

NCED Australia Research Update

David Furukawa, National Centre of Excellence in Desalination Australia



Professor David Furukawa was appointed Chief Scientific Officer for Australia’s National Centre of Excellence in Desalination, Murdoch University, Perth, Australia. He was awarded an Honorary Professorship at the university in 2011. He is an internationally recognized expert in the field of membrane separation processes. He is past president and director of IDA and AMTA.

In 1992, he was named to the research advisory board of the National Water Research Institute and later became the RAB chair. Since its founding in 1991, NWRI has collaborated with over 100 partners around the world to fund efforts in research, education, and outreach related to water and marine environment projects.

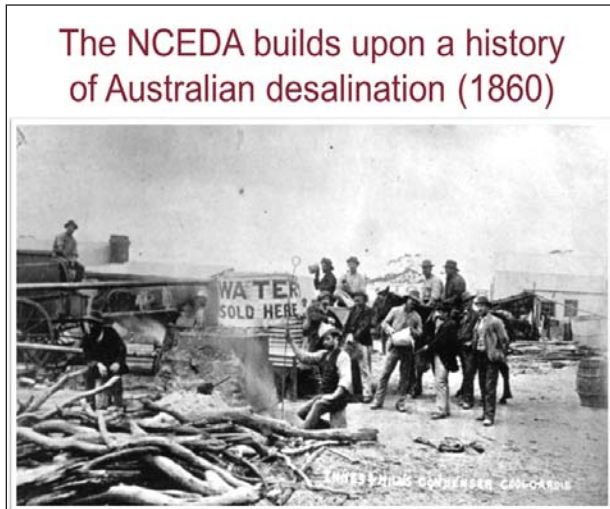
In 1996, he and Ron Linsky, laid groundwork for the Middle East Desalination Research Centre, in Muscat, Sultanate of Oman and later became vice moderator of the Research Advisory Council. Organized under the auspices of the Multi-lateral Middle East Peace Process, this centre was developed to help countries in the region cooperatively solve common water problems.

Professor Furukawa is president of Separation Consultants, Inc., whose clientele includes water districts, city water utilities, private companies, engineering companies, national and international organizations.

PowerPoint Presentation

<http://wri.nmsu.edu/publish/watcon/proc56/Furukawa.pdf>

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The National Centre of Excellence in Desalination Australia

- Established in 2009
- \$20m research funding over 5 years from the Federal Government's National Urban Water and Desalination Plan
- \$3m for establishment of Rockingham Desalination Research Facility funded by WA Government



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NCEDA research program objectives

- ◆ Lead and coordinate national research
- ◆ Build national capacity, capabilities and international collaboration
- ◆ Advance the science of desalination



Murdoch University
Rockingham
Campus

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The National Centre of Excellence in Desalination Australia

- Research Roadmap developed in 2010



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NCEDA mission

- ◆ To optimise and adapt desalination technology for use in Australia's unique circumstances
- ◆ To develop suitable desalination technology for use in rural and regional areas
- ◆ To improve efficiency and reduce the carbon footprint of desalination facilities and technologies

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The Research Roadmap developed priority research themes, validated by industry

- ◆ Pre-treatment
- ◆ Reverse osmosis desalting
- ◆ Novel desalting
- ◆ Concentrate management
- ◆ Social, environmental and economic issues



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NCEDA stakeholders are Australia's leading desalination and water research scientists

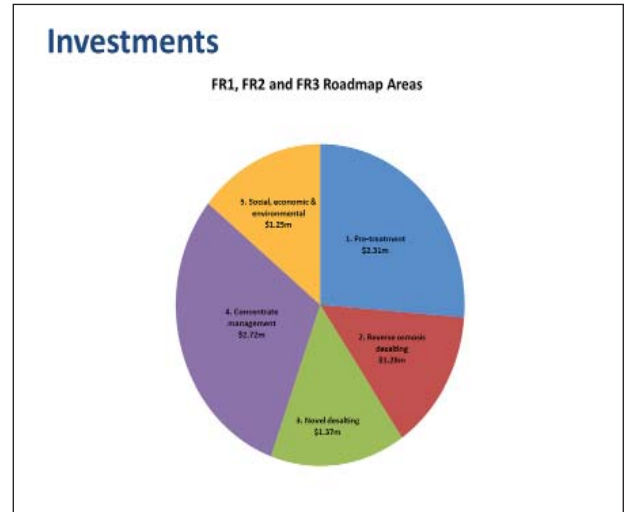


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NCEDA's 13 members collaborate in research projects with more than 50 industry partners, including:

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NCEDA's international collaborators include:

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- ### Approved Projects in Three Funding Rounds
- 126 expressions of interest
 - Centre funds invested: \$9.6m in 33 projects
 - In-kind contributions from Partners \$18.5m
 - Leveraged cash from industry \$3.7m
 - A total of \$31.8m of research activity

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NCEDA industry engagement

Go Gold Sponsors

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- ### Funding Round 1
- Novel low grade heat driven desal (MEDx)
 - High water recovery; ceramic membrane distillation
 - Brine disposal management into inland ecosystems
 - RO brine management; membrane distillation crystallisation
 - Vibratory shear membrane technology; concentrate minimisation and recovery/recycle
 - Public perception of/response to desalination
 - Reuse of RO membranes
 - Diatom nanostructure; predictive model for species sustainability
 - Bio-organic membranes
 - Membrane flocculation hybrid system for pretreatment; chemical use reduction and recovery

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Funding Round 2

- Cleaning guidelines for desalination membranes
- Universally applicable coatings/additives for RO and pretreatment membranes
- Tjuntjunjarra remote inland indigenous community solar/waste energy BW desal
- Silica removal to enhance recovery/brine volume reduction
- Fertilizers as draw solutes for FO
- Natural polysaccharide surface coating to mitigate fouling
- Non-brittle ceramic HF membranes
- CDI for inland brackish water desalination

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Prof. Linda Zou, UniSA



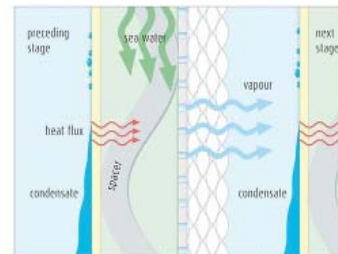
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Funding Round 3

- Fibre optic sensor for water quality monitoring
- Transverse vibrational motion enhanced submerged hollow fiber crystalliser
- Modelling, monitoring and control of RO biofouling
- Smart materials for corrosion management
- Non-chemical pulsed power technology as antifouling pretreatment for RO
- Assisted FO for RO energy reduction
- Biofouling role of microbes in desalination system; from intake to RO membranes
- Continuous silica removal to increase water recovery
- Brine management guidelines
- Membrane adsorption bioreactor hybrid system to pretreat RO
- Optimisation/improvement of direct filtration pretreatment for organic and biofouling of RO membranes

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Emerging ideas: Robust, self sustaining, remote water



Dimension μm	25	1000	25	200	4000	25
Function	heat transfer surface	sea water channel with spacer	phase separation membrane layer	film spacer	separator	heat transfer surface
Material	PP		PTFE	PP		PP

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Emerging ideas: Capacitive deionisation

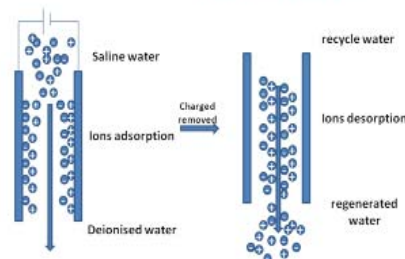


Photo: EWI/UT Green Energy

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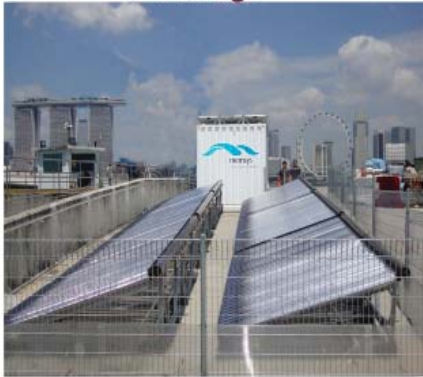
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Membrane Distillation by definition

A process in which a microporous, hydrophobic membrane separates aqueous solutions at different temperatures and compositions. The temperature difference across the membrane results in a vapour pressure difference. (Drioli, et al, J. Membrane Science, 33,277, 1987).

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MD system at Singapore Marina Barrage



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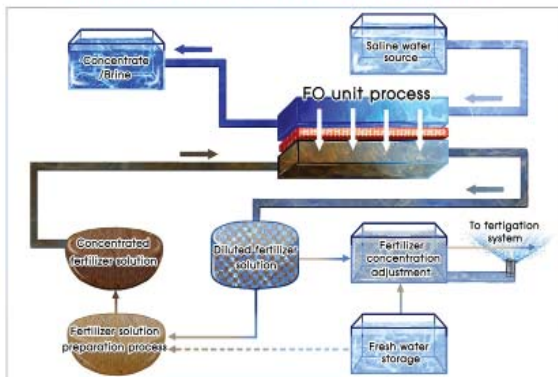
The Centre has taken a unique approach to commercialisation and industry involvement

- A share of IP revenues is reinvested in research
- Commercialisation potential is a key evaluation criteria for proposals
- The Centre sought widespread industry involvement in shaping and validating the *Roadmap*
- The Centre seeks a clear path to market for technological proposals

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Emerging ideas: Fertigation



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Rockingham Desalination Research Facility



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Dr. Vigi and team, UTS



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NCEDA Rockingham's concept design focuses on flexibility and service delivery

- Seawater and fresh water from underground provides a range of feedwater
- Instrumentation, automation, control
- Supporting workshop laboratories, offices, and administration



Mike Blackwood, Facility Manager (L) and Frank Olewniak, Project Manager

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NCEDA Rockingham targets pilot-scale research and testing







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EduLab

Showcasing the many real benefits and opportunities desalination offers Australia, this new science education laboratory engages students and visitors in the science of desalination.







The first of its kind in Australia, the EduLab:

- Gives visitors hands on experience in scientific enquiry and discovery, exploring water and desalination technologies in a way typically inaccessible to schools
- Promotes the latest developments of Australia's desalination industry and the work of the NCEDA
- Offers age appropriate 'experiments', all of which highlight different aspects of desalination
- Offers a range of demonstrations and small group activities, suitable for all ages of schooling
- Accommodates up to 36 students, with content linked to the national curriculum
- Has a flexible configuration to accommodate different ages and group sizes

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Desal Discovery Centre

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Multi Media Room

This state-of-the-art room:

- Allows the presentation of a variety of topics catering to different age groups and points of interest
- Enables remote participation from industry specialists as well as live seminars to other venues
- Will take visitors on an animated 3D journey through the desalination process and highlight the role of desalination in securing Australia's water future
- Contains 50 tiered seats in front of a 3.5m rear projection screen, S3D enabled with 5.1 surround sound
- Is a flexible facility which can be hired for training sessions, seminars, presentations and meetings
- Offers video conferencing with capacity for multiple participants, desktop and screen sharing and teleconferencing




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Desal Discovery Centre

Capturing imagination with the science and engineering of desalination

The Desal Discovery Centre (DDC) is the education and community engagement part of the National Centre of Excellence in Desalination (NCEDA).

From 2012 the Desal Discovery Centre will offer tailored visits for schools and other interested groups.

The two main areas of the DDC are the EduLab and Multi Media Room.



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Coordination with the Australian Water R&D Coalition



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QUESTIONS?

For more information:
www.desalination.edu.au

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A problem



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An idea



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