director of Ahuora - Centre for Smart Energy Systems and leads the team's research on minimising process energy demand and the integration of high-temperature heat pumps. He is currently supervising 6 PhD students, all of whom have focuses process integration and optimisation and heat pump technology. His research is supported by Project Ahuora (www.ahuora.co.nz), an Advanced Energy Technology Platform, funded by the New Zealand Ministry of Business, Innovation and Employment.



JUSTIN WEST

AUSAPWS, Consultant; Industrial Water Services Australia

Justin was born and raised in Tasmania, Australia and after stints in various countries around the world, still resides in Hobart. He studied Applied Science at the University of Tasmania, is now the Managing Director for Industrial Water Services

Justin has worked for what was previously BetzDearbon, Hercules, GE Water, Suez and is now part of Veolia, since 2005, starting at the field service technician level and working up through various hands on and technical support positions, culminating in the position of Technical Director for ANZ – a post held for ~ 10 years.

Industrial Water Services was created in January of 2019 as a vehicle to provide both services and products associated with industrial water treatment.

His role today is to provide advice and support to clients - specifically for issues pertaining to industrial water treatment chemistry, for water treatment monitoring and control solutions, and for a variety of separation processes.

Passionate about the water industry in ANZ, Justin is a member of the executive committee of AUSAPWS.



KEN YOSHIDA

Associate Professor - Tokushima University

Ken Yoshida (Ph.D., Kyoto University, Japan) is an associate professor at Tokushima University, Japan. He specializes in the studies of structure, dynamics, and reactions in aqueous solutions and fluids.

Dr. Yoshida has intensively studied the self-diffusion coefficients in sub- and supercritical water and aqueous solutions by NMR spectroscopy and molecular dynamics simulations. Meanwhile, he has also conducted kinetic and mechanistic studies of hydrothermal reactions to understand the environmentally friendly conversions of biomass. Furthermore, he has also conducted NMR studies of lipid bilayers and membrane proteins. These studies were internationally recognized and the IAPWS awarded him the Helmholtz Award in 2014. His recent research has focused on understanding the reactions of film-forming amines in high-temperature water and the structure of their protective films.

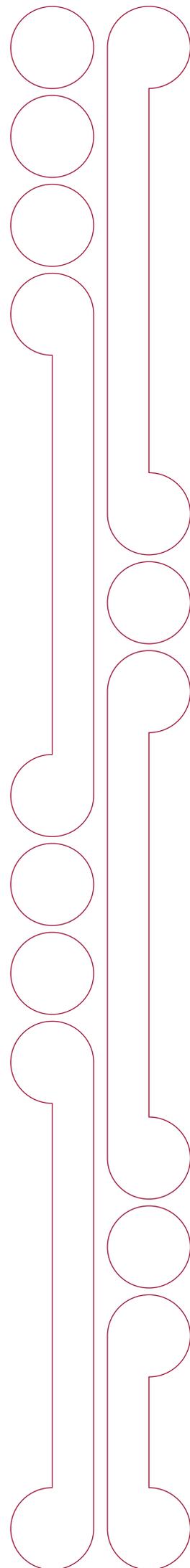
Dr. Yoshida is the current secretary of the Japan Association for the Properties of Water and Steam (JPAPWS) and the chairperson of the Physical Chemistry of Aqueous Systems (PCAS) working group of the International Association for the Properties of Water and Steam (IAWPS).



ANITA ZUNKER

Engineering Manager, PEI Group Limited

Anita Zunker is a mechanical engineer and pressure equipment inspector with PEI Group Ltd, leading their engineering and integrity division. She has many years of experience in the design, construction, commissioning and asset management of Pressure Equipment and Piping across power generation, oil and gas, dairy and pulp and paper industries. In recent years, her focus has been on assessing aging equipment, and determining inspection programmes to target areas of failure before the point of failure and determining strategies for transitioning to new equipment and/or different technologies as part of decarbonisation strategies.



THE 2022 IAPWS WORKSHOP SPONSORS



Contact Energy

Created in 1996, we're one of New Zealand's largest listed companies with over 550,000 customers across electricity, natural gas and LPG products, supported by a team of over 1000 employees located up and down the country, all working to help New Zealanders live more comfortably with energy. Our focus is on delivering great value, great products and great service to customers. We currently offer electricity, natural gas and bottled LPG generated through our 11 hydro, geothermal and gas-fired power stations.

We're always looking to the future and are constantly trialling new products and services; all inspired by what our customers have told us they value.



Ecolab

Ecolab has a profound influence on how we live our lives, and the impact we have on our planet. From clean water to safe food and healthy environments, we are at the very forefront of environmental innovation and business technology, keeping people safe and preserving our resources. Ecolab. Driving progress and protecting our vital assets. Anticipating the future and enhancing your world.



Energy Plant Solutions

Energy Plant Solutions Limited (EPS) are specialists in the supply and installation of energy plant for industry. Our sole focus is to provide high efficiency package boilers, turn key projects from design through to implementation, top quality service, ongoing maintenance, repairs, upgrades, and efficiency improvements for our industrial clients.

EPS is helping New Zealand move towards a more sustainable and energy efficient future. Because industrial energy plant is our sole focus, we are able to provide innovative, cutting edge products, knowledge and services not offered by other engineering firms. Many EPS products and services are centred on energy efficiency, environmental impact minimisation and reduced CO2 emissions. The benefits of working with EPS are immense. We value our staff, we value our clients, and we look forward to further discussing our role as your preferred energy plant supplier.



Fonterra

We are a New Zealand Co-operative made up of everyday good people who work together to do good things with dairy. Good things with the land we work on and good things for the people that our products end up with. We are passionate about doing amazing things with dairy.

In Aotearoa, the indigenous peoples, Māori, have a spiritual connection between people and the land – the wellbeing of one sustains the wellbeing of the other. It's a spirit we adapt as New Zealanders, and one we share with many cultures around the globe, that connects and unifies us all.

We want farming in Aotearoa, New Zealand to continue for generations to come that is why we are committed to farming in a way that regenerates our farms and the environment.



H2O Engineering

The H2O Group of companies begun in 2007 with H2O Systems providing specialist service and maintenance support for municipal and industrial clients. In 2010 the projects division was added and shortly after a third division of equipment sales was added. The group of companies currently has 16 full time staff.

Our philosophy and commitment is based on our desire to be the best in our industry and deliver facilities designed and constructed to the highest level. We strive to be the contractor that clients and head contractors do not need to be concerned with due to good communication and consistently delivering on time.

We specialise in developing conceptual and process designs into detailed designs, then building and delivering those detailed designs to hand over to the client. Ongoing service support can then ensure that any system built can continue to operate as designed.

The wide range of industries that H2O operate in is a testament to the experience of the staff as well as the proven track record in delivering process systems which are out of the ordinary. These industries include fossil and geothermal power generation, dairy plants, municipal and waste water, and aquariums zoos, aquatic centres and municipal water features.



IXOM

IXOM understands the fundamentals of a secure, sustainable, and competitive world class chemical solution provider includes the following components:

- Assurance of supply
- Assurance of safety
- Assurance of quality
- Legal compliance
- Internationally competitive value
- Technical and operational support
- Innovation
- Ixom – Suppling Industrial Water solutions since 2008
- Distribution agreement with VEOLIA in 2014
- Exclusive Channel Partnership agreement with VEOLIA in 2017
- World Class chemistry
- World Class technology
- Local Service expertise
- Regional Subject matter experts
- Global partnership



MERCURY NZ LIMITED

We generate electricity from 100% renewable sources: hydro, geothermal and wind. Our electricity generation sites are located along the Waikato River (hydro), the nearby steamfields of the northern part of the Central Plateau (geothermal) and in the Manawatū, South Taranaki and Otago regions (wind). We are currently building our Turitea wind farm in the Tararua Ranges of the Manawatū region, which will be New Zealand's largest wind farm once complete. We have a pipeline of future wind development sites across the country. We are also a multi-product utility retailer of electricity, gas, broadband and mobile services through our retail brands (Mercury, Trustpower and GLOBUG), and are focussed on delivering wonderful solutions for New Zealanders at home, at work and on the move. Our mission, which guides us in what we do and why, is Energy Freedom for all. This is about Aotearoa New Zealand being stronger economically and more sustainable through better use of homegrown, renewable energy. We're listed on the New Zealand Stock Exchange and the Australian Stock Exchange with foreign exempt listed status. The New Zealand Government (the Crown) holds a legislated 51% shareholding in the Company.



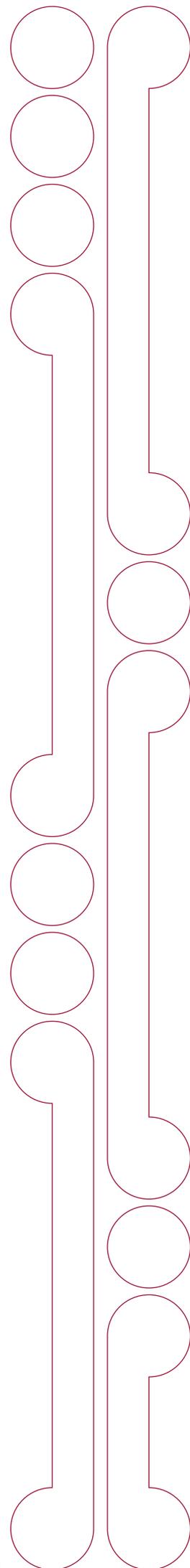
Solenis

A global specialty chemical company headquartered in Wilmington, USA.

We solve tough water treatment and process improvement challenges for customers in the consumer, industrial and pool water markets through people, experience and technology.

We are strongly invested in the Geothermal Power industry and have developed technologies proven to control deposition, corrosion and microbial growth. We have also developed chemical and application processes to rejuvenate - and stimulate - production and reinjection wells.

Check us out at www.solenis.com



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Spirax Sarco Engineering

We have three world-leading Businesses helping a diverse range of global industrial clients. Our Steam Specialties Business (Spirax Sarco and Gestra) provides products and services for the control and management of industrial and commercial steam systems; our Electric Thermal Solutions Business (Chromalox, Thermocoax and Vulcanic) provides electrical process heating and temperature management solutions; while Watson-Marlow has been providing pumps and associated fluid path technologies to customers for over 60 years.



SWAN Analytical

SWAN Analytical Australia and New Zealand proudly distribute SWAN Analytical Instruments in Australia, New Zealand, and the greater pacific.

SWAN instruments are developed on the principles of simplicity, precision and reliability.

Our range of analysers for pure, ultrapure and cooling water applications cover a wide variety of parameters including pH, Conductivity, ORP, Dissolved Oxygen, Silica, Sodium, Phosphate, Chlorine, Chlorine Dioxide, Bromine, Iodine, Ozone, and Turbidity as well as Aluminium Chloride, COD, Colour, Fluoride, Iron, Manganese, Phenol, Total Organic Carbon, Total Alkalinity and Total Hardness).

If there is anything you'd like to ask or discuss, please call by our booth during the conference.



Duff and Macintosh

Duff and Macintosh are exclusive agents in Australia Pacific for Sentry Equipment Corporation.

As suppliers of instrumentation for 95 years, Duff and Macintosh have specialised in SWAS for over 50 years.

With the technical assistance of Sentry, Duff and Macintosh now supply a broad range of steam and water sample conditioning components:

- Sample Conditioning Components
- ASME-coded sample coolers
- Pre-engineered ASME-coded single line sample panels
- Complete wet-racks to the latest EPRI, ASTM and IAPWS guidelines

Sentry's equipment, though competitive, is built to the highest standards ensuring your chemistry's quality and certainty with system longevity.



Utrex

Utrex Limited is a key supplier of niche Industrial Services. Utrex is 100% privately owned and operated in New Zealand which enables us to provide ultimate flexibility for clients.

The vision is to build an organization that operates and grows sustainably, building knowledge and expertise to support our chosen fields. Whilst focusing on the needs of New Zealand's current heavy industries, we are also dedicated to transitioning to the service needs of future clean energy providers.

Services include chemical cleaning and maintenance on boilers, heat exchangers, pipelines, tanks and evaporators. Tank cleaning of class 8, class 3 and class 5. Equipment rental, mechanical repairs, fitting, welding, PVC welding, hydrotesting and pneumatic testing. API tank design and tank repair work, HSNO tank installations and approval, turn key consulting and project management services.



Visentia

Visentia Limited was founded in 2016 by a group of like-minded professionals who believed there was a better way to provide water treatment chemicals and services to New Zealand industries. The company's tag line is "better water, better lives". We live by this, we mean it, and we make our decisions based on this principle.

Founded on the opinion that a business exists to serve the needs of customers and employees first and foremost, Visentia strives to maintain an environment where people are supported, and where work is fun.

In practical terms, this translates to not overworking staff, carefully listening to each other, encouraging new ideas and innovation, being quick to adopt new technologies, and removing bureaucracy and inefficient processes wherever we can.

We challenge everything, and we will gladly abandon the status quo if it does not deliver the value that our employees and/or our customers deserve. We believe these principles are not only good for people's lives and the water we treat, but that they are the way to sustain and further develop a successful and vibrant business.



Waltron

Waltron manufactures and distributes analytical industrial instrumentation and supporting reagents used for the management of ultra pure steam and water chemistry. Founded in 1903 under the name "Bull & Roberts" as a laboratory testing boiler water for ocean going vessels, Waltron is one of the world's oldest companies in the water industry. The original company was at the forefront of many technical innovations in the management of steam and water chemistry, including the first modern boiler water treatment program, the first nuclear water chemistry program on a commercial ship, and the founding of the American Council of Independent Laboratories.

Currently, Waltron supplies a full line of online instruments for the ultra pure water market. Starting in 2013, Waltron embraced luminescent technology as our only method for dissolved oxygen analysis, and has just released the latest version, the 9165 with completely new electronics, as well as the 9165S "smart sensor" as a limited sensor only version that can be directly connected to a plant DCS system to provide an analog milliamp signal to the DCS. In 2019, Waltron released the 3054 Filming Amines analyzer, the first online analyzer for film forming amines.



Windsor Energy

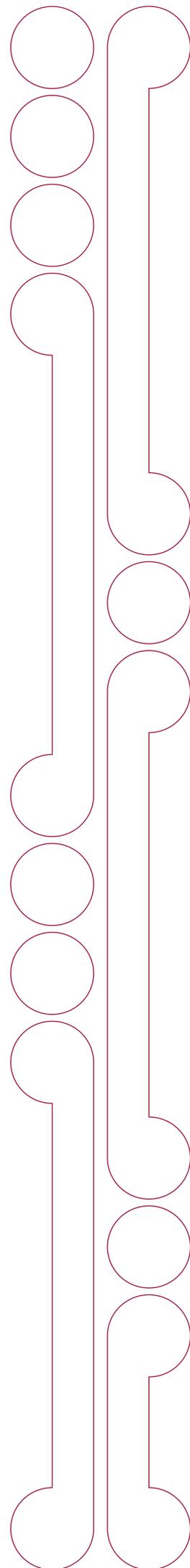
Windsor Energy is a division of Windsor Engineering Group. Well established in NZ with a history of nearly 50 years Windsor has earned their reputation building timber drying kilns, heat exchangers, air pollution control, acoustic silencers and industrial heating and combustion solutions.

In 2019 Windsor acquired RCR Energy and formed the new division Windsor Energy. Windsor attained the rights to the previous RCR IP including industrial boilers and indirect gas-fired air heaters. The entire RCR Energy engineering and service teams were retained and continue to provide thermal energy solutions to industry around our core products.

As well as our in-house designs up to 20MW capacity we hold a design licence with Babcock & Wilcox USA to build Towerpak boilers for solid fuel solutions and FM boilers for gas fired solutions above 20MW. Complementing our in-house designs, we are the Australasian representative of Elpaneteknik from Sweden for industrial Electrode Boilers.

Our team of 30-strong engineers based in Napier provide full project delivery solutions covering all engineering disciplines. Project management, procurement and construction resources in the Energy Projects team enable full end-to-end project execution capabilities.

Additionally, our nationwide Energy Service team provides regular service and annual survey support for delivered projects.



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