

## Research pinpoints cost of carbon capture and storage



**Research analysing the economic impact of carbon capture and storage (CCS) shows that operating costs for generators could increase by around 25 per cent coupled with a ten per cent decrease in power generation efficiency.**

**The additional cost to power plant generators is approximately € 40-50 per tonne of CO<sub>2</sub> abated<sup>1</sup>, with major implications for end users.**

The research methodology, developed to effectively compare and model low carbon energy and carbon capture processes, has been recognised by the EFCE Working Party on Computer Aided Process Engineering (CAPE).

Dr. Laurence Tock's work addresses the challenge of greenhouse gas emissions from power generation. She compares fuel decarbonisation in the production of hydrogen and energy from renewable sources, such as biomass, with the production from fossil fuels.

A more specific analysis of hydrogen production from natural gas shows that pre combustion carbon capture is found to be thermodynamically more efficient than post combustion, but the capital cost is significantly higher.

Dr. Tock, from the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland, was awarded the **2014 EFCE Excellence Award in recognition of an Outstanding PhD thesis on CAPE.**

Professor Antonio Espuña, Chair of the CAPE Working Party awards committee, said: "Tock's thesis effectively combines energy integration techniques as well as economic and environmental models in order to better support the decision making process for optimal plant design and operation."

On receiving the award, Dr. Laurence Tock said: "I'm very happy and honoured to be the recipient of this award. I'm proud that my

efforts have been appreciated. This award is a milestone and it will motivate me to contribute further to the progress of CAPE in meeting the global energy challenge."

She was presented the **Excellence Award for her thesis Thermo-environmental optimisation of fuel decarbonisation alternative processes for hydrogen and power production** at the 24th European Symposium on Computer Aided Process Engineering (ESCAPE-24) which was held in Budapest, Hungary in June.

The award comprised of a €1,500 cash prize and certificate.

<sup>1</sup> L. Tock, *Thermo-environmental optimisation of fuel decarbonisation alternative processes for hydrogen and power production* (2013): [http://infoscience.epfl.ch/record/184901/files/EPFL\\_TH5655.pdf](http://infoscience.epfl.ch/record/184901/files/EPFL_TH5655.pdf)

### Take part in the survey on process safety education and training

The EFCE Working Party on Loss Prevention is currently conducting a survey on process safety education among European engineers. The purpose of the survey is to help identify the needs for new initiatives in process safety education in Europe in order to better satisfy the needs of the European process industry in general, and particularly the chemical and refining sectors.

We hope you will take the survey by visiting the following website: <https://safepark.limequery.com/index.php/16471/lang-en>

Please encourage your younger colleagues to take the survey as well.

The Working Party on Loss Prevention will publish the summary results on its website <http://www.wp-lossprevention.eu/> after the results have been presented to the Working Party members.

# An interview with Professor Rafiqui Gani, President of EFCE



## What do you hope to achieve as President of EFCE for your term of office?

When I started, I initially had 3 main goals with a view to develop others later on. My first goal was to initiate a scientific panel discussion on the role of chemical engineering in meeting the challenges we face

within Europe and globally. Another goal I have is to develop a work plan to attract and involve students as I currently recognise that there is no younger generation involvement with EFCE. And my last goal is for EFCE to become better at telling people within the wider scientific community and beyond our message.

## What is the Scientific Panel Discussion and what will become of it?

I think it would be a good idea for EFCE to play a leading role in defining the status for chemical engineering in terms of where we are, where we want to go and outline the important things that chemical engineers should be addressing.

This is what the Scientific Panel Discussion paper will describe – it will go into detail about the core topics of chemical engineering and how they interface with other disciplines. Both academics and industrialists are contributing to this panel discussion and the idea is produce a popular version and a more scientific version. The scientific version will hopefully be published in a journal, with potential to present it at the 10th European Congress of Chemical Engineering in 2015. My hope is that we can make a collective statement and in one voice say that this is our view on chemical and biochemical engineering within Europe.

## You said you want to improve how EFCE communicates across

## its message, can you tell me more about that?

So EFCE has survived for the last 60 years and it will survive for many more years to come, but we can do better. We need to get across our message to the right people. We serve the member societies and they should be clear about what services we can provide for them such as conference organisation, supporting education and training, influencing decision makers and initiating collaboration. I also would like to see our conference – the European Congress of Chemical Engineering – become one of the most important conferences in Europe to go to for chemical engineers.

## Where do you see EFCE heading in the future? Do you think EFCE can influence decision makers?

First, we need to find out what our possibilities are. At the European level, we have commissioned a report from Dr. Townsend to outline what options we have, so I am very much looking forward to finding out how we can do it. EFCE can't do lobbying in the way that people understand, but perhaps there is a way for us to be nominated onto committees at the European Commission as we have a lot of experts on hot topics within our organisation.

## What do you think the key challenges are in educating the next generation of chemical engineers?

One of the key challenges is thinking about what the core topics for a chemical engineering degree should be. We also need our students to extend their knowledge in order to be flexible and adaptable in solving the many challenges facing society today. EFCE want to play a role in helping to define this curriculum in terms of core topics, science related topics and how to factor in sustainability and product issues into the equation. I think this is a great time for chemical and biochemical engineering because there are so many opportunities. If we, as a community, don't take advantage of those opportunities then somebody else will and that is why we have to attract young people to come and study this discipline.

## And finally, what is the most innovative thing that is happening in your area of expertise?

In my area of expertise - computer aided process engineering (CAPE) - we are trying to address the 'grand challenges' such as water, energy, raw materials, resources and food etc. As these problems are so large, they require a multi-disciplinary approach. Providing a solution to these problems requires a lot of input of

data from different areas and so it becomes a very complex maths problem. And what the CAPE community do very well is to integrate these different components together and find the best solution. We can find solutions from the smallest scale - the unit operation of a reactor - right up to the large scale of processing plants for multinationals. We can find solutions that would otherwise not be found, and can therefore reduce time and cost for development.

## Events: PSE2015/ESCAPE-25

**Copenhagen, Denmark, 31 May - 4 June 2015 (EFCE Event No. 727)**

12th PSE (PSE - Process Systems Engineering conference) and 25th ESCAPE (ESCAPE - European Symposium on Computer Aided Process Engineering) Joint Event would like to highlight the contributions of the PSE/CAPE community to the sustainability of the modern society. The event is aimed to establish the core products of PSE/CAPE, define the new and changing scope of our results, and the future challenges we face. During the conference the 25th anniversary of the ESCAPE-series, the 12th PSE conference and the 40th year of the Computers and Chemical Engineering journal will be celebrated. PSE2015/ESCAPE25 will provide a platform to anybody who has a good story, high scientific quality, interesting application and new significant development to tell. To achieve all this, a package of measures is envisaged including flexible registration fee; attractive scientific program; world-wide participation; high industrial participation; and incentives for young researchers.

Three plenary speakers representing the regions of Asia, Europe and North America:

- Prof. Ignacio E. GROSSMANN, Carnegie Mellon University, Pittsburgh, USA  
*Research Challenges in the Optimization of Process Systems*
- Prof. Ka Ming NG, The Hong Kong University of Science and Technology, Clear Water Bay, Hong Kong  
*Design of Consumer Chemical Products*
- Prof. Kai SUNDMACHER, Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany  
*Multiscale Design of Process Systems for Efficient Chemicals Production and Energy Conversion*

### Topical areas:

- Modelling, numerical analysis and simulation
- Mathematical programming (optimization)
- Cyber-infrastructure, informatics and intelligent systems
- Process and product synthesis/design
- Process dynamics, control and monitoring
- Abnormal events management and process safety
- Plant operations, integration, planning/scheduling and supply chain
- Enterprise-wide management and technology-driven policy making
- Domain applications (molecular, biological, pharmaceutical, food, energy, and environmental systems engineering)

A special session on education with participation from EURECHA and CACHÉ will be organised as well. The Call for Papers is open. Deadline for abstract submission: 31 August 2014

**Symposium website: <http://www.pse2015escape25.dk/>**



(L-R) Prof. Dietrich Knorr, Dr. Volker Heinz, Winner David Lloyd, Dr. Ulrich Bobe, 1st runner-up Erika Georget, 2nd runner-up Delphine Huc

## Producing emulsions in food could be less energy intensive

**A more energy efficient process for emulsion production, with applications in the food industry and beyond, developed by a postdoctoral student in Birmingham, UK, has been recognised by EFCE.**

David Lloyd is the latest recipient of the Julius Maggi Research Award.

Lloyd's research explores rotating membrane emulsification (RME) to produce oil-in-water emulsions. RME is an optimisation of the membrane emulsification process, where droplets are grown individually over time to create a uniform structure across the mixture.

Because the droplets are formed in a different way to the more traditional emulsification processes, for small scale production, RME is shown to be up to 90% more energy efficient.

This less energy intensive emulsification process could deliver a significant reduction in manufacturing costs.

The structure of many food products is emulsion-based, and it is the structure that affects mouth feel, flavour and texture, and even shelf-life. A uniform structure across the mixture means household foods such as milk and mayonnaise are of a high quality.

David Lloyd, an EngD student from the University of Birmingham, UK, presented his work at the 8th European Workshop on Food Engineering and Technology, which took place in April at the German Institute of Food Technologies (Deutsches Institut für Lebensmitteltechnik e.V., DIL), Quakenbrück. The annual workshop is organised by the EFCE's Section on Food in cooperation with the European Federation of Food Science and Technology (EFFoST).

## 2015 EFCE Student Mobility Award announced

**For the sixth time, the European Federation of Chemical Engineering (EFCE) is pleased to announce its prestigious Student Mobility Award.**

The objective of the award is to promote mobility among European chemical engineering students. The award is presented every two years to the best European students of chemical engineering who have spent one or more semesters studying abroad.

**The EFCE Student Mobility Award 2015 will consist of three prizes:**

**1st Prize:** € 2,000; **2nd Prize:** € 1,500; **3rd Prize:** € 1,000

The prizes will be awarded during the 10th European Congress of Chemical Engineering / 3rd European Congress of Applied Biotechnology – ECCE10/ECAB3, including EPIC 2015, which will be held in Nice, France, from 26 September to 1 October 2015. The prize-winners will be invited to the congress including a travel grant of up to €500.

All students who are citizens of a European country in which EFCE is represented can apply for the EFCE Student Mobility Award if they have successfully studied for at least one semester ( $\geq 30$  ECTU) in first or second cycle study programmes in chemical engineering in each of two or more different countries.

For details on the application procedure, supporting documentation and download of the application form, please visit the EFCE website at:

[http://www.efce.info/Student\\_Mobility\\_Award.htm](http://www.efce.info/Student_Mobility_Award.htm)

All documents should be submitted in *English* no later than 2 years after graduation.

**The deadline for submission of applications is 28 February 2015.**

The Section Chair, Prof. Dietrich Knorr, said: "David's work contributes to a better understanding of the process mechanisms that determine emulsion microstructure using low energy rotating membrane technology - if this technology can be applied at a large scale, and compete with the other established technologies, it could have a major impact on the food industry."

The award comprised of a €2,500 cash prize sponsored by Nestlé.