

Curriculum Vitae – Thermal Chemistry Limited

David Addison – BSc (Chem), MSc (Materials)
Principal

Thermal Chemistry Limited

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Position: Principal Consultant of Thermal Chemistry Limited.

Thermal Chemistry is a specialist chemistry consulting company providing independent chemistry, materials, environmental and hazard & risk management related services to the thermal and geothermal power industries in New Zealand and internationally.

Education and Formal Qualifications:

MSc(Technology): Majoring in advanced materials science, corrosion control and scientific & technical management.

Thesis Title: *“The Effect of Oxygenated Treatment on Flow Accelerated Corrosion of Carbon Steel Surfaces in Thermal Power Stations”*

BSc(Technology): Majoring in Chemistry/Industrial Chemistry with a supporting minor in Science and Technology Management. Waikato University

Major Projects List

2010 - Thermal Chemistry Limited

Rio Tinto – Yarwun CoGeneration Project

- Cycle chemistry audit of existing boiler plant and new Alstom 13E2 gas turbine based CoGeneration plant.
- Review of plant commissioning and early operation chemistry. Development of best practice site specific guidelines.
- Development of site specific chemistry training packages and delivery to site staff

Hydro Tasmania (potential CoGeneration site(s) purchase – due diligence chemistry review)

- Due diligence review of site(s) chemistry operation and potential issues.
- Identification of potential short, medium and long term chemistry issues.

Fonterra Todd Energy Joint Venture, Whareroa CoGen Site, Hawera, New Zealand (4x10.5 MW Gas Turbines and HRSGs, x1 28 MW back pressure steam turbine)

- Review of all chemistry systems – sampling, analysis, dosing, and chemical service provider performance.
- Identification of HRSG chemistry issues and development of resolution strategies.

United Group: Power and Water – Power Systems, Australia, Contact Energy Stratford Peaker Project (2x100MW GE LM1000 OCGT, wet low NOx, auxiliary cooling tower.

- Construction and commissioning support. Development of site specific Inspection Test Plans (ITPs).
- Management of Dangerous Goods approval process for all chemicals on site.

Mighty River Power: Kawerau Geothermal Unit (100MW geothermal steam turbine, direct contact condenser and cooling tower) – Re-injection well Acidising Project – x2 Injection Wells

- Project chemistry site support for large scale Hydrochloric and Hydrofluoric acid injection across multiple work sites.
- Liaison with prime contractor to ensure suitable chemical handling and safety systems in place. Emergency and environmental support as required.

2008/2009 - Thermal Chemistry Limited

Aurora Energy Tamar Valley Power Limited, Georgetown, Tasmania, Australia (1x200MW CCGT, 180 MW OCGT site) -Ongoing

- Design review of all chemistry systems – sampling, analysis, dosing, water treatment, waste water, HRSG, cooling tower, condensate system.
- Identification of potential HRSG chemistry issues and development of resolution strategies.
- Onsite operator cycle chemistry training.
- Development of site operational cycle chemistry documentation.
- Development of site chemistry improvement program for post commercial handover.
- Water Treatment Plant trouble shooting and process improvements.
- Identification of potential cooling tower and cooling water chemistry issues and development of resolution strategies.

Mighty River Power: Kawerau Geothermal Unit (100MW geothermal steam turbine, direct contact condenser and cooling tower) – Re-injection well Acidising Project

- Development of project environmental approval documentation for the Regional Council.
- Project support in relation to large scale hazardous chemical handling and use safety and compliance.

United Group: Power and Water – Power Systems, Australia, Contact Energy Stratford Peaker Project (2x100MW GE LM1000 OCGT, wet low NOx, auxiliary cooling tower).

- Specification development and requirement review of water treatment plant, tender reviews and final vendor selection and negotiation.
- Cooling tower water chemistry model development and assessment of chemical treatment requirements, corrosion control, effluent composition and water balance (make up and blowdown).
- Chemistry instrumentation specification
- Chemical hazard management program development

TRU Energy: Halletts OCGT Power Station, SA, Australia

- Specification development for high fogging demineralised water system. Water storage and non regenerable mixed bed system specification, tender review, and design review.

UTREX Limited: Kinleith Pulp and Paper Mill Boiler 4 and 5 Chemical Cleans

- Chemical clean chemistry support.
- Development of laboratory analytical methods.
- Laboratory management and analysis of samples (Fe and Cu)

TRU Energy: Tallawarra CCGT Project, NSW, Australia (450MW, Alstom GT26, Triple Pressure Horizontal HRSG, Once through sea water cooling)

- Design review of all chemistry systems – sampling, analysis, dosing, water treatment, waste water, HRSG, condensate system.
- Identification of potential chemistry issues and development of resolution strategies.
- Onsite commissioning support to TRU Energy and Alstom. Implementation of best practice plant operating strategies.
- Onsite operator cycle chemistry training.
- Development of site operational cycle chemistry documentation.
- Development of site chemistry improvement program for post commercial handover.
- Water Treatment Plant trouble shooting and process improvements.

Genesis Energy: Unit 5 CCGT Unit, New Zealand (400MW, Mitsubishi 701F, Triple Pressure Horizontal HRSG, Condensate Polishing, Cooling Tower)

- Development of the site FAC monitoring program. Design of total iron sampling systems and analysis methodology
- Development of site operational cycle chemistry documentation
- Review of cooling water chemical treatment programs
- Review of site Legionella Management Plans

Mighty River Power: Kawerau Geothermal Unit (100MW geothermal steam turbine, direct contact condenser and cooling tower)

- Review of cooling tower water chemical treatment programs
- Development of cooling water sampling methodology
- Development of site Legionella Management Plan
- Development of alternative biocide dosing program trials and project support.

Hydro Tasmania/Bell Bay Power: Tasmania, Australia (2x120 MW conventional gas fired boilers, once through sea water cooling)

- Full onsite cycle chemistry audit, review of all chemical plant, sampling and analysis systems, dosing systems and laboratory
- Identification of cycle chemistry issues and proposals for resolution

Aeromotive: Hamilton, New Zealand

- Electroplating division chemical hazard and management audit
- Recommendations for process and equipment improvements

Year 2001-2007 (whilst employed full time with Genesis Energy, New Zealand)

Huntly Energy Efficiency and Enhancement Project (e3p) [~400 MW Combine Cycle Gas Turbine Plant]:

Technical input and best practice advice to the e3p Project Manager (Cycle Chemistry, Water Treatment, Materials and Corrosion Control areas) 2002 to 2007 as part of e3p project team (Genesis Energy and Connell Wagner);

- Technical and design input at both tender specification and tender review stages in conjunction with project owners engineers (Connell Wagner).
- Production of justifications and cost benefits for inclusion of best practice technology and systems.
- Design and technical review into;
 - HRSG design (steam and water systems)
 - Cycle chemistry
 - Sampling and analysis
 - Flow Accelerated Corrosion assessment and review
 - Condensate Polishing Plant
 - Technology selection (TRIPOL)
 - Construction and commissioning
 - Cooling Tower
 - Chemical dosing and delivery systems
 - Legionella management and control
 - Environmental compliance
- Plant construction quality review
- Plant commissioning quality review and hands on involvement – including HRSG chemical cleaning
- Post commercial operation optimisation – cooling water and steam cycle
- Plant defect identification and management of resolution
- Development and delivery of Operator training – cycle chemistry, cooling water chemistry and condensate polishing

Year 2007 -2007

Huntly Power Station Unit 7 Project – Expansion and Combined Cycling of Huntly Power Station Unit 6 Open Cycle Gas Turbine:

Technical and best practice input at project specification and pre tender tender stage in conjunction with project team and owners engineers (Connell Wagner)

- HRSG Design – FAC/Materials selection/etc
- Cycle Chemistry selection
- Chemical sampling and analysis systems
- Chemical dosing and chemical storage systems
- Condensate polishing plant design
- Water treatment technology
- Cooling system design

Huntly Power Station Legionella Management Plan Development and Rollout– Helper Cooling Tower and Unit 5 (e3p) Cooling Tower:

- Risk assessments
- Development of risk management procedures
- Sampling and analysis program

- Rollout of program
- Integration into chemical dosing management

Huntly Power Station Units 1-4 Chemical Analyser Room Replacement Project:

Project manager for project justification stage and initial specification development

- Assessment of need for replacement
- Review of sampling and analysis technology options
- Initial project budget development
- Cost benefit analysis development and presentation
- Contractor pre-qualification assessment
- Specification development

Year 2006-2007

Rodney Power Station Project – New Combined Cycle Gas Turbine Power Plant North of Auckland:

Technical and best practice input at pre tender specification and tender review stages in conjunction with project team and owners engineers (BECA)

- HRSG Design – FAC/Materials selection/etc
- Cycle Chemistry selection
- Chemical sampling and analysis systems
- Chemical dosing and chemical storage systems
- Water treatment technology
- Cooling system design
- Environmental performance and consenting

Year 2004-2005:

Degussa Peroxide-Genesis Energy Joint Cooling Water Treatment Research and Development Project (Project on hold from February 2005):

Project Manager of jointly funded project between Degussa Peroxide and Genesis Energy to develop and test innovative cooling water treatment technologies for existing once through condenser systems and for future Genesis cooling tower systems.

- Overall project vision and guidance for student research chemist

Year 2002-2003:

Oxygenated Treatment Cycle Chemistry: Station Conversion from AVT[o] to OT (3 units):

Project Manager of project team (6 members, cross functional team) 2002 to 2005;

- Overall responsibility for all aspects of project (system design, installation, procedures, and additional research).
- Direct supervision of Chemical Section staff involved in sampling and analysis program.

Year: 2001-2002:

Boiler Chemical Cleans: Large-scale chemical cleans of 2 generating unit boilers (approx. 90 tons water full) to remove build up of corrosion products affecting unit production:

Project Manager of project team (14 Genesis Staff, 8 Chemical Clean Contracting Staff) October 2001 to June 2002. Co-ordination of all aspects of the project.

Sub Projects to Boiler Chemical Clean Project

- Production of functional specification and tender documents for project.
- Detailed assessment of tenders and tender selection.
- Pre-clean planning covering chemical, engineering and operational aspects.
- Direct operational control during unit 4 chemical clean (January 2002) and unit 3 chemical clean (March 2002) and unit 3 repeat chemical clean (May 2002). 24 hour operation.
- Technical assessment of chemical cleans

Oxygenated Treatment Trial: Conversion of one Huntly Generating Unit from AVT[o] to OT operation to eliminate/minimise flow accelerated corrosion, increase expected plant life, improve unit operating efficiency and decrease operating costs:

Project Manager of project team (6 members, cross functional team) February 2000 to 2002

Sub Projects to OT Trial Project

- Iron and Copper Corrosion Rate monitoring for Flow Accelerated Corrosion rate determination. Design and operation of sub ppb iron and copper corrosion sampling rigs.
- Chemical Analyser Room Sampling System redesign and optimisation to eliminated sampling errors and contamination. Engineering design, material and components selection.
- Investigation into the application of Oxidation Reduction Potential (ORP) analysers in high purity water systems.
- Design of oxygen injection and control system.

Year: 2000-2001:

Installation and commissioning of x4 Orbisphere 3660 Dissolved Oxygen Analysers. Project Manager.

Optimisation of Dionex Ion Chromatography system. Commissioning of Dionex eleuent generator system and optimisation of ppb and sub ppb anion analysis methods for ultra pure water samples.

Installation and commissioning of x4 Honeywell HPW7000 Ultra Pure water pH analysis systems. Project Manager.

Development of Boiler Chemical Cleaning policy.

Installation and commissioning of x2 ABB 8241 Silica Analysers (6 analysers previously installed). Project Manager.

Employment History:

April 2008 to Present: **Principal Consultant**, Thermal Chemistry Limited

Provision of technical services to the thermal power industry

- Project Specification development
 - HRSG / Boiler
 - Chemical dosing plant
 - Cooling Towers
 - Chemical sampling and analysis systems
 - Water treatment plants
 - Condensate polishing plants
 - Waste water treatment plants
- Process trouble shooting
- Training and lecturing
- Plant commissioning
 - HRSG / Boiler Chemical Cleaning
 - Chemical plant start up
- Chemistry audits
- Emergency Management Training and Risk Assessment

January 2000 to April 2008: **Industrial Chemist**, Genesis Power Ltd.

Tasks include:

- Providing chemical, metallurgical and engineering solutions to management for the optimisation and maintenance of plant efficiency and reliability. This includes generating plant, water demineralisation plant and waste water treatment plant.
- Management of technical projects to ensure both the long and short term operation and the long term viability of generation assets. E.g.
- Chemical Analyser installations and commissioning.
- Cycle Chemistry optimisation projects. E.g. Chemistry optimisation on start-ups, shut-downs, wet storage.
- Plant operation optimisation for life improvement and increased efficiency.
- Large scale chemistry related plant modifications. E.g. Boiler Chemical cleans.
- Carrying out research and investigations for the development and application of innovative thermal plant chemistry practices.

- The provision of chemistry solutions for the elimination of chemical related plant failure and outages by way of investigation, sampling & analysis and also to provide general technical support.
- Co-ordination and assessment of boiler tube samples for boiler condition monitoring and life assessment. Physical inspections of pressure vessels, water touched surfaces, and boiler internals during unit outages and surveys.
- Co-ordination of routine testing and analysis of water and material samples.
- Provide operational chemistry related support on a 24 hour a day basis.

Also co-ordination of the Huntly Power Station Emergency Response Team (advanced first aid/ high angle rope rescue/breathing apparatus/chemical suits/emergency site management etc) since 1999 to 2008.

- Senior Member of Team
- First response to all emergencies on site
 - Fire
 - First Aid
 - Chemical Spills
 - High angle rescue/elevator rescue
- Incident management and control
- Co-ordination and planning of team training to relevant standards
- Co-ordination of team equipment to ensure suitability for task and compliance with standards
- Team performance reporting and management lobbying

April 1998 to January 2000: **Chemical Technician**, Genesis Power/ECNZ Thermal Generation.

November 1997 to April 1998: **9 month BSc(Technology) Student Placement**, ECNZ Thermal Generation, Chemical Section, Huntly Power Station.

November 1996 to February 1997: **3 month BSc(Technology) Student Placement**, ICI Chemical Cleaning, Research & Development Group, Mount Maunganui.

Relevant Publications:

- *Condensate Polishing and Combined Cycle Gas Turbines – Technical and Financial Justification and Appropriate Technology Selection*; D. Addison, L Llyod; Presented at the 2009 EPRI 9th International Conference on Thermal Power Station Cycle Chemistry in Boston, USA, July 2009

- *The Unique Application of a Separate Bed Condensate Polishing System (TRIPOL®) in a 400 MW Combined Cycle Gas Turbine Power Plant – The Huntly Power Station Experience*; D. Addison, L Llyod; Presented at the 2008 Ion Exchange Technology (IEX) Conference in Cambridge, United Kingdom, June 2008
- *The Easy Way is always the Wrong Way - HRSG Commissioning and the Epic Struggle for Good Chemistry*; D. Addison; Presented at the 2008 API Power Station Chemistry Conference in Twin Waters, Sunshine Coast, Queensland, Australia, May 2008
- Genesis Generation Quality Management System; Chemical QSI Manual; Quality Standing Instruction; HLY-CHM-INS-PRD68; *Legionella Management Plan for the Huntly Power Station Cooling Towers Systems*; D. Addison, J Weir.
- *Improving Chemical Planning Aspects of New Generation Plant – Huntly e3p Project Experience*; D. Addison; Presented at the ESAA Power Station Chemistry Conference, Sydney Australia, March 2006
- *Oxygenated Treatment on 2-Shifting Plants; The Huntly Power Station, New Zealand, Experience*; D. Addison; Presented at the 7th EPRI International Conference on Thermal Power Station Cycle Chemistry, Houston, Texas, USA June 2003
- *Oxygenated Treatment at Huntly Power Station Unit 2: Preliminary Results from Steady State & 2-Shifting Operation*; D. Addison; Presented at the ESAA Power Station Chemistry Conference, Rockhampton Australia 22 May 2002
- *Cycle Chemistry History and Issues at Huntly Power Station, New Zealand*; Co-authors K. Hopkins & D. Addison; EPRI 6th International Conference on Cycle Chemistry In Fossil Plants, June 27-29 2000, Columbus Ohio, USA
- Genesis Generation Quality Management System; Chemical QSI Manual; Quality Standing Instruction; CHM/QSI/PLT01; *Unit Cycle Chemistry*; Issue Date November 2004, updated 2005; Co-authors K. Hopkins & D. Addison.
 - This QSI document covers all areas of cycle chemistry for Huntly Power Station.

Additional Courses Attended:

- ESAA Power Station Chemistry Conference, Australia 2006: White paper presented
- Scottworks Negotiating Skills Course (3 day course) 2004

- ESAA Power Station Chemistry Conference, Australia 2004
- EPRI 7th International Conference on Cycle Chemistry in Fossil Plants: White paper presented, USA June 2003
- Major Incident Investigation using Analysis Reference Tree Trunk Course 2002
- ESAA Power Station Chemist Conference; White paper presented, Australia 2002
- EPRI Boiler Tube Failures and HRSG Failures and Inspections International Conference; USA November 2001
- Pacific Power: Power Utility Boilers, Pressure Parts Inspection Course (LM9034); February 2000
- Pacific Power: Power Station Chemist Course (LM9012); February 1999
- Carson Group Wellington Ltd: Introductory Project Management Course; September 1998