

Maggie Chetty: chosen by chemical engineering

MechChem Africa profiles Manimagalay (Maggie) Chetty, who is a senior lecturer in chemical engineering for the Faculty of Engineering and the Built Environment at Durban University of Technology (DUT); a full member of SAICHe IChemE; vice-chair of the KZN branch since Sept 2009; and a Council member since 2017.

Maggie Chetty received her matric certificate through the House of Delegates at that time, graduating as the Dux student of her year. While achieving higher grade passes in all her subjects, including maths and science, her distinction subject was in history, reflecting the influence of her well-read father.

But when it came to choosing a career, engineering wasn't her first choice. "Like all fathers at that time, mine wanted me to be a doctor. But I originally chose chemistry. Then, while reading about engineering in the library – there was no Internet to turn to at that time – I came to believe that chemical engineering was a more 'glorified' career, with more to it than being a chemist or a pharmacist. When I started, though I really didn't know much about it," she recalls.

Chetty started to study chemical engineering at the University of Durban Westville in 1986. "In those days, there were no modular courses. The first two years of engineering was in common with the BSc course in maths, physics and chemistry. It was intense with nothing watered down," she recalls.

"In 1989, I took a break from my university studies and went to work as a research assistant for three years. I worked for Professor Robin Judd on a coal gasification project for Sasol and the NRF. This gave me extensive experience of organic chemistry and the coal gasification process. At the time, we were trying to beneficiate coal fines from waste dumps to produce hydrogen (H₂), methane (CH₄) and carbon monoxide (CO) for use as fuel gases.

"Professor Judd together with my Masters supervisor, Prof Waheed Almasry, helped to shape my career in many ways. They instilled in me a love for research and problem-solving

skills that cannot be learnt from a textbook," recalls Chetty.

Following publication of this research in 1991 – *The development of a horizontally configured circulating fluidised bed coal gasifier* – Maggie Chetty, went on to complete her chemical engineering degree. She graduated in 1994 and immediately registered for an MSc, which she completed one year later.

"My Master's research involved investigating the hydrodynamics of both Newtonian and non-Newtonian fluids in airlift reactors. As opposed to reactors with conventional mixing systems, airlift reactors have no moving parts and provide a sterile environment, which is very important in the food and pharmaceutical industries. The external loop design provides a higher liquid circulation rate, enhanced mixing and high rates of heat and mass transfer," Chetty explains.

Following her Masters, Chetty joined the Durban University of Technology (DUT) as a lecturer. "I initially intended to continue with airlift reactor research, but I ended up going in another direction and worked on neural network modelling of the survival rates of cancer patients," she tells *MechChem Africa*.

Neural networks strive to solve problems involving large amounts of input data in the same way as a human or animal's brain would. A large number of pieces of different data are fed into a single node, called a neuron, for processing using an algorithm or function to give a single output. This output, along with others from different nodes, is then fed into another neuron for further processing. Because results can also be fed back, a neural network is able to adapt and change its outputs to produce more and more useful results.

On graduating with her PhD in 2009, Maggie Chetty continued her research on



airlift reactors and branched out into wastewater treatment and engineering education in the department of chemical engineering at DUT. "I have been at DUT for 22 years now, but I haven't stopped studying. In order to avoid being limited to science, I decided to do an MBA, which I completed through UKZN in 2012. I wanted a better feel for management and finance. The qualification was immediately beneficial, because I was appointed head of department (HOD) for chemical engineering in 2011, a post that I held until to 2017," she adds.

She also continued her research work, however, with an increasing focus on industrial wastewater treatment. "KZN doesn't really have the water scarcity problems that provinces such as the Western Cape do, but our industries are some of the largest users of potable water. It is a complete waste to continue to use expensive potable water for industrial purposes and then to release that water into the sea. So we advocate municipal wastewater and industrial-water treatment, which can then be recycled into a process or reused depending on the purpose and the water quality required," Chetty explains.

The development work she is currently involved with includes using anaerobic co-digestion principles for the production of biogas from municipal and industrial wastewater, most notably from breweries and dairy, yeast, alcohol and sugar producers. Since biogas is a renewable resource, the outputs of this research contribute to the drive in South Africa to reduce our dependency on fossil fuels. More recently, growing different algae varieties in industrial wastewaters has been investigated, a project that has recently been extended to include airlift reactors. "Currently we are trying to grow chosen strains of algae in airlift raceway ponds using industrial wastewater. One of the objectives is to grow algae to generate bio hydrocarbons, which are feedstocks for a range of chemicals, and to produce renewable biofuels as a by-product



A dual airlift reactor being used at DUT to investigate the effects of change in flow area. Airlift reactors have no moving parts and provide a sterile environment, which is very important in the food and pharmaceutical industries.

of COD (chemical oxygen demand) reduction treatment," she explains.

Skills development and education

Chetty's roles at DUT have also included the development of new qualifications in the chemical engineering field. "We have been developing a new suite of qualifications to meet the new qualification standards prescribed by the HEQSF. The National Diploma in chemical engineering is currently being phased out at DUT, while the Bachelor of Technology will phase out from 2020. These qualifications will be replaced with the SAQA-registered Bachelor of Engineering Technology (BEngTech) and the BEngTech (Honours) qualifications. DUT is now in the second year of offering the BEngTech in chemical engineering," she reveals.

When asked about women in engineering, she responds that chemical engineering does attract more women than other disciplines,

with the current intake being approximately 50% female. "In terms of studying engineering, women are more studious. Our research shows that their marks and pass rates are higher. Female students tend to be more diligent and they try harder to meet deadlines.

"However, we still need to bring a lot more women into other science and engineering careers," she points out. "Schools, universities and professional bodies need to get much more involved in encouraging more women into science because science and engineering remain dominated by men," she points out.

"Chemical and process engineering tends to be the most attractive of the disciplines for women because they offer widespread career options, from process control to water management and plant design. Even banks employ chemical engineers, so women have many more career roles and opportunities," Chetty adds.

"Increasingly, we are seeing second and

third generation chemical engineers entering the profession, because they have more understanding about what it involves and about the potential career options.

"But I need to say that a good grounding and love of maths, physics and chemistry are essential. It's a tough degree at undergraduate level. The rewards are great, though. While chemical engineering never turned into the 'glorified' field I imagined, I regard myself as very fortunate. It chose me and grew on me, enabling me to make good choices at the right places and the right times: in academia, teaching and research.

"It's a tough career and one needs to stay motivated, but qualified chemical engineers find well paid work very easily in a host of different areas, from analysing and optimising systems or developing new materials all the way up to being a plant manager or a CEO of a company," Chetty advises. □

SAICHe IChemE



SAICHe Board members:

President:	C Sheridan
Imm. Past President	D van Vuuren
Honorary Treasurer	L van Dyk
+ Vice President:	
Honorary Secretary:	EM Obwaka
Vice President:	D Lokhat
Council member:	JJ Scholtz
Council member:	AB Hlatshwayo
Council member:	K Harding
Council Member:	M Low
Council Member:	H Mazema
Council Member:	M Chetty
Council Member:	A de Bondt
Council Member:	M Mabaso
Council Member	NN Coni
Member (co-opted):	MD Heydenrych
Member (co-opted):	M Hughes
Member (co-opted):	C Mause
Chair Gauteng:	C Sandrock
Chair KZN:	D Lokhat
Chair Western Cape:	H Mazema

Contact details

SAICHe
PO Box 2125, North Riding, 2162
South Africa
Tel: +27 11 704 5915
Fax: +27 86 672 9430
email: saiche@mweb.co.za
saiche@icheme.org
website: www.saiche.co.za

"I have been at DUT for 22 years now, but I haven't stopped studying. In order to avoid being limited to science, I decided to do an MBA, which I completed through UKZN in 2012. I wanted a better feel for management and finance. The qualification was immediately beneficial, because I was appointed head of department (HOD) for chemical engineering in 2011, a post that I held until to 2017," she adds.