

School of Architectural Civil and Mechanical Engineering

Dr. Eric Peterson

Lecturer

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Research Interests

Climate data for environmentally sustainable design; windpowered desalination; wind & wave energy on coral reefs; habitat suitability modelling for biodiversity; HVAC design, aquacultural engineering, computational fluid dynamics (CFD) applied to environmental flows

Research Interests/Projects

Climate Change: Analysis of recent meteorological data to determine new air conditioning design temperatures dry bulb and wet bulb at over 500 locations throughout Australia.

Using VPAC facilities to model Rongelap Atoll, an exceptionally pristine coral reef system. Combined with fieldwork ground truthing November and December 2006.

"Greenpowered desalination" windpowered desalination of borewater at Mt Coot-tha Botanic Gardens for Brisbane City Council and soon at various locations in Victoria.

Selected Papers

Burford, M., Peterson, E.L., Bianco, J., Preston, N., 1998. Bacteria in shrimp pond sediments - their role in mineralising nutrients and some suggested sampling strategies. *Aquaculture Research* 29: 843-850.

Peterson, E.L., 1999. Benthic shear stress and sediment quality. *Aquacultural Engineering* 21: 85-111.

Peterson, E.L., 2000. Observations of pond hydrodynamics. *Aquacultural Engineering* 21: 247-269.

Peterson, E.L., J.A. Harris and L.C. Wadhwa, 2000. CFD modelling pond dynamic processes. *Aquacultural Engineering* 23: 61-93. Aquacultural Engineering Society Superior Paper Award, 29th January 2002.

Peterson, E.L., L.C. Wadhwa, and J.A. Harris 2001. Arrangement of aerators in an intensive shrimp growout pond having a rectangular shape. *Aquacultural Engineering* 25: 51-65.

Halide, H., P. Ridd, E.L. Peterson and D. Foster, 2001. Assessing the sediment removal capacity of vegetated and non-vegetated settling ponds in prawn farms. Accepted for publication in *Aquacultural Engineering*.

Peterson, E.P. and M.B. Walker 2001. Effect of speed on Taiwanese paddlewheel aeration. *Aquacultural Engineering* 26: 129-147.

Peterson, Eric L. 2001. Review of engineering for sustainable shrimp farming. Pages 153-167 in: Browdy, C.L. and Jory D.E. (eds.) *The New Wave, Proceedings of the Special Session on Sustainable Shrimp Farming, Aquaculture 2001*. The World Aquaculture Society, Baton Rouge, Louisiana USA.

Peterson, E.L., N. Williams, D. Gilbert, K. Bremhorst (two articles in AIRAH Ecolibrium 2006).
New air-conditioning design temperatures for Queensland.

Biography

Employment History.

MISSION STATEMENT:

Engineering Design teaching & research in topics such as ecologically sustainable design (ESD).

CAREER SUMMARY:

- Air-conditioning/process-piping industry experience (NZ, Aust, USA) 1982/92
- Second engineering degree (BSci Env Eng, Michigan Tech Univ, USA) 1993/94
- Post-graduate student (James Cook University, Townsville, Australia) 1994/98
- Post-doctoral fellowship (Environmental Engineering, JCU, Townsville) 1999/2001
- Adjunct Senior Research Fellow and Lecturer (JCU Marine Biology and Aquaculture) 2002 and again at Victoria University from 2006

EDUCATION / QUALIFICATIONS:

BSci. Mech. Eng. University of Massachusetts 1982 with thermo/fluids concentration

Prof. Eng. (Mechanical) examined and registered in the State of Minnesota 1990

BSci. Env. Eng. (Summa Cum Laude) Michigan Technological University 1994

Prof. Eng. (Environmental) examined in the State of Michigan 1994

PhD James Cook University (Australia) - graduation due 16th April 1999

POSTDOC:

Kevin Stark Research Fellowship in Civil and Environmental Engineering, James Cook University School of Engineering, Townsville. My research resulted in the development of control systems for aquaculture pond aerators. The control system attempts to predict concentration of dissolved oxygen in aquaculture ponds, by controlling the speed and operating times of pond aerators, in response to light levels. The benefits include a direct reduction of electric energy consumption, by utilizing solar energy to produce oxygen. The project has provided knowledge of oxygen transfer rates at different aerator speeds and helped develop prototypes. Prototypes have been trialed at several working aquaculture facilities.

Qld EPA have recently decided to promote the use of PC-PAS units on aquaculture farms as a standard feature for controlling pond aeration. This will be achieved through development of a second-generation prototype at Seafarm Stage II in Cardwell North Queensland designed to exploit economies of scale. This will be matched with a promotional campaign through industry associations & state government.

PhD THESIS:

"The Effect of Aerators on the Benthic Shear Stress in a Pond" with a scholarship from the Pond and Effluent Management Project of the Cooperative Research Centre for Aquaculture. Academic supervisors were Associate Professor Lal Wadhwa, Civil and Environmental Engineering, and Senior Lecturer Jonathan Harris, Mechanical Engineering. Fieldwork was conducted at Seafarm, south of Cardwell, North Queensland. Lab work was conducted at the Australian Centre for Tropical Freshwater Research, Advanced Analytical Centre, Sedimentology Unit, Civil Engineering Lab, and Environmental Engineering Lab - all located at James Cook University, Townsville. Computer skills were developed in the Marine Modelling Unit, Computational Mechanics Lab, and High Performance Computer Service - all located at James Cook University, Townsville.

PRECIS OF PhD:

The outcome of my postgraduate research addressed some of the issues raised by the Aquaculture CRC Pond and Effluent Management Project, but not necessarily every aspect. Having found a singular objective for the operation of pond circulation systems, benthic shear stress was identified as the principle governor of aquaculture pond sediment condition. The PhD thesis documented the hydrodynamic processes in intensive aquaculture ponds and simulated these with computational fluid dynamic software (CFD). The simulation model was challenged with field data in order to assess validity of simulations. Simulation results were interpreted in terms of zones of benthic shear stress intensity. The simulation methodology was then applied to evaluate three alternative aerator deployment strategies commonly employed by industry, of which one was found to be superior.

PROFESSIONAL EXPERIENCE:

2002 to 2006, Principal Project Officer - Energy Conservation, Built Environment Research Unit, Queensland Department of Public Works. I was employed in a position that has allowed me to conduct applied research on energy efficient cooling systems for hot humid climates. This made me realize that I desire an academic career, and would like to apply my engineering and teaching skills directly in the Design industry where I began my career 20 years ago. I targeted my interests to training Department of Public Works designers to reduce energy cost of building operations, all the while improving thermal comfort and indoor air-quality (IAQ). I also was a regular attendee of Mechanical Engineering Seminars chaired by Professor Klaus Bremhorst at the University of Queensland, and spending free time lecturing Aquaculture Design at University of Queensland.

2002 Adjunct Senior Research Fellow, School of Marine Biology and Aquaculture Teaching Aquaculture at James Cook University and concept design of Orpheus Island Research Station water, wastewater, seawater, and wharf in collaboration with Maunsell Australia. I also worked with QDPI on the Bingil Bay Constructed Mangrove Wetland project, GBRMPA on impact assessment and compliance auditing of Aquaculture, and as an honorary research fellow at the Museum of Tropical Queensland under direction of Coral Taxonomist Dr Cardon Wallace, and surveyed Rongalap Atoll.

1999 to 2001 Research Fellow, Aquacultural Engineering (pond aeration systems) For Aquaculture CRC and the School of Engineering, James Cook University, Townsville.

1998 Part Time Lecturer in the School of Engineering, James Cook University, Townsville Air Conditioning; and Construction Management (after completion of PhD Scholarship)

1994 Laboratory Worker Department of Environmental Engineering, Michigan Technological University, USA. Assistant to Dr David W Hand for International Space Station recycling of water; and assistant to Professor Martin Auer, I maintained the Eagle Harbor Air Quality Monitoring Station.

1993 Energy Auditor Northern States Power (Electric and Gas Utility) Minneapolis, Minnesota, USA

1991 to 1993 Heavy Industrial Design and Site Surveying Noramco Engineering Co, Hibbing Minnesota, USA (Design-Construct Firm) Taconite slurry piping; mineral kilns and conveyors; and paper pulp piping.

1989 to 1991 Lead Mechanical Engineer in charge of Duluth Office of Gausman & Moore (Mechanical-Electrical Firm) reporting to head office in St Paul, MN, USA. Fire protection systems; steam and combustion heating; air conditioning systems; plumbing and on-site water supply; and sewer and on-site waste water systems.

1987 to 1989 Air Conditioning Project Engineer
Norman Disney and Young, Brisbane, Australia (Mech. and Elect. Engineering) Hospitals;
high rise commercial developments; underground parking and shopping arcades.

1986 to 1987 Contract Design and Construction Administration
Medley, Greijmans and Flowers P/L, Darwin, Australia; and Meinhardt and Partners P/L,
Darwin, Australia Air conditioning design for commercial clients as well as the Territory and
Federal Governments

1984 to 1986 Thermal Environmental Engineering
Kingston Reynolds Thom and Allardice, Auckland, New Zealand
(Multidisciplinary firm of Architects, Engineers, and Geoscientists)
Air conditioning; Plumbing & drainage; Fire protection; and Geothermal power stations

1982 to 1984 Sales Engineer
Brown Brothers Engineers of Christchurch and Auckland, New Zealand
(Pump and engine equipment importer and manufacturer)

Web Links

Analysis of meteorological data to determine air conditioning design temperatures dry bulb
and wet bulb for hundreds of locations throughout Queensland

http://www.airah.org.au/eco_feb06.asp

Presented model validation from Rongelap atoll expeditions 1946, 2002 & 2003 at the first
International MPA Congress abstract #80.

<http://www.impacongress.org/>

Demonstrated CFD model of a generic “pseudo-atoll” and outlined attempts to modelling
Rongelap atoll at ICRS10

<http://wwwsoc.nii.ac.jp/jcrs/icrs2004/>

Established that Rongelap Atoll is an exceptionally pristine coral reef system. <http://www.nras-conservation.org/> NRAS-Conservation public report to Rongelap Atoll Local Government