Heat transfer expert Prof Detlev Kröger – the Faculty's first A-rated researcher

Prof Detlev Kröger

A decade after his death, Prof Detlev Kröger of the Department of Mechanical and Mechatronic Engineering at Stellenbosch University's (SU) international legacy in the field of air-cooled heat exchangers and cooling tower research lives on. It is in action wherever power plants, industrial buildings, and processing plants that he helped design in South Africa and beyond are in operation, and whenever the two volumes of his seminal textbook on the subject are studied by engineers, designers, lecturers, and postgraduate students.

In the preface of "Air-cooled Heat Exchangers and Cooling Towers: Thermal-flow Performance Evaluation and Design" (2004), for which he received the Bill Venter/Altron Literary Award, he pointed out that "an appropriate and well-designed cooling system can have a very significant positive impact on plant profitability and the environment".

Postgraduate students at SU and beyond are still today introduced to his innovations through its two volumes, which summarises the more than 200 research papers, patents and numerous sets of class notes he presented at SU and other international universities during his career.

Prof Kröger joined the then Department of Mechanical Engineering in 1968 in the division for thermodynamics, and in the early 1970s initiated cooling system research at SU. He founded the Institute for Thermodynamics and Mechanics, and went on to forge strong relationships with industry, both locally and abroad, which are still enjoyed today by the Department.

In his time, Prof Kröger was regarded as the worldwide specialist in both air-cooled heat exchangers and wet cooling towers and has many patents to his name. He also investigated the phenomena that determine the performance of dry- and hybrid cooling systems to reduce the use of water. Such systems are found in many mine cooling plants, thermal processes in the process and steel industries, in solar energy and dry-cooling power plants. It is also used by the refrigeration, air-conditioning, automotive and related industries. Using fundamental theoretical and numerical analysis, laboratory experimentation and full-scale performance tests, he also worked on refining and improving the performance of such systems under various operating conditions.

He made an immeasurable contribution to the field of energy transfer optimisation, and his designs helped to reduce the environmental impact of electricity generation in terms of for instance water use and noise levels. His research stretched from basic studies of physical phenomena in heat exchangers, to computer simulations in atmospheric conditions and applied research used in some of the world's largest power stations in the USA, Europe, Russia, Australia, India, the Middle East and China. In South Africa his ingenuity is still in action as part of the design of the Kendal

power station's indirect dry cooling towers, and Matimba, Kusile and Medupi's air-cooled condensers.

Among the mantras he often repeated were "Keep on building power stations", "Test the main heat transfer components and air moving equipment before building the power plant" and "Run frequent quality tests during manufacturing".

While much of his related work was in the field of coal-fired power stations, he also in later years sought inspiration from nature, and for instance considered rock rather than salt as storage medium in gas turbines powered by the sun. He helped pushed boundaries through designs of solar chimney power plants.

Prof Kröger in 1997 became the first (and for many years the only) member of staff in the Faculty of Engineering with a coveted peer-reviewed A rating (which acknowledged him as a world expert in his field) from South Africa's National Research Foundation (NRF). Among his many local accolades were honorary doctorates from the University of Johannesburg (2002) and Stellenbosch University (2011), a DEng from Stellenbosch University in 2005, the South African Institute for Mechanical Engineers' Silver Medal (1994) and its Campbell-Pitt Award (1990, 2000). His ingenuity and influence however stretched far beyond South Africa. He was a life fellow of the American Society of Mechanical Engineers and was honoured as a "friend of China for 10 000 years", and in 2001 the 12th International Association of Hydraulics Research Symposium on Cooling Towers and Heat Exchangers in Australia was held in his honour. At the time, he was recognised for his "long and distinguished role" and "substantial and significant contributions to the art and science of cooling towers and heat exchangers".

He completed his BSc BEng (Mechanical Engineering) degree in 1962 at SU. He sold ice cream to raise some funds to study further at the world-renowned Massachusetts Institute of Technology (MIT) in the USA. There, his ingenuity was soon recognised, and he could thanks to bursaries complete the degrees MScEng and MEng in 1965 and a DScEng in 1967. After one year at Iscor, he joined SU as professor in mechanical engineering in 1971. He would later use many of the insights he gained at MIT to help design the world-class laboratories of the Department of Mechanical Engineering, built in 1972. These are, with some modification, still in use today, to provide a space for independent tests by researchers and industry alike.

One of Prof Kröger's last official contributions was helping to organise the 14th International Association for Hydro-Environment Engineering and Research (IAHR) Conference on Cooling towers and Air-cooled Heat Exchangers to Stellenbosch in December 2009. He officially retired in 2010 after 43 years as an academic and researcher.

An obituary in *Heat Transfer Engineering* (2015), described Prof Kröger as "remarkably focused", "a deep thinker" and "a towering figure as a university professor". Former students remember their modest mentor for the interest he showed in their careers. This strict taskmaster with the ability to inspire others supervised 76 postgraduate students – most of whom went on to make their mark in parastatals such as Eskom, at private power generation companies across the world, or in academia.

Prof Kröger, who was born on 31 July 1939 in Cape Town. He passed away on 16 March 2014, leaving behind his wife Regine, three children, and five grandchildren.