

CHEMICAL ENGINEERING OCTOBER 2008 IN AUSTRALIA

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CHEMECA

Local adaptation to global climate change fraught with uncertainties

While most of the rapid rise in carbon dioxide in the atmosphere in the past century can be identified as coming from human activity and the burning of fossil fuels, any predictions of climate change and the likely consequences for specific regions are still very uncertain, according to Professor Garry Willgoose, the director of the Centre for Climate Impact Management at the University of Newcastle.

Speaking at the Chemeca Conference in Newcastle last month, he outlined some of the challenges in determining appropriate measures for climate change adaptation.

He pointed out that while average global temperatures have risen over the past century, there have been significant variations over individual years and decades. "The temperature hasn't always gone up year on year."

Also, he said the actual greenhouse gas emissions over the next century are very uncertain, depending on global economic growth, the impact and extent of emission mitigation measures and the amount of carbon sequestration in oceans and on land.



Prof Garry Willgoose

A salient example of the impact of economic growth is China, he said. When that country achieves a similar living standard to that in Taiwan or South Korea in about a decade, it will be a bigger emitter of greenhouse gases than the rest of the world combined.

Looking at different carbon emission scenarios, Willgoose suggested that until 2050 global carbon dioxide concentrations are unlikely to be affected significantly by any mitigation measures.

"Even if we dramatically reduce emissions immediately, there will be very little effect on overall carbon concentrations and

temperature until then."

The big changes will occur in the second half of the century, mainly due to a lag in ocean temperatures, which influence the oceans' capacity to absorb carbon dioxide, he said. "So far we have only felt about 50% of the effects of 20th century emissions."

As for risk assessment for any climate change adaptation measures, he said that reliable regional and short-term predictions are "beyond current state of the art".

"There is a lot of uncertainty regarding detailed predictions and the link between global mean temperatures and local weather patterns. Current climate models are quite limited in their ability to predict local extremes and regional impacts," he said.

He offered the following time scale for adaptation, regardless of any mitigation measures:

- In the short term, up to 2030, "it is probably realistic to ignore climate change and simply continue to allow for natural variability".
- For medium term planning, up to 2050, climate projections will not be sensitive to mitigation, with most uncertainty still due to natural changes.
- Only long-term projects, with a planning horizon up to 2100, such as dams and powerstations, will need to include in their risk assessments any potential effects from climate change depending on projected greenhouse gas emissions and mitigation.

New facility for research on climate change adaptation

Professor Garry Willgoose's Centre for Climate Impact Management at Newcastle University is a member of the newly established National Climate Change Adaptation Research Facility. Funded by the federal Department of Climate Change, the facility is hosted by Griffith University. According to its website (www.griffith.edu.au/research/nccarf/), it is "one of only a handful of research institutions around the world focusing specifically on how we adapt to the physical impacts of climate change and climate variability".

The facility is a partnership with the

Queensland Climate Change Centre of Excellence, the Queensland Department of Emergency Services and seven other universities across Australia. Besides Newcastle University they are James Cook University, Macquarie University, Murdoch University, Queensland University of Technology, the University of Southern Queensland and the University of Sunshine Coast.

Its primary role will be to provide research and findings that will underpin policies and decisions on measures to adapt to climate change. Following stakeholder consultation it will start research activities from next year.

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More cooperation among chemical engineers

Engineers Australia Chemical College chair Elizabeth Harangozo and IChemE in Australia chair Russell Scott (shown here at Chemeca 2008 in Newcastle) have pledged closer cooperation, in particular in exploring possibilities of making presentations to government. As an example they gave Australia's energy regulation. "Chemical engineering must be involved in determining technical solutions to energy supply, conservation and more carbon reductions," they said, adding that chemical engineers should be included in more government advisory forums. Both support the IChemE's Roadmap on energy (see article on this page).

The role of chemical engineers in energy

Chemical engineers must help to ensure that "energy is treated as a scarce resource" and that technologies which are implemented "are sustainable and available to all – not just the rich", according to a report on energy and chemical engineering prepared for the Institution of Chemical Engineers.

The report is part of the IChemE's Roadmap, which outlines the organisation's views on energy and five other core areas of concern for the profession and the community.

Presented at Chemeca 2008 by Dr Matt Hardin from the University of Western Australia, the report sets out "the current position of energy production and distribution including political, economic, social and technical factors". It covers all of the major current and predicted fuel types, but does not attempt to "pick winners".

On fossil fuels – oil, gas and coal – it states that "the high energy density of these fuels combined with the huge existing infrastructure for their use means that they are likely to be the main source of primary energy for some time to come."

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in Australia

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To reduce carbon emissions, the report outlines several technologies likely to increase in use including Fischer Tropsch technologies for producing liquid fuels from gas, coal or biomass, carbon capture through gasification (precombustion) or flue gas scrubbing (postcombustion).

It sees chemical engineers increasingly working on biomass technologies that don't use food crops.

As for solar energy, the report says photovoltaic energy will need to be combined with highly efficient energy storage, distribution and conversion technologies for it to be used on a large scale.

Solar thermal technologies are seen as being able to deliver baseload power.

Geothermal energy using hot dry rock is not used commercially yet. So far there are only demonstration projects in Australia and Europe.

Wind is seen as making an increasing contribution to power supplies. However, the main drawback is the intermittent availability of wind power requiring backup with other more stable generating capacity.

Tides and waves represent a vast untapped source of power, the report says. However, to date there have been few commercial scale applications.

Energy conversion technologies will be a prime area of involvement for chemical engineers. Similarly energy storage and distribution will require the expertise of chemical engineers. The report discusses hydrogen fuel cells, particularly as a transport fuel.

As for nuclear fission, the report states that its chief advantage is its capacity to provide reliable and stable low-emission baseload power. But the disposal of nuclear waste at present remains an unsolved problem and the safety of nuclear power plants

“is a key area of concern. Improvements in the intrinsic safety of nuclear fission reactors will be required before widespread public acceptance of nuclear power can be expected,” the report says.

The report also looks at political and social considerations. It states that community consultation and involvement in the decision-making process for energy solutions will be of prime importance. “How the costs and benefits of any proposed development are explained and queries dealt with will determine much of the community's ultimate reaction to the proposal.”

The report sees an increasing role for chemical engineers in this regard. “Chemical engineers are likely to be called upon increasingly to articulate the case for choosing technically sound and economic solutions to problems as the issues become more complex,” it says.

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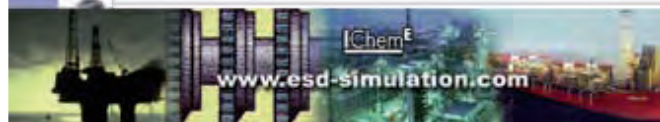
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CHEMECA AWARDS AWARDS

Celebrating excellence in chemical engineering

CHEMECA MEDAL

Dr Stuart McGill received the Chemeca Medal, the most prestigious chemical engineering award in Australia and New Zealand, at the Chemeca conference in Newcastle last month. The medal recognises outstanding and ongoing contribution to the profession.

McGill is the first Australian ever to become a senior vice-president of ExxonMobil. "His career stands as a shining example of how the intellectual rigour and discipline of a chemical engineer can deliver excellence in a wide variety of roles," the chair of the conference Professor Graeme Jameson said.

McGill retired from ExxonMobil at the end of last year and now lives back in Sydney. A graduate of the University of Sydney, he started his career with the company in Bass Strait. He then went to Malaysia and was eventually based at the company's head office in Irving, Texas.

On receiving his Medal he said he was awarded for something he liked doing best. He said ExxonMobil highly values its engineers. "The company sees itself as a technology company that finds hydrocarbons and brings them to market. While I was with the company, its management committee always consisted exclusively of engineers," he told the Chemeca delegates.

Many other excellence awards were given out at the Chemeca conference:

CALTEX TEACHING AWARD (\$5000 and certificate)

The award recognises outstanding achievements in the teaching of chemical engineers.

Winner: Jeffrey Mayne

Over the past decade, Jeffrey Mayne has taught core chemical engineering subjects to more than 800 students at Curtin University of Technology. He has combined his teaching duties with a full-time job at BP's refinery in Kwinana.

The award citation singled out Mayne's petroleum processing, and plant management and economics courses for showing students how an oil refinery operates in real life. "His students have come away inspired and better able to make informed choices about their careers in chemical engineering," the citation said.

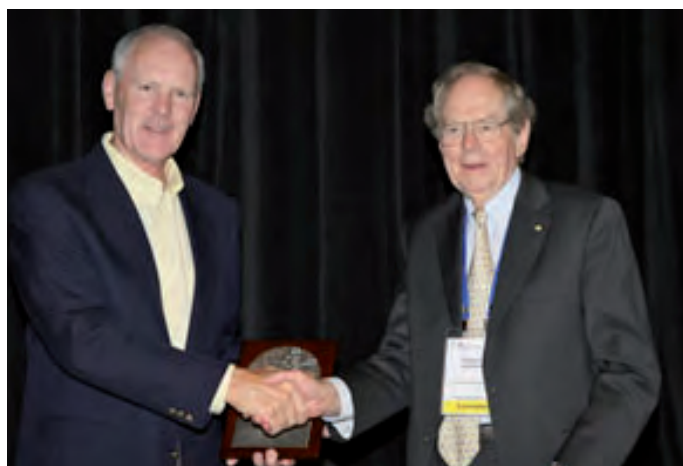
EXXONMOBIL AWARD (\$5000 and certificate)

The award recognises ongoing contributions to chemical engineering through innovations or a series of related publications over a number of years.

Winner: Neil Foster

Neil Foster, professor of chemical engineering at the University of NSW, is at the forefront of research into dense gas and supercritical fluid technologies. Advances in these fields can be applied to bio- and nanomedicine.

Foster has published 120 articles in peer-reviewed journals and books, co-authored 110 presentations delivered at



Dr Stuart McGill (l) receives the Chemeca Medal from Professor Graeme Jameson.

ALL AWARDS PHOTOS BY JOSH FITZGERALD



Caltex chief executive Des King (l) presents the Caltex Award to Jeffrey Mayne.



ExxonMobil's chairman in Australia Mark Nolan (l) presents the award to Professor Neil Foster.

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conferences in Australia and overseas, and is named as co-inventor on 13 patent filings.

He has received many Australian and international awards.

FLUOR AWARD (\$5000 and certificate)

The award recognises exceptional management and leadership talent that has directly resulted in sustained corporate success over a significant period.

Winner: Alex Strang

After graduating in chemical engineering from the University of Sydney, Alex Strang joined Caltex at its Kurnell refinery in Sydney. He rose through the ranks, assuming many leadership positions, including manager of strategic planning, corporate treasurer, and general manager of supply and distribution.

He has played key roles in the 1995 merger of Caltex and Ampol, and the alliance between Caltex and Woolworths that began in 2003.

FREEHILLS AWARD (\$5000 and certificate)

The award recognises innovation in product design or development, or service delivery.

Winner: Rose Amal

Professor Rose Amal is the youngest woman ever to become a professor of chemical engineering in Australia. She is a member of the Australian Research Council (ARC) College of Experts and is co-director of the ARC Centre of Excellence for Functional Nanomaterials.

She has made significant contributions in the fields of fine particle technology, photo-catalysis, and functional nanoparticles in water, energy and biological applications. Her work appears in over 200 refereed publications.

RIO TINTO AWARD (\$5000 and certificate)

The award recognises outstanding applied chemical engineering.

Winner: Rick Whitelaw

Rick Whitelaw started his process design engineering career at ICI Engineering, after graduating from the University of Melbourne.

He showed an ability to apply his knowledge of chemical engineering fundamentals to a wide range of process design projects.

He has worked at Global Engineering, Bechtel, Kinhill and Aker Solutions, which are contractors to many Australian and international oil and gas companies.

UHDE SHEDDEN AWARD (\$4000 and medal)

The award recognises practical services to the profession and practice of chemical engineering.

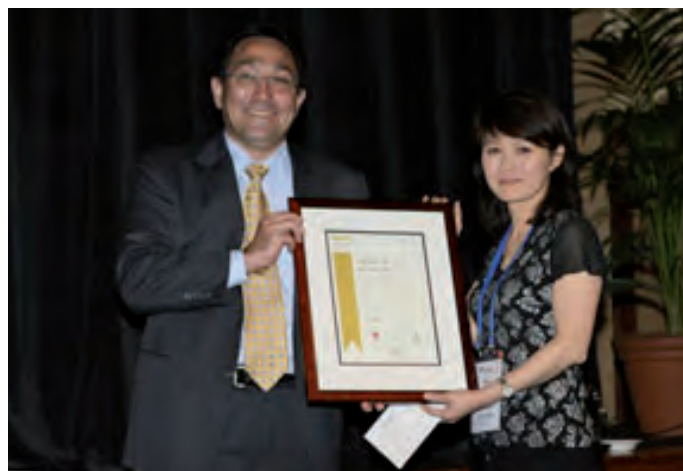
Winner: Anthony Pryde

As upstream planning and joint interest manager at ExxonMobil, Anthony Pryde provides guidance and planning for the company's assets in Australia and Papua New Guinea.

He joined the company in 1996, after graduating with degrees in chemical engineering and commerce, and worked in many



Fluor Australia director of process engineering Dr David Dolan (l) presents the award to Alex Strang.



Brett Connor, a partner at Freehills, presents the award to Professor Rose Amal.



Professor Graeme Jameson presents the award to Rick Whitelaw (l).

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technical, strategic planning and management roles. His technical and business expertise was useful in designing Bass Strait development plans.

Pryde also provides supervision, technical advice and support to young engineers and leads ExxonMobil's mentorship program for graduates.

WORLEYPARSONS AWARD (\$5000 and certificate)

The award recognises personal commitment and leadership in the area of safety and/or the environment.

Winner: Joseph Micallef

Joseph Micallef has been working on process safety in Qenos and its parent companies for about 20 years and is a recognised expert in this field. He has worked as a consultant on several ExxonMobil facilities overseas.

Under his supervision, the Qenos Olefins petrochemicals, synthetic rubber and plastics facility in Altona in Victoria became one of the first plants to complete the assessments required by the state's major hazardous facilities regulations.

He continues to develop risk assessment tools and systems for Qenos.

AKER SOLUTIONS DESIGN PRIZE

The award recognises an outstanding final year student design project.

Winners: Kippy Ingram, Josh Leary, Stella Moretti and Julia Ralph

The University of Melbourne students carried out detail design for a potential 500,000t/a dimethyl ether production facility in Victoria's Latrobe Valley, which would use desulfurised syngas from an adjacent coal-to-liquids project. In return, the coal-to-liquids plant would receive carbon dioxide produced by the dimethyl ether plant. Carbon dioxide would then be compressed and sequestered underground.

JOHN A BRODIE MEDAL

The medal is awarded for the best paper presented at the Chemeca conference.

Winners: Brent Young, Richard Murphy and Vojislav Kecman

The paper, titled "Modelling and control action optimisation for biological wastewater treatment application", analysed the behaviour of a suspended growth biological system used to remove ammonia in Auckland's Mangere Wastewater Treatment Plant. By creating a steady-state representation of the plant, the researchers minimised the compressed air required to control the rate of ammonia removal.

GRAEME JAMESON AWARD (\$5000 and certificate)

The Australian Particle Technology Society presents the award to the postgraduate student who presents the best paper on particle technology at Chemeca. The award is sponsored by Xstrata Technology, Brisbane.

Winner: Timothy Hunter



Managing director of Uhde Shedden Russell Scott (l) presents the award to Anthony Pryde.



Raja Ratnam regional manager at WorleyParsons presents the award to Joseph Micallef (r).



Anthony Tucs (r), acting engineering manager for Victoria at Aker Solutions, presents the award to (l-r) Josh Leary, Julia Ralph and Stella Moretti.



Chair of EA Chemical College Elizabeth Harangozo presents the award to Brent Young.

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Timothy Hunter from Newcastle University presented a paper called "Behaviour of aqueous foam stabilised by nanosilica and non-ionic surfactant".

He used partially hydrophobic, 300nm silica particles and non-ionic Triton X-100 surfactant to investigate the parameters required to enhance the stabilisation of the foam in various mixed systems. The results helped highlight the possible interactions between the two species at the air-water interface, which were related to changes in surface tension, absorbance, surface pressure behaviour, turbidity and interfacial rheology.

RK MURPHY MEDAL

This is the most prestigious award presented by the industrial-chemistry division of the Royal Australian Chemical Institute for significant achievements in chemical engineering, process chemistry or related areas.

Winner: Suresh Bhargava

Professor Suresh Bhargava has been professor and chair of industrial chemistry at RMIT University since 1999. He has published more than 180 papers on industrial chemistry, including alumina technology, environmental chemistry and applied catalysis. One of his papers has been cited more than 300 times.

He has attracted more than \$15 million in grants from government and industry, and formed links with companies such as Alcoa and BHP Billiton.

AWARD FOR SERVICE TO CHEMECA

Emeritus Professor Rolf Prince received an award in recognition of his service to Chemeca and the profession. From now on, the first plenary lecture of every Chemeca conference will be known as the Rolf Prince lecture.

Prince is a former head of chemical engineering at the University of Sydney and a past international president of IChemE.

BEST POSTER AWARD

Esther Kok, a student at the University of NSW, won the prize for the best poster presented at Chemeca. The poster was titled "Preparation of silver-doped titanium coating for bactericidal application".



Professor Graeme Jameson presents the award to Esther Kok.



Timothy Hunter's wife receives the award on his behalf, from (l-r) Professor Graeme Jameson, Xstrata marketing manager Steve Smith and Professor Clive Davies.



Chair of Industrial Chemistry Division of the Chemical Institute Dr Gary Bowman (l) presents the award to Suresh Bhargava.



Emeritus Professor Rolf Prince (l) receives his award from Professor Graeme Jameson.

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CHEM-E-CAR COMPETITION

Adelaide University takes the prize again

A team of chemical engineering students from Adelaide University has won the 2008 Chem-E-Car competition. It was the second time in a row that a team from that university took the prize after also winning in 2007.

There were two teams in this year's competition run on 1 October in Newcastle as part of the annual Chemeca conference. The second team came from the University of Newcastle, with a third team, that had also entered for the competition, not showing up.

In the competition small model vehicles, that must fit into a shoebox and cost no more than \$500, had to travel a certain distance, carry a specific load and stop as closely as possible to the finish line. Both the distance and the weight were announced only an hour before the race, giving each team time to adjust its vehicle's propulsion and stopping systems accordingly.

The propulsion system had to be based on a chemical reaction with the stopping mechanism cutting out the propulsion once the



Enjoying their win of the Chem-E-Car competition were (l-r standing) Steven Dutschke holding their vehicle, Nicole Hughes, Danielle Peddler and (kneeling) Joanna Princi.

required distance is reached.

To be able to set the system to the given distance and weight, each team had to run a series of tests, as part of its research project, to create a graph that shows how much propellant is needed for the task.

Each team also had to document its research and present it on a poster displayed at the competition and judged separately.

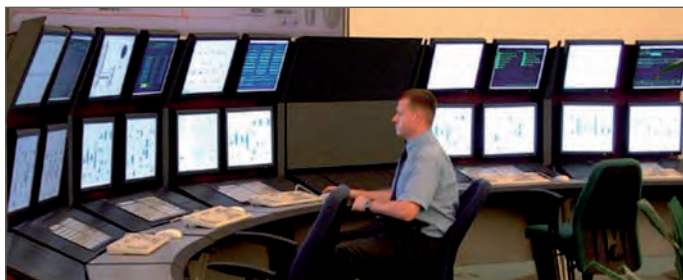
Each team had two runs and the winner was the team whose vehicle stopped closest to the finish line.

This year the distance to be travelled was 15m and the weight to be carried 250g.

Adelaide's car stopped at 15.7m, with Newcastle unable to get its car moving at all.

The Adelaide team used a lead-acid battery to drive an electric motor. The stopping mechanism was the depletion of the battery charge, with the distance travelled before the car stopped controlled by the length of time the battery was charged.

The winning team consisted of Steven Dutschke, Nicole Hughes, Danielle Peddler and Joanna Princi. The team also won the poster competition.



Outcomes of the Review of the Australian process industries process control survey 2005

11 November 2008
3pm Australian Eastern Daylight Time

Webinar, presented by
Emeritus Professor Mike Brisk

This web-based seminar organised by IChemE's Process Management & Control Subject Group, will use findings from a 2005 benchmarking survey as a basis of discussion on the current status of process control in Australia

Tanya Graham, email: tgraham@icheme.org

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28–30 October 2008

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ICHEME

Why not chemical engineering – Inspiring school students in maths and science

Chemical and process engineers in Australia are involved in a campaign to engage and motivate school students in their learning of science, and broaden awareness of the types and variety of exciting careers available in the fields of science and mathematics.

Chemical and process engineers are at the cutting edge of developing alternative energy sources, bringing clean water to the industrialising world, health care research, working towards solutions to world problems of pollution and climate change and much more. Research carried out by the Institution of Chemical Engineers (ICHEME) showed an “urgent need to increase the number and quality of applicants’ for places in chemical engineering degrees” in order to effectively continue this work.

ICHEME launched the *whynotchemeng* campaign in response to the research in the UK in 2001. The campaign was designed to communicate a positive, successful image of chemical, biochemical and process engineering, and to demonstrate its benefits to society. A similar campaign has now begun in Australia, with the website being launched in September 2007.

The campaign is designed to encourage

the brightest and best secondary school leavers to study relevant mathematics and science subjects in senior school and then move on to tertiary studies in chemical engineering. The campaign is built on these core activities: the *whynotchemeng* website, the *whynotchemeng* volunteer contact with schools and interaction with chemical engineering faculties of universities.

The website

The site contains information for students, teachers, career advisers and parents including what chemical engineers do; benefits and salaries; school and university course information; examples of cutting edge research; case studies of young engineers at work; employer weblinks and company profiles.

The *whynotchemeng* website also features a volunteer section with presentation material, Q&A and handouts. If you are ever invited to speak at a local school about your job as a chemical engineer, this website contains information you may find useful.

Volunteers in schools

Volunteers from the ICHEME membership in Australia will be the major instruments

for contact with school students, teachers and parents. These volunteers will conduct visits to schools throughout Australia to talk about careers or aspects of school science related to the work of chemical engineers and many will develop an ongoing relationship with students in one or more classes in a school over the period of one year. Ongoing relationships between schools and engineers are coordinated through the Commonwealth Scientific and Industrial Research Organisation’s Scientists in Schools program.

For examples of these relationships in action go to the Scientists in Schools website at www.scientistsinschools.edu.au/showcase/index.htm.

Participation

ICHEME in Australia has just begun the process of pairing volunteers and schools and is very pleased with the enthusiasm of chemical engineers to be involved in the campaign.

Information about participation as a school or as a chemical engineer volunteer can be obtained by contacting whynotchemeng@icheme.org.au and visiting www.whynotchemeng.com.

Chemeca 2009 on 27-30 September in Perth

“Engineering our future: Are we up to the challenge” will be the theme of Chemeca 2009, held on 27-30 September at the Burswood Entertainment Complex in Perth. “Engineers of all disciplines have the capability and the duty to contribute to sustainable solutions,” says conference chair Thys Heyns in his invitation.

His organising committee consists of co-deputy chairs Ming Ang and Peter Snowsill, Claire Butler, Peter Hay, Roger Kelson, Jon Longford, Yee-Kwong Leong,

Peter McEwen, David Montgomery and Prof Moses Tade, who will lead the technical program.

Abstracts are now invited for paper and poster presentations. Abstract submission closes on 20 February 2009, with the paper submission deadline being 19 June 2009.

Abstracts can be submitted online at www.chemeca2009.com.

The conference is being organised by ICMS in Melbourne, email chemeca2009@icms.com.au, phone 03 9682 0244.

