



30

YEARS OF EXCELLENCE

**CENTRE FOR
COMPRESSOR TECHNOLOGY**



“It is all about people”

I start each International Conference on Compressors and their Systems with this sentence.

This is because successful institutions, organisations or indeed conferences depend upon and foster people who are part of them. This applies to the Centre for Compressor Technology, a research unit in the Department of Engineering at City St George’s, University of London. The Centre was formed with the name of the “Centre for Positive Displacement Compressors” in February 1995 by my esteemed colleagues Prof Emeritus Ian K. Smith and Prof Nikola R. Stosic, who had a vision and desire to help the screw machine industry advance and thrive. Among the key people at the beginning of that journey were Ronny Kershaw and Chris Holmes from Holroyd, Jack Sauls from Trane and Dr Joost Brasz from Carrier. I joined the Centre in 1996 for a short project; to support the development of the first screw compressor fully designed by the Centre, from modelling to detail design, prototyping and testing. In 1998, I moved permanently to the UK to be a part of this exciting journey. Many colleagues joined us on this 30-year-long journey. Dr Colin Aldis, Dr Elvedin Mujic, Dr Ashvin Dhunput, Dr Matthew Read, Dr Sham Rane, Dr Thibaud Plantegent, Aleksander Krupa, Hossein Keshtkar, Dr Yang Lu, and Ivona Ivkovic-Kihic, are just a few of them. The journey, that significantly contributed to the science and technology of positive displacement machines, would not have been possible without industry and support from the University. During this time, we collaborated with more than 100 companies and several academic institutions that will be mentioned in the book.

This book is about these people and their stories.

It was a challenge to compile all the photos and stories when preparing this book, and I am sure we may have missed some. But, with the support of the actors of this story, and the enormous efforts and time, Ivona dedicated to compiling all the information, the book is here to remind us about the journey. In this fourth decade ahead of us, the Centre has reached its third phase, where a young team, which we formed, will lead it in the new era, to contribute further to energy sustainability and a net-zero economy.

Prof Ahmed Kovacevic, FREng
Director

Nikola Stosic: My personal view on screw compressors



“My first encounter with screw compressors was more than forty years ago when the executives of a local compressor factory ‘Trudbenik’ decided to try their luck with these machines. Trudbenik had 35 years of experience with reciprocating compressors and they were members of a conglomerate company ‘Energoinvest’ which at the time employed 42,000 people, a good basis for a serious step forward.

At that time the executive director of Trudbenik, Mr Pero Bukejlovic, a person of my age with bright sparks in his eyes approached us at Sarajevo Mechanical Engineering with a simple question, would it be possible to generate a screw compressor rotor profile. We did not know the direct answer to the question, but we knew that we would work hard on that task to achieve the goal. We at Sarajevo University had at that time 10 years of modelling of positive displacement compressors behind us. Everything started with Professor Kemal Hanjalic, who led us, mainly on piston machines and we were very ambitious to try something new. We accepted the offer without hesitation.

Only later I realised that all enthusiasts working on screw compressors had similar sparks in their eyes. These include Dr Chris Holmes of Holroyd, Mr Varadaraj of Elgi, Mr Kim of Airplus, Mr Laine of Tamrotor, Mr Kapadia of Gardner Denver, Dr Haghjo of Ingersoll Rand, Mr Sangfors of SRM, Mr Edstroem, Professor Rinder and Jack Sauls... all believed in screw compressors and had vision.



At that time, all of us in Yugoslavia lived in a socialist society, enjoying every one of its progressive aspects. This started to crumble in the eighties to be completely destroyed in the nineties. To decline that kind of offer was simply not an option. Just imagine a person in their early thirties with literally infinite funds to feed our enthusiasm for exploring something new, never tried in our surroundings. We accepted and used the abundant experience of Russian authors, Sakun, Andreev and Amosov, and designed our first rotors in only a few weeks.

Pero's next question was: Nice, now that we have the profile, how do we make the rotors? Do you know how to design the tools? Certainly, we did not know, but we spent several more weeks generating the tool profile.

There were many more questions after that, how to design the suction and discharge ports, how to calculate the bearings, where to locate the oil port, how to measure the prototype performance after the company provided a special rotor milling machine to start screw compressor manufacturing. The appetites grew and the following questions were mainly related to dry screw and refrigeration compressors, as well as multistage units. In five years, everything matured and we successfully passed all exams of the screw compressor education. This provided a good jump start for our City Compressor Centre, established in 1995, which since then has become a part of screw compressor history.

Pero's last question was how to sell screw compressors effectively in the local and world markets. This was a question that he answered successfully without much help from us. He provided perfect servicing and aftermarket care so that Trudbenik succeeded to thrive equally well in the socialist and postwar periods, selling good screw compressors in all of former Yugoslavia. Many credits are due to Pero, but even more credits belong to the screw compressor, a fantastic machine, which proved to be successful all over the world, achieving its ceiling and practically without a major failure anywhere.

Prof Nikola Stosic, July 2025

Content

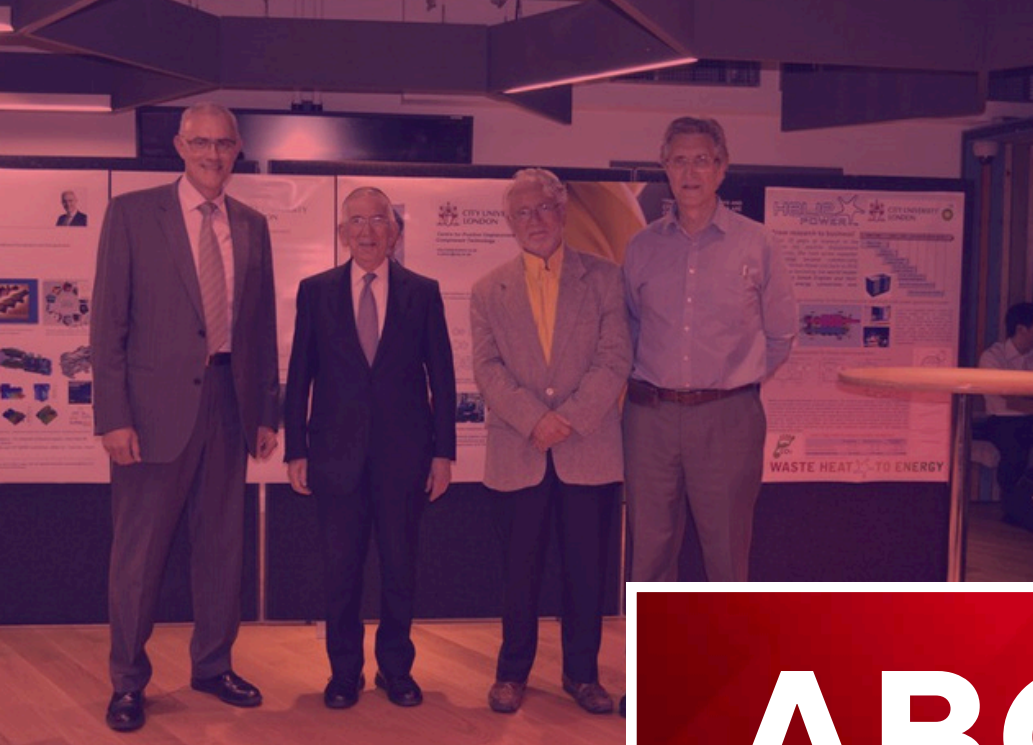
1 About the Centre

5 Our Story

63 Alumni & Friends

75 Centre Today





ABOUT THE CENTRE



Pioneering Compressor Technology Since 1995

Established in 1995, the Centre for Compressor Technology at City, University of London, is a world-leading hub for research, innovation, and industrial collaboration in the field of positive displacement compressors and expanders. With over three decades of collaboration with industry, the Centre has become internationally recognised for bridging academic excellence with practical engineering solutions.

The Centre plays a key role in advancing energy efficiency, supporting sustainability, and delivering novel approaches to compression and expansion technologies across a wide range of industries. Its work is underpinned by long-term partnerships with industry, government, and academic institutions, and by a deep commitment to mentoring the next generation of engineering leaders.

Our Mission

To advance the understanding and development of rotary positive displacement machines for compression and expansion processes. We aim to enhance the efficiency of these machines across a broader range of conditions, contributing to the Net Zero 2050 targets by reducing environmental impact and manufacturing costs. We are also dedicated to supporting industry in the research, design, manufacture, and operation of these machines in both existing and innovative applications.

Our Vision

To lead the development of rotary positive displacement technology, enabling its integration into novel energy systems and the recovery of power from low-grade heat. Through pioneering research and collaboration with industry, we aspire to redefine the role of these machines in sustainable energy systems and support the transition toward a cleaner Net Zero future.

Our contribution in numbers

RESEARCH AND INNOVATION

200+
JOURNAL PAPERS

400+
CONFERENCE PAPERS

3
TEXTBOOKS

17
BOOK CHAPTERS

13
PATENTS

INDUSTRIAL IMPACT

CONSULTED
AND COLLABORATED
WITH
100+
COMPANIES

160+
COMPLETED
PROJECTS

3
SPIN-OUT
COMPANIES

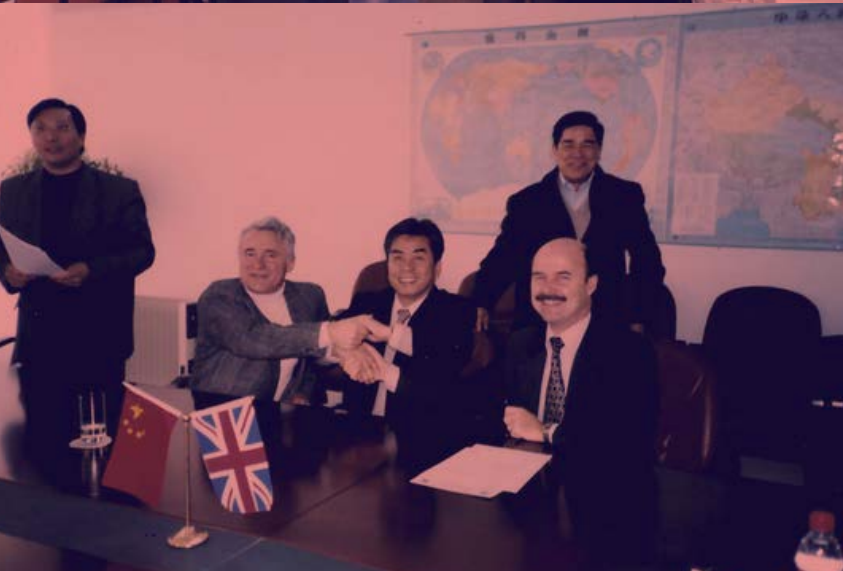
PEOPLE

25
PHD STUDENTS
GRADUATED SO FAR

9
PHD STUDENTS
STUDING AT THE
MOMENT

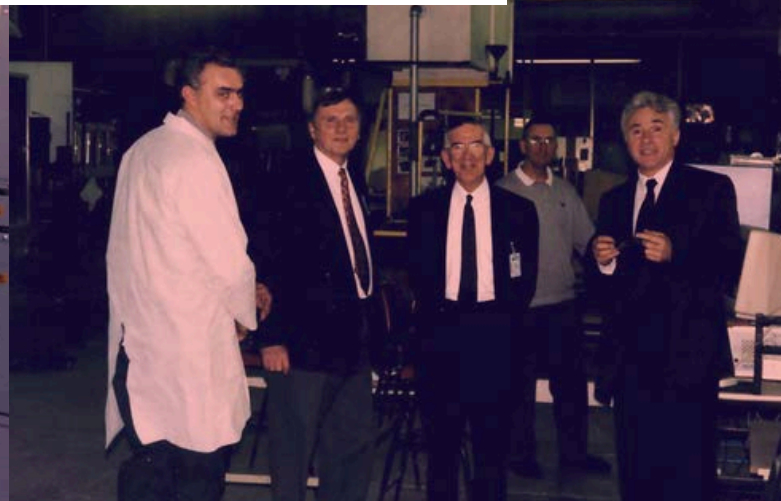
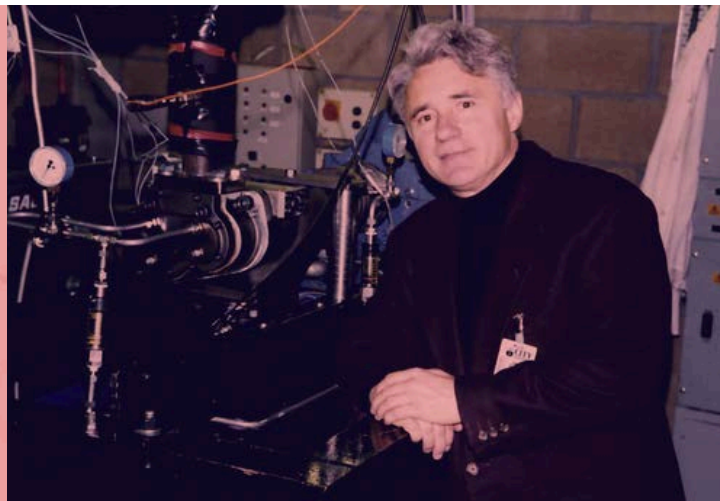
3
FELLOWS OF THE
ROYAL ACADEMY
OF ENGINEERING

2
DOCTORS OF
SCIENCE





OUR STORY



The Spark Before the Start

Origins of the Centre



The story of the Centre for Compressor Technology at City St George's, University of London began not in a lab or lecture hall, but with a chance encounter shaped by extraordinary global circumstances.

In the early 1980s, Professor Ian Smith, who had been at City since 1962, began exploring the possibility of using two-phase expanders to recover power from the heat of the mildly radioactive rock in Cornwall. With private funds arranged by Peter Kalms, an entrepreneur, and Peter Martin, the CEO of an engineering design consultancy, the SPHERE (Single Phase Heat Efficient Recovery of Energy) test rig was built to test expanders.

Meanwhile, at about the same time, Nikola Stosic, a young academic and former student of Professor Kemal Hanjalic, at the University of Sarajevo, in Bosnia and Herzegovina, joined his team. This included the then-young university graduate, Ahmed Kovacevic. They were commissioned to embark on a project to design rotor profiles and a screw compressor family for "Trudbenik", a compressor company, which was part of the engineering giant "Energoinvest". By the 1990s, Trudbenik was a major supplier of screw compressors to the Eastern European market.

In 1992, Prof Nikola Stosic, then already a renowned academic and engineer, was sent abroad and began a new professional chapter due to the outbreak of the war in Bosnia and Herzegovina. Amid the uncertainty of displacement, Nikola replied to an advert by Professor Ian Smith, for a research worker to model twin-screw machines as two-phase expanders. Prof Smith, impressed by Nikola's depth of expertise, invited him to City University. Their collaboration was instant, intense, and productive. Nikola completed in six months what Ian had projected as two years of work. Their combined skills— Smith's vision and Stosic's rigour and deep industrial understanding—formed the foundation of a transformative research partnership.



Prof John Denton, Dr Colin Aldis, Prof Stosic, Ronnie Kershaw, Prof Smith, Tony Daniels, Dr Holmes



Prof Stosic, Dr Holmes, Mr Sauls

It was, however, a time of some austerity and there was no chance of his getting a permanent position here, once Nikola's placement grant funding expired. We did, though, possess unique advantages of both test facilities and analytical skills that we believed to be superior to any available elsewhere, and we thought that it might be possible to earn enough to keep going by using these facilities to offer a service to the compressor industry. However, this might take a long time, and initial external support was essential.

At that time, the Royal Academy of Engineering, the UK's premier engineering body, was offering specialist chairs to people who could show that there was a demand for such positions by obtaining half their funding from industrial sources.

I now come to the heroes of the hour, who, arrived at the last moment and this was Holroyd, whose, then Managing Director, Ronnie Kershaw, encouraged by his research manager, Chris Holmes, saw the potential advantages of such an arrangement and offered to put up the 50% industrial funding that we needed. With both their financial input and business contacts, over the years, we have survived and even thrived.

**Prof Ian Smith
for the 20th Anniversary of the Centre, 2015**

1995

Around the same time, the screw compressor industry in the UK was undergoing rapid evolution. There was a growing demand for deeper technical understanding and innovation. Ian and Nikola recognised a unique opportunity: to create a centre of excellence in compressor research that could bridge the gap between academia and industry.

Their vision gained traction quickly. The Royal Academy of Engineering (RAEng) awarded a prestigious Research Chair to Professor Stosic in 1995, a move that was strongly supported by industrial partner Holroyd, who confirmed the Centre's potential value to UK manufacturing. With this endorsement and funding, the Centre for Compressor Technology was formally founded within the Department of Engineering at City University.

What happened?

The Royal Academy of Engineering Research Chair was awarded to Professor Stosic with industrial support from Holroyd. This marked the formal founding of the Centre for Compressor Technology.

Why did it matter?

This step validated the Centre's potential and secured long-term backing for world-class research in compressors, placing City University at the forefront of global development in this field.



Prof Stosic and Ronnie Kershaw

It was either 1991 or 92 that we at Holroyd had become aware of the compressor expertise at City, and it is even possible that Ian and I met at some of the events we attended. Memories fade.

Ronnie Kershaw, besides being my boss, was a strategist who I admired greatly. He believed in making friends before making business. Ian was invited to Holroyd for a meeting. I think I collected him from the train station in Manchester, and we soon shared our opinions on the inconvenience of travelling to such far-flung conferences to discuss screw compressors, when the UK had been the home of their production, and one of us said "Wouldn't it be good to have one in London?" The other one agreed.

The relationship then developed in a way which had a significant effect on the Centre's future. Ian told us he had persuaded Nikola Stosic to work at City after he and his family had left the fracturing Yugoslavia for Germany in 1992. He was appointed Visiting Fellow 1st February 1993.

Ian then discovered the Royal Academy of Engineering's offer of Professorships, requiring 50% funding from industry. He contacted Ronnie Kershaw about this and Ronnie invited Nikola to visit Holroyd. Ronnie asked me to spend half a day with him and report to him afterwards.

After showing Nikola around our rotor production area (the 'rotor shop') and explaining what each of the machine tools did, we had a long and interesting talk, and then I drove him back to the station and went to give my opinion to Ronnie. I said he was intelligent, quick to understand our processes, and enthusiastic. Ronnie nodded but said little, and I left his office wondering what his decision would be. The following day he told me he had decided to give the full industrial contribution, and would let Ian know.

Dr Christopher S. Holmes, 12 March 2025

Retired from Holroyd



Prof Stosic and Dr Holmes

Profiles of the Founders

Professor Ian Smith has been part of City, University of London since 1962, where he is Professor of Applied Thermodynamics in the Department of Mechanical Engineering. He holds a BSc in Mechanical Engineering from the University of Cape Town, a diploma in Gas Turbine Technology from Imperial College London, a PhD from the University of London, and a DSc from City.

Before entering academia, he worked in the aircraft gas turbine industry. At City, he pioneered the Department's first MSc course and initiated research into power recovery from low-grade heat sources—his primary area of expertise. In 1995, he co-founded the Centre for Compressor Technology with Professor Nikola Stosic, and their work led to the creation of Heliex Power Ltd in 2009.

Professor Smith has published over 190 works, including three monographs, and holds nine patents. His many honours include the Institution of Marine Engineers Silver Medal and the James Clayton Prize. He is a Fellow of both the Royal Academy of Engineering and the Institution of Mechanical Engineers.



**PROFESSOR EMERITUS
IAN K. SMITH**

Professor Smith speaks quickly and I took some time to get used to it. As director of the Centre, he has a lot to do. However, when I wrote my first paper intended for submission to the International Journal of Refrigeration, Professor Smith still revised the draft very carefully. The paper he revised is not only much more fluent to read, but also more accurate in its expression.

Professor Liansheng Li
**Qingdao University of Science &
Technology**
**Attended Technical Co-operation Training
at the Centre in 1999**



Professor Nikola Stosic graduated in Mechanical Engineering from the University of Sarajevo in 1973, earned an MSc from the University of Zagreb in 1976, and completed his PhD in 1982, all under the supervision of Professor Kemal Hanjalic. He later received a Doctor of Science degree (DSc) from City, University of London in 2019.

He began his career at Energoinvest before joining the University of Sarajevo, where he became Professor of Applied Thermodynamics. In 1992, he joined City, University of London, and in 1995 was appointed Royal Academy of Engineering Professor of Positive Displacement Compressor Technology. Together with Professor Ian Smith, he co-founded the Centre for Compressor Technology. He was appointed Chair of the field in 2000.

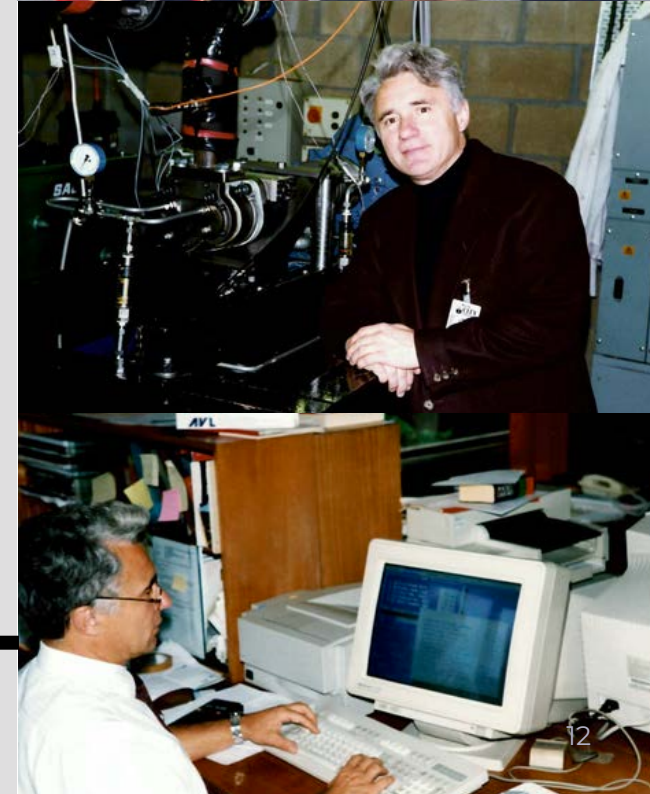
Professor Stosic is internationally recognised for his expertise in screw compressor design and analysis. His research spans fluid dynamics, thermal systems, and industrial applications. He has worked with manufacturers in over 25 countries and authored more than 300 publications, multiple textbooks, and holds four active patents.

His awards include the IMechE Bernard Hall Prize, Clayton Prize, and ASME Best Paper Awards. He is a Fellow of the Royal Academy of Engineering and the Institution of Mechanical Engineers.

PROFESSOR
NIKOLA STOSIC



Prof. Hanjalic, Ms. Hanjalic,
Ms. Stosic, Prof. Stosic



OUR TEAM

Dr Colin Aldis

TEST OFFICER 1995-2002

Dr Colin Aldis was the University test officer a long time before the Centre was established.

He was an experienced engineer and had worked with Prof Smith on the SPHERE expander test rig since 1984. This was a privately financed unit within the University for research into two-phase expanders. Three expanders were tested, namely a Howden 204 mm dry compressor with hydrodynamic journal bearings, suitably modified, a Bellis and Morcom, 163 mm unit, designed as an expander, with hydrostatic bearings, both with problems of oil leaks and the latter with noise, and a 128 mm liquid flooded expander of our own design, with Nikola's N praofile rotors and rolling bearings. The SPHERE test rig was a full thermal plant and included a boiler, expander, condenser and feed pump. Later our expressor designed by Nikola and Ahmed was added. When the University decommissioned the boiler, the expander component was transferred to our modified refrigeration compressor plant to test an alternative unit designed by Ahmed. Colin also worked on two compressor test rigs until 2002, when he left.



What happened?

A landmark collaboration with Carrier Corporation, led by Dr Joost Brasz, opened new avenues in two-phase expander research.

Why did it matter?

This partnership demonstrated the Centre's ability to translate complex theoretical research into practical engineering solutions for international partners.

1996



In 1996, the Centre for Compressor Technology launched one of its first major international collaborations with Carrier Corporation, a global leader in HVAC systems. Led by Dr Joost Brasz, the project focused on developing two-phase expanders to improve energy recovery in refrigeration systems.

Working alongside Professors Ian Smith and Nikola Stosic, the Centre applied its emerging simulation tools to enhance the thermodynamic modelling of these machines. The collaboration provided valuable experimental data and helped validate the Centre's methods in a real-world industrial context.

This partnership was a big milestone—it demonstrated the Centre's ability to deliver impactful research and laid the foundation for future collaborations with leading global manufacturers.

Prof Kovacevic, Dr Joost Brasz,
Dr Vishnu Sishtla

1997

In 1997, the Centre for Compressor Technology began a long-standing collaboration with ELGI Equipments, one of India's largest compressor manufacturers. This partnership focused on rotor profiling, performance optimisation, and design improvements for industrial screw compressors.

The project marked a significant step in the Centre's growing global reputation. ELGI provided real-world challenges and data, while the Centre delivered advanced modelling techniques and customised design tools—laying the groundwork for a series of successful projects over the following decade.

What happened?

Partnership launched with ELGI Equipments, strengthening the Centre's industrial base and global profile.

Why did it matter?

This engagement allowed for real-world validation of design tools and broadened the Centre's influence across continents.

We were one of the earliest collaborators with the Centre for Compressor Technology at City St George's, University of London (it was earlier called City University). Our decision to collaborate with the Centre that did not have the reputation that it has today, was based on the enthusiasm, sincerity and phenomenal domain knowledge of Nikola Stosic, Ian Smith and later Ahmed Kovacevic.

We were looking for not just "know-how" but to deeply build the "know-why" of screw compressors. At a world-class standard. And the Centre was the ideal partner for our ambition. Our decision was almost instantly made after our first meeting. And we always look back with pride about that decision.

The passion and seriousness with which the team immersed themselves with the challenges that we posed to them, were outstanding. There was total ownership to our problems and solutions were tailored to our circumstances without resorting to standard solutions.

Our collaboration was over a 10-year period and during this time, we not only obtained designs specific to our requirements but also guidance and teaching for a multitude of designs that we developed on our own. A part of our current technological capabilities can be attributed to the learning that was enabled during our partnership with the Centre.

Dr Jairam Varadaraj,
ELGI

ELGI
Always Better.

What happened?

Ahmed Kovacevic joined the Centre as a doctoral researcher, bringing expertise in mechanical engineering and a strong focus on numerical modelling.

Why did it matter?

His early work on CFD and compressor simulation became foundational to the Centre's research. Ahmed would go on to become Director of the Centre in 2014, leading it into a new era of innovation and international impact.

1998

Ahmed led the Howden/City University strategic partnership when I joined Howden in 2009. I was immediately struck by his ability to integrate academic knowledge into real life industrial challenges and involve both entities into designing and executing screw compressor solutions for complex applications.

His involvement across engineering and our commercial functions ensured we were successful on a global basis, winning projects as far away as Australia and the US. We also had great fun travelling the world together putting British industry on the map.

The partnership also developed people and I'm proud of the work we both did giving ladders to young engineers to further their careers.

His leadership was exemplary and set the example to us all. It's no surprise to me that the Centre for Compressor Technology has gone from strength to strength.

Jim Fairbairn

Formerly Managing Director, Howden Compressors

In 1998, Ahmed Kovacevic joined the Centre for Compressor Technology as a doctoral researcher, marking the beginning of a career that would become central to its development. With a strong background in mechanical engineering and a keen interest in numerical modelling, Ahmed quickly became a key contributor to the Centre's work on screw compressor simulation and design.

His early research focused on the development of advanced CFD tools and numerical methods that laid the foundation for many of the Centre's future innovations.

This entry marked not only the strengthening of the research team but also the arrival of a future leader who would later guide the Centre into its next era.

1999

In 1999, the Centre for Compressor Technology played a key role in launching the International Conference on Compressors and their Systems, in response to growing industrial demand for deeper academic collaboration.

The inaugural event was organised by the Fluid Machinery Group of the Institution of Mechanical Engineers (IMechE), with support from Holroyd and active involvement from the Centre's researchers. Hosted at City, University of London, the conference provided a dedicated platform for sharing technical advances, industrial challenges, and academic research in compressor technology.

The event laid the foundation for a biennial series that would grow into one of the most respected forums in the field, reinforcing the Centre's role at the heart of global compressor innovation.

What happened?

The first International Conference on Compressors and their Systems was launched.

Why did it matter?

The conference met a clear industrial and academic need, becoming a lasting platform for knowledge exchange—and one of the Centre's most recognised global contributions.

Early on, in the establishment of the Centre, it occurred to me that we needed to become better known in the compressor world and at that time, the meeting point of industry and academia, interested in this area was Purdue University, in the USA, where a biennial conference was held on this topic. Having attended there previously, I had noticed that very few of the people who came there were from Europe. I, therefore considered that we might gain some advantage by holding a complementary conference, here, in London, on alternate years.

Since, at that time, we were an unknown entity, I applied for and was elected as a member of the Fluid Machinery Group of the IMechE and, on joining, I proposed that they arrange such an event, to be located here at City. My proposal did not meet much support, because the IMechE had conducted such conferences previously as local events and had not had much success. With the backing of Holroyd, I proposed to start again, but this time, to make it an international event and undertook, personally, to underwrite it, against loss. In 1999, we held the first such conference and it turned out to be a success.

Prof Ian Smith
at the 25th Anniversary of the Centre

The International Conference on Compressors and their Systems series began in 1999 as a result of industrial consultation and need for academic collaboration. At the time the conference was organised by the Fluid Machinery Group of the Institution of Mechanical Engineers (IMEchE) with support from Holroyd.

2000

The year 2000 marked an important turning point for the Centre for Compressor Technology. Professor Nikola Stosic was formally awarded a Chair in Positive Displacement Compressor Technology at City, University of London—an academic recognition of his pioneering contributions and the growing importance of the Centre within the engineering research landscape.

Several important papers were published at major conferences. The first results of CFD modelling of screw compressors were presented for the first time at Herrick Conferences at Purdue University in West Lafayette, Indiana and later that year at ASME International Mechanical Engineering Congress and Exposition in Orlando, Florida. The expessor concept as a replacement for a throttle valve in chillers was presented at the DESIGN 2000 in Dubrovnik and the mechanical engineering conference in Bled.



UK Conference Organizing Committee

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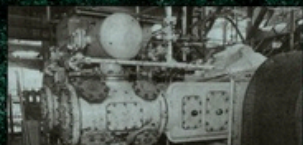
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INTERNATIONAL CONFERENCE ON COMPRESSORS AND THEIR SYSTEMS



Proceedings of the 1st International
Conference on Compressors and their
Systems

2001

What happened?

The Centre received two major awards.

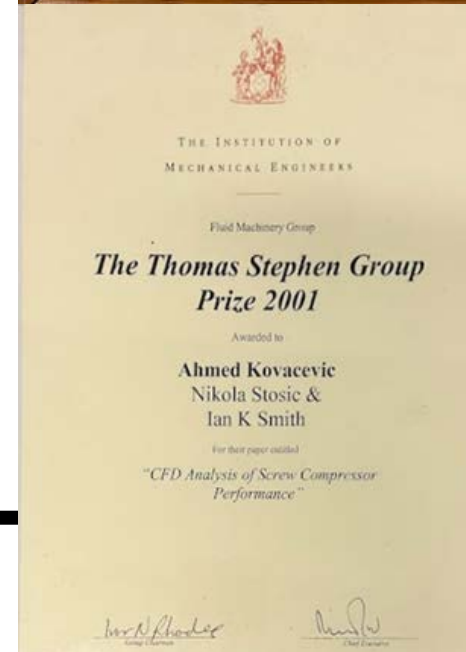
Why did it matter?

These honours recognised the Centre's outstanding contributions to thermodynamics and energy systems, strengthening its global academic and industrial reputation.

In 2001, the Centre for Compressor Technology received two prestigious international awards, highlighting its growing influence in energy systems and mechanical engineering. The Geothermal Resources Council awarded the Centre the Best Paper Prize, recognising its contributions to energy recovery and expanders for low-grade heat applications—an area central to the Centre's mission from the beginning.

In the same year, the Centre was honoured with the Thomas Stephen Group Prize from the Institution of Mechanical Engineers (IMechE). This award acknowledged outstanding contributions to applied thermodynamics and compressor technology, particularly in the development of novel analytic tools and methods for screw machines designs.

The 2nd International Conference on Compressors and their Systems was held at City University.



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COMPRESSORS AND
THEIR SYSTEMS

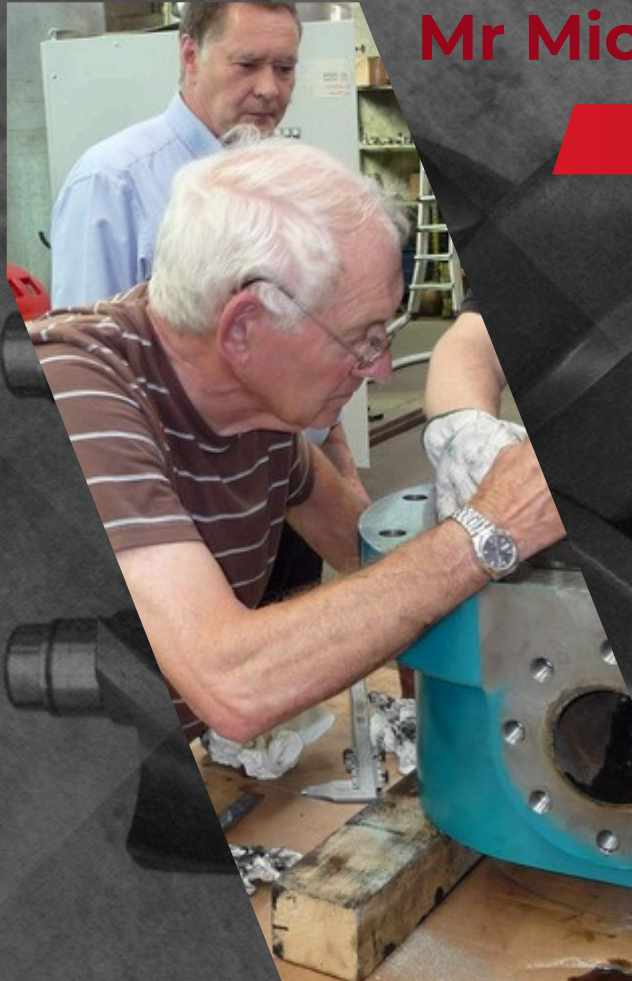


OUR TEAM

Mr Michael (Mike) Smith

TECHNICIAN 1995-2017

Mr Michael (Mike) Smith started as a technician in the Department of Mechanical Engineering in 2001. In 2002, he was instrumental in building the first refrigeration test rig at the University, which was used for testing refrigeration compressors for Dalian, China. That test rig was later used for testing of expanders. Mike was the most capable and intelligent technician who could operate a variety of machinery and produce miracles with them. He worked with the Centre for Compressor Technology event after his retirement until 2017. Sadly, Mike passed away in 2018.



2002

What happened?

The Centre received the 2002 ASME Congress Best Paper Award and a patent application was filed for innovations in Plural-Screw Machines.

Why did it matter?

These developments confirmed the Centre's dual leadership in academic excellence and technology development, advancing both theoretical knowledge and applied engineering practice.

In 2002, the Centre's commitment to cutting-edge research was once again internationally recognised with the ASME Congress Best Paper Award. This achievement underscored the Centre's continued contributions to advancing thermodynamic performance and design methods in positive displacement machines.

That same year, the Centre filed a patent application for Plural-Screw Machines, further solidifying its position as an innovator in the field. This technology extended the boundaries of traditional screw machine applications, with potential impact across sectors requiring high-efficiency, high-performance compression and expansion systems.

Ahmed completed his PhD in 2002 on the use of computational fluid mechanics to model screw machine performance. His main contribution was to develop grid generation methods for CFD. This opened a new field of high-fidelity modelling of screw machines. Later on, many vendors of CFD software adopted this method. It is built in the in-house software SCORG, which has been improved since and is today a leading tool for modelling of rotary positive displacement machines.



Ahmed with his PhD supervisor Prof Nikola Stosic, and family at Graduation Ceremony in 2003



Ahmed's Viva with external examiners:
Prof Jon Denton, FREng FRS and Dr John Fleming

What happened?

Another two awards to the Centre.

Why did it matter?

The Centre's expertise was recognised across multiple engineering domains once again.

2003



In 2003, the Centre for Compressor Technology received two significant awards from the Institution of Mechanical Engineers (IMechE). The first was the Moss Prize, awarded for outstanding work in mechanical engineering with practical industrial application, a recognition of the Centre's continued success in translating complex theory into solutions that benefit manufacturers and energy systems worldwide.

Additionally, the Centre received the Donald Julius Groen Prize, awarded by the IMechE's Process Industries Division. This honour acknowledged the Centre's contributions to innovation and efficiency in process engineering—particularly through advancements in compressor simulation and system optimisation.

The 3rd International Conference on Compressors and their Systems was held at City University.

2004

What happened?

Centre's first industrial PhD graduation

Why did it matter?

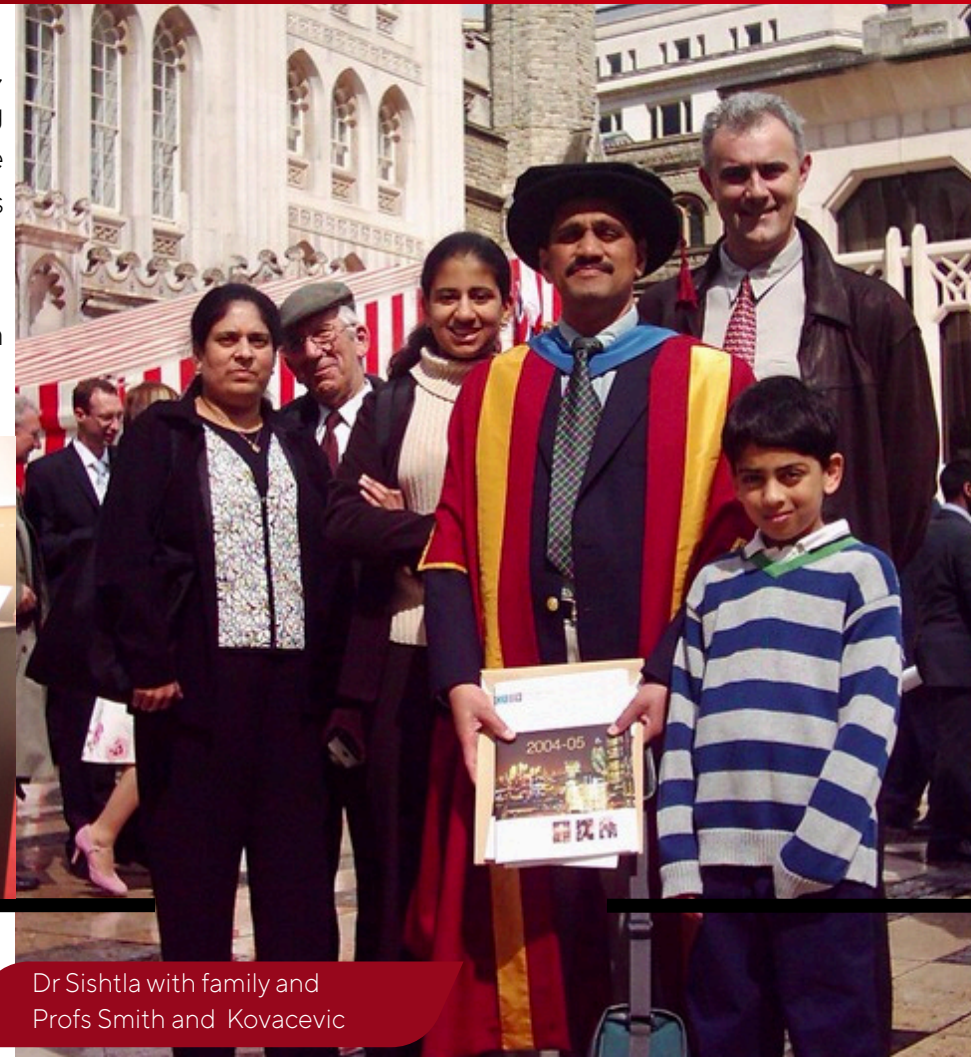
This was an important milestone in long-term industry partnerships.

In 2004, the Centre's first industrial PhD student, Dr Vishnu Sishtla from Carrier, completed his doctoral studies at City University. His research on bearing technology laid the groundwork for a strong and lasting collaboration between the Centre and Carrier. We are proud to continue working closely with Dr Sishtla to this day.

In the same year, two ranges of compressors designed at the Centre, in collaboration with ELGI and Rotorcomp, were presented at Hannover Messe.



Compressors designed by the Centre at Hannover Messe, 2004



Dr Sishtla with family and Profs Smith and Kovacevic

OUR TEAM

Dr Ashvin Dhunput

RESEARCH ASSOCIATE
2004-2014

Ashvin Dhunput conducted his PhD study at City, University of London between 2004 and 2009 on the topic of optical measurements of internal combustion engines. From 2010 to 2014, he was a research associate within the Centre, where he performed several activities on design, modelling and experimental investigation of screw compressors and expanders. Some of the activities are his duties were:

- Responsibility for the operation and development of the test rigs with special reference to instrumentation, data acquisition, and control
- Designing of air and refrigeration compressors
- Carrying out performance and endurance tests on compressors and expanders
- Participating in the supervision of the training of engineers from the industry

During this period, he also lectured on Design and Thermodynamics within the School and acted as an admission tutor for Mechanical and aerodynamic courses. Since 2014, Ashvin has been employed by industry, first with Dunham-Bush and later with Daikin-ADC UK, better known as J&E Hall. He is currently the Technical Manager, leading a team of professional engineers to execute global new product development projects for screw compressors.



2005

What happened?

The Centre's first monograph was published, and the Centre filed two patent applications.

Why did it matter?

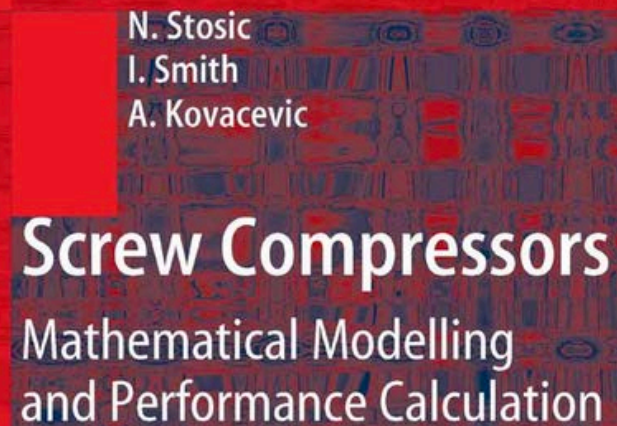
Centre's expertise was solidified in print and protected by patents, strengthening its academic authority and practical value to industry.

In 2005, the Centre published its first monograph, *Screw Compressors: Mathematical Modelling and Performance Calculation*. This book became a foundational reference for both researchers and industry professionals working in positive displacement machine design. It formalised over a decade of research and development into a structured methodology and has since been widely cited and used in academic and commercial environments.

The Centre secured two additional patents, on a new cycle for power recovery from low-grade heat and a method for expander process fluid lubrication.

The 4th International Conference was held at City University.

Prof Smith and Prof Stosic were awarded The James Clayton Prize for their jointly made outstanding contribution to the application of twin screw machines to the compressed air, refrigeration and power generation industries.



Prof Stosic and Prof Smith
awarded The James Clayton Prize

OUR TEAM

Dr Elvedin Mujic

RESEARCH ASSOCIATE
2005-2011

Elvedin Mujic joined the Centre as a Research Associate and PhD student. Elvedin worked on the noise suppression in screw compressors, and in 2010, he graduated with a PhD. In addition, Elvedin was instrumental in the creation of our software suite DISCO, which was the first integration of the complete design process from rotor profiling to CAD design. We still use some of Elvedin's routines in our latest software, SCORG.

Since 2011 Elvedin is lead engineer for screw compressor R&D in Bitzer, Germany.



Prof Kovacevic and Dr Mujic



Prof Kovacevic, Dr Mujic, Prof FP Joseph,
Prof Smith, Prof Stosic



Dr Mujic, Prof Stosic, Prof Smith, Prof.
Wright and colleagues from Heliex Power

2006

What happened?

Centre published another monograph.

Why did it matter?

This book introduced advanced 3D simulation methods to the field, setting new standards for performance prediction and digital design of screw compressors.

In 2006, the Centre for Compressor Technology published a second major monograph titled *Screw Compressors: Three Dimensional Computational Fluid Dynamics and Solid Fluid Interaction*. This work extended the Centre's research into the field of 3D simulation and multi-physics analysis, focusing on the complex interaction between fluid dynamics and solid mechanics in screw machines.

The book provided one of the first structured treatments of advanced numerical techniques in positive displacement compressors, marking a turning point in how such systems were designed and analysed. It quickly became a valuable resource for academic institutions, manufacturers, and simulation software developers worldwide.



Collaboration with Trane started before the creation of the Centre for Compressor Technology, back in 1993. Jack Sauls, an exceptional engineer who was manager of the compressor development group in Trane, was a visionary who saw large potential in using Computational Fluid Dynamics to gain a better understanding of the processes within screw machines and their improvement. Trane was the first company to 2006 adopt our software SCORG, which has been used by their analyst Scott Branch to advance screw compressor technology.

A. Kovacevic
N. Stosic
I. Smith

Screw Compressors

Three Dimensional Computational
Fluid Dynamics and Solid Fluid Interaction

What happened?

Centre Received the Geothermal Resources Council Best Paper Award.

Why did it matter?

The award acknowledged the Centre's innovation in energy systems.

2007



In 2007, the Centre's work on sustainable energy applications received international recognition with the Best Paper Award from the Geothermal Resources Council. This accolade reflected the Centre's leadership in technologies for low-grade heat recovery, a field with growing relevance in global decarbonisation efforts.

That same year, the 5th International Conference on Compressors and their Systems was held in London, continuing its biennial tradition. The event attracted a steady increase in participation from both academia and industry, reinforcing its role as a critical platform for the exchange of knowledge in compressor technology. The Centre's researchers presented several key papers, including pioneering work in expanders and performance optimisation.

In the same year, the first green machine was installed in Electratherm. It was a 50kW ORC system with an expander designed by the Centre and manufactured by ELGI.



2008

What happened?

Prof. Kovacevic awarded Fellowship of IMechE and Appointed to the Howden Chair in Engineering Design and Compressor Technology. Another Patent granted to the Centre.

Why did it matter?

This year demonstrated leadership recognition, advancement in academic-industry ties, and a continued contribution to energy efficiency innovations.

The year 2008 marked an important professional milestone for Professor Ahmed Kovacevic, who was granted the Fellowship of the Institution of Mechanical Engineers (IMechE) – a recognition of his significant contributions to mechanical engineering and leadership in compressor technology.

That same year, he was also awarded the Howden Chair in Engineering Design and Compressor Technology at City, University of London. This also included the position of R&D manager at Howden. In the next 5 years he formed an R&D department of 15 members there, following which Howden received major orders for coal bed methane gas gathering, which tripled their turnover.

On the innovation front, the Centre secured another patent, this time for technology focused on generating power from medium temperature heat sources.



Howden R&D Team led by Prof Kovacevic



What happened?

The Centre took over full organisation of the International Conference on Compressors and their Systems

Why did it matter?

This shift empowered the Centre to shape the conference's future direction.

2009

In 2009, a major transition took place: for the first time, the Centre for Compressor Technology assumed full organisational responsibility for the International Conference on Compressors and their Systems. Until then, the event had been jointly coordinated with the Institution of Mechanical Engineers (IMechE), whose Fluid Machinery Group had played a key role in its inception and early development.

While the Centre took over the logistical and academic leadership of the conference from this year onward, IMechE remained a valued and longstanding partner, continuing to support the event.

Conference dinner of the 6th International Compressors Conference in the IMEche library



Mr Cook (Howden), Prof Arcoumanis (City University Dean), Prof Kovacevic at the 6th International Conference on Compressors and their Systems



2010

What happened?

The Centre secured another patent and deepened its industrial collaboration with Howden

Why did it matter?

This laid the foundation for a long-term partnership with Howden that continues to this day.

In 2010, the Centre for Compressor Technology secured a patent for the lubrication of screw machines. Lubrication plays a critical role in the efficiency and durability of screw compressors, and this innovation offered new ways to optimise performance under varying operating conditions.

The patent marked another step in the Centre's strategy to transform advanced research into practical engineering solutions, particularly for industrial applications seeking to maximise efficiency and reduce wear in complex machinery.

The project with Howden continued. Dr Jim Fairbairn OBE, FREng, FRSe was appointed CEO of Howden Compressors Ltd (HCL). Ahmed and Jim collaborated extensively and secured orders which tripled HCL's turnover in just a few years. Jim was appointed visiting professor at City and in 2020 received honorary doctorate from City, University of London. Jim is currently CEO of Bodycote in London.



Prof Kovacevic with Howden at IMechE annual dinner, 2010.



Jim Fairbairn (on the left), MD of Howden Compressors, introducing Prof Kovacevic to HRH Anne, Princess Royal, on the occasion of opening the new factory floor in Craighton.

2011

What happened?

Centre Awarded the Moss Prize and Ludwig Mond Prize (IMechE) and Prof. Kovacevic appointed to the IMechE Fluid Machinery Group Board.

Why did it matter?

These milestones reflect the Centre's growing recognition, its expanding leadership role, and its continued success in convening the global compressor community.

The year 2011 was rich with achievements for the Centre for Compressor Technology. Professors at the Centre received two prestigious awards from the Institution of Mechanical Engineers (IMechE) – the Moss Prize and the Ludwig Mond Prize – in recognition of their impactful contributions to the field of mechanical engineering and energy systems.

In addition to these accolades, Professor Ahmed Kovacevic was appointed to the IMechE Fluid Machinery Group Board, a reflection of both his leadership and the Centre's increasing influence within the professional engineering community. His appointment helped further strengthen the link between the Centre and IMechE, reinforcing a partnership that continues to shape industry standards and research priorities.

The Centre also successfully organised the 7th International Conference on Compressors and their Systems, which had by then become a cornerstone event in the global compressor research calendar. The 2011 conference continued to foster collaboration between academia and industry, while showcasing cutting-edge developments in compressor and expander technologies.



OUR TEAM

Dr Sham Rane

SENIOR RESEARCH FELLOW

Dr Sham Rane joined the Centre for Compressor Technology in 2011, where he currently works as a Senior Research Fellow. Dr Rane has over 20 years' experience in the field and focuses on computational modelling. His research addresses areas such as dynamic grid-generation techniques for twin-screw machines, fluid-solid coupled models, multiphase flows with heat and mass transfer, flash boiling in geothermal turbines, and oil-injected and water-injected screw compressors. Dr Rane has over 58 technical publications, an h-index of 16 with 791 citations. Dr Rane is chairman of the Short Courses on CFD in Positive Displacement Machines.



Prof Ian Smith and Prof Dan Wright



Heliex Power is a Spin-out company based on the research and development activities of Professors Ian Smith and Nikola Stosic at the Compressor Centre. The company was first managed by entrepreneur Dan Wright.

Following a £2m industrial investment in late 2010, Heliex Power designs, manufactures and sells twin screw steam expanders. The steam expander is used to generate electrical power to feed into the electricity supply grid recovering energy from waste steam either produced in industries such as manufacturing and power generation or from geothermal energy.

2012

What happened?

Researchers from the Centre received two awards, and Professor Ian Smith marked 50 years at City, University of London.

Why did it matter?

The year celebrated both emerging talent and enduring leadership —recognising research excellence and honouring Professor Smith's pivotal role in shaping the Centre's legacy.

In 2012, Sham Rane received the Best prize for Analysis of Single-Screw Compressor at the Schools' Research Symposium and Prof Kovacevic received the Moss Prize from IMechE.



Prof Smith, who started as a lecturer in thermodynamics at City University in 1962, celebrated his 50th anniversary in the institution. The University invited Ian to deliver an evening lecture on expander technology and the role of the Centre for Compressor Technology in its development.

This memorable evening was attended by more than 100 colleagues and guests, including Prof Smith's family, to celebrate this remarkable achievement. Prof Smith reflected on the development of the department of engineering and the growth of the Centre for Compressor Technology.



Dr Buckney, Dr Chukanova, Mrs. Prof Holmes, Prof Holmes, Dr Dhunput, Prof Stosic, Dr Rane, Mr Samardzic



Dr Youyou, Dr Rane, Mr Smith, Mrs Smith, Ms Kethidi, Dr Dhunput

OUR TEAM



Dr Matthew Read

LECTURER IN MECHANICAL ENGINEERING

Matthew Read joined City University in 2012 as a Research Fellow and has been a Lecturer in Mechanical Engineering since 2016. He received the degree of MEng in Aerospace and Aerothermal Engineering from the University of Cambridge, following which he obtained a PhD from Imperial College London. His research interests are in the fields of low-temperature power generation, waste heat recovery and compressor and expander technologies. He also has a long-standing interest in power-train hybridisation, transmissions and energy storage systems, which were the subject of his Doctoral Thesis.



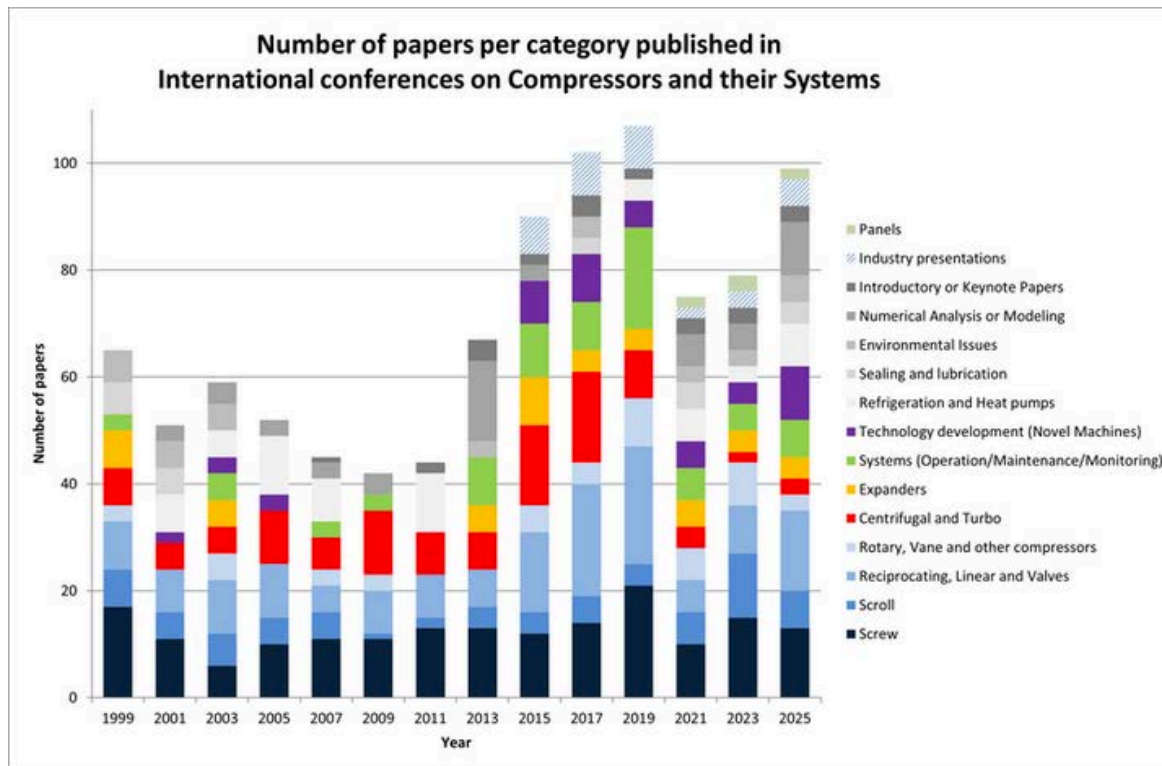
2013

What happened?

Prof. Kovacevic had taken over as the Chairman of the 8th International Conference on Compressors.

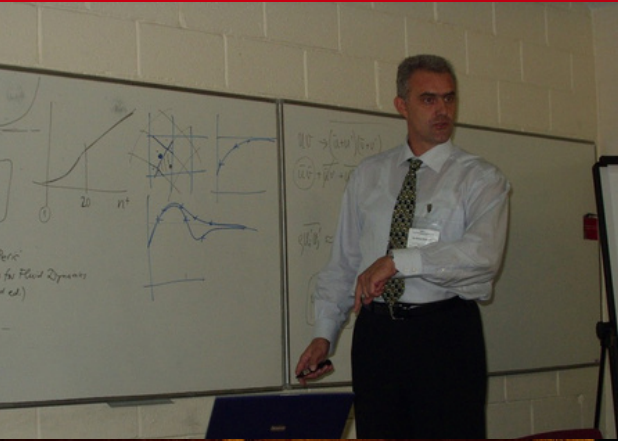
Why did it matter?

The number of papers and attendees had peaked at a record number. The Conference's popularity was re-established.



The 8th International Conference was a turning point. With Prof Kovacevic taking over the chair of the conference in 2013, the format changed, resulting in a growth of interest by industry. Consequently, the number of papers and attendance at the conference grew fast and remained growing until 2019, when a record number of papers, keynotes and panel sessions was presented.

Profile of the Director



Professor Ahmed Kovacevic holds a prestigious Royal Academy of Engineering Research Chair in Compressor Technology at City, St George's, University of London. His work is dedicated to development of design excellence in academia and industry through research, teaching and collaborating with industry in numerical modelling, analysis and design of positive displacement machines.

He has been the director of the Centre for Compressor Technology since 2013 and chairs the International Conference on Compressors and their Systems. He is the director of PDM Analysis Ltd, a spin-out company from City which develops and commercialises SCORG.

Professor Kovacevic has authored 11 books and book chapters, more than hundred and fifty referenced journal and conference papers, several patents and industrial reports. He received 13 awards for his work, including the prestigious IMechE James Clayton Prize 2020, the InstMC Cornish Award 2024 and J&E Hall Gold Medal 2025. He is a Fellow of the Royal Academy of Engineering in the UK and an Academician of the Academy of Science and Arts of Bosnia and Herzegovina.



**PROFESSOR
AHMED
KOVACEVIC**

Short Course on CFD in Positive Displacement Machines

Computational fluid dynamics (CFD) began gaining momentum in the early 1990s with rapid advances in computing power. Simulation codes developed at universities and research institutions were increasingly integrated into commercial software such as CoMeT, FLUENT, and Star-CD.

The Centre for Compressor Technology was among the first academic institutions to adopt and expand CFD tools specifically to tackle the unique challenges of positive displacement compressors. In twin screw machines, the continuous deformation of the fluid volume between rotating rotors requires equally dynamic and adaptable CFD grids—something early commercial codes could not support.

While initial methods offered partial insights, a breakthrough came in 1999 when the Centre developed a deforming grid technique using algebraic, block-structured meshes adapted to rotor geometry. This advancement enabled full 3D simulation of internal flow, setting a new standard in compressor analysis.

To support wider dissemination of this technology, the Centre began organising specialised short courses. These started in 2001 with courses on screw, scroll, and centrifugal compressors, followed by training in screw compressor modelling and performance calculation in 2003 and screw compressor design in 2005. Building on this foundation, a dedicated CFD short course was launched in 2007, held on the weekend before the International Conference on Compressors and their Systems. At the time, it was the first course of its kind focused on CFD applications in positive displacement compressors.



When Dr Sham Rane joined the Centre, he took over the organisation of the course and refined its focus on CFD for positive displacement machines. Since 2013, the CFD short course has been held every two years in conjunction with the conference, becoming an important platform for knowledge exchange in the field. Non-classical methods such as Cut-Cell remeshing were introduced into the talks in 2015. 2017 marked a peak in the education demand when the Centre saw nearly 50 participants for the course.

2019 saw the addition of talks on Single Screw Compressor CFD and the use of OpenFOAM solutions. Experimental research works conducted at the Centre such as PIV, PLIF and Infrared Thermography were presented. Even during COVID in 2021, a remarkable over-the-clock online short course was held. From the far east (Japan, China) to India, Europe and the far west (USA, Canada), the sessions were run on the Gather Town platform remotely. City staff were located in a controlled space at the University.

With technology rapidly changing, CFD Short Course introduced lectures on Machine Learning and Digital Twins in 2023.

In the current year, further emerging technologies such as Quantum Computing and the Lattice Boltzmann method will be introduced into the wider CFD subject. Continued interest from industry and academia is being experienced, and the short course hosted by the Centre is now considered one of the major international learning platforms in this field.



2014

What happened?

PDM Analysis Ltd was founded by Prof. Kovacevic and the Centre published another monograph.

Why did it matter?

This marked a key step in transferring academic innovation to industry.

In 2014, the Centre for Compressor Technology marked a significant step in knowledge transfer and innovation with the formation of PDM Analysis Ltd, a spin-out company from City, University of London. Founded by Professor Kovacevic, the company commercialised advanced simulation software for positive displacement machines, developed over many years within the Centre. PDM Analysis became a valuable bridge between academic research and industrial application, offering tools that were quickly adopted by manufacturers around the world.

That same year, the Centre continued its scholarly contributions with the publication of another important monograph: Power Recovery from Low Grade Heat by Means of Screw Expanders. The book reflected the Centre's growing focus on energy efficiency and sustainability, showcasing how screw expanders could be used to recover power from waste heat—a subject of increasing industrial interest.



A fruitful collaboration with Jacklin started in 2014 and has lasted to date. Jacklin supplies compressors for the railway industry, but also does prototyping of rotors and complete compressor blocks.

WOODHEAD PUBLISHING
IN MECHANICAL ENGINEERING

Power recovery from low grade heat by means of screw expanders

Ian K. Smith, Nikola Stosic and Ahmed Kovacevic



WP
WOODHEAD
PUBLISHING



What happened?

PDM Analysis was founded in 2014 by researchers at City, University of London. Applying the successes of their research, on screw compressors they developed SCORG.

Why did it matter?

SCORG is an industry-leading grid generation and performance prediction software used to design, analyze, and optimize rotary positive displacement machines.

PDM SERVICES

- ✓ R&D
- ✓  **SCORG**™
- ✓ Training
- ✓ Consultancy

EXPERTS IN POSITIVE DISPLACEMENT MACHINE DESIGN AND ANALYSIS

The PDM Analysis mission is to provide fast and reliable analysis and design solutions for compressors, expanders, pumps, motors, and more through its SCORG software.

PDM Analysis Ltd is the proud creator of **SCORG**, a cutting-edge software solution for analyzing and designing screw compressors, pumps, and other related systems. With a deep commitment to bridging industry and academia, **PDM Analysis** strives to provide state-of-the-art software tools and expert services that deliver precise, reliable insights into the performance and optimization of positive displacement machines.

Today, alongside **SCORG** and the cloud-based version, **SCORG alto**, hosted on Microsoft Azure, **PDM Analysis** also offers additional services. This includes:

- Software training and onboarding that is tailored to the needs of engineering teams using our software.
- R&D collaboration opportunities through our close ties with the Centre for Compressor Technology, offering world-leading research and development in the area of twin screw machines and other positive-displacement compression and expansion technologies.
- Consulting services, from performance optimisation to custom model development.

SCORG Trusted in Industry

“SCORG software is a valuable tool for anyone designing positive displacement screw compressors. Aside from the capability to generate complex CFD meshes, the lower-order thermodynamic model and related calculation tools provide everything needed for the basic design and performance evaluation of screw compressors. The team at PDM Analysis is very supportive, and this is reflected by the new features and improvements introduced in every new release

Dr David Buckney
Chief Engineer, Mayekawa UK Ltd.

”

What happened?

Another patent granted and Donald Julius Goen Prize awarded to the Centre.

Why did it matter?

This year celebrated both past achievements and forward-thinking innovation, recognising foundational contributions while continuing to shape the future of energy systems.

2015



Dr Rane and Prof Kovacevic at the Donald Julius Goen Prize award ceremony

In 2015, the Centre continued to demonstrate its leadership in the field of compressor technology through research, intellectual property, and academic excellence. A notable technological achievement was the granting of a patent for an internally geared expander, a significant step forward in the development of compact and efficient power recovery systems.

In 2015, Professors Ahmed Kovacevic, Prof Nikola Stosic, and Dr Sham Rane received the Donald Julius Goen Prize from the IMechE Fluid Machinery Group. The award recognised their work on analytical grid generation for accurate clearance representation in CFD for screw machines.

In 2015, the Centre for Compressor Technology celebrated its 20th anniversary, marking two decades of innovation, research, and strong industry collaboration. The milestone was commemorated during the 9th International Conference on Compressors and their Systems, which brought together leading experts from around the world. The event not only highlighted the Centre's legacy but also set the stage for its continued leadership in compressor research.



Centre celebrating 20th Anniversary at the 9th Compressors Conference

2016

What happened?

Professor Smith was awarded the Donald Julius Groen Prize and was also elected a Fellow of the Royal Academy of Engineering

Why did it matter?

These recognitions celebrated Professor Smith's lifelong impact on fluid machinery research and education, highlighting the Centre's founding excellence.

The year 2016 stood as a tribute to the longstanding academic and research excellence at the Centre for Compressor Technology. In recognition of his outstanding contributions to the advancement of fluid machinery and compressor design, Professor Ian Smith received the Donald Julius Groen Prize from the Institution of Mechanical Engineers. This prestigious award highlighted his pivotal role in shaping the field and mentoring a generation of researchers.

Further elevating his recognition, Professor Smith was elected a Fellow of the Royal Academy of Engineering, one of the UK's highest professional honours. This fellowship acknowledged not only his academic achievements but also his broader impact on engineering innovation and education across the sector.

Led by Professor Ahmed Kovacevic, the research collaboration with Kirloskar Pneumatics from Pune, India started in 2016 on the development of the best air screw compressor for the Indian market. During this 6-year journey, four fully sponsored PhD candidates were trained and received their doctorates. Phase I of this ambitious project lasted from September 2016 to August 2019, and phase II extended until February 2023, resulting in the successful development of a family of electrically-driven, efficient and reliable oil-injected, twin-screw compressors for air application.



These products were successfully commercialised and were received well in the Indian market. This range of indigenously developed twin-screw compressors played a big role in mitigating the national health crisis due to Covid-19 pandemic in 2020-2022. When the demand for oxygen soared and these products helped to satisfy the needs of patients.

- Nausheen Basha, the first PhD student, did her research on “Improving performance by enhancing Oil-injection Systems”
- Suraj Abdan, the second PhD student, completed his research on quantifying mechanical losses in twin screw compressor systems, thereby improving specific power consumption at the design stage.
- Sumit Patil, the third PhD student, researched on rotor profiling supervised by Professor Nikola Stosic, the profiling expert and the inventor of City’s well-known N-profile. The research has produced novel methods of profile generation inspired from the field of Mathematical Topology. TA patent of the Kirloskar rotor profile based on these innovations is also in the pipeline as a successful culmination of this collaboration.
- Abhishek Kumar completed his PhD in 2025. His research interests include high pressure applications for screw compressors and multivariate optimisation of the screw compressor designs.



kirloskar
Pneumatic

Date: 24th June 2025

To,
Professor Ahmed Kovacevic, FEng
Howden/RAEng Research Chair in Compressor Technology
Director Centre for Compressor Technology
School of Science and Technology, Department of Engineering
City St George's, University of London, Northampton Square, London EC1V 0HB.

It has been a privilege for Kirloskar Pneumatic Company Limited to collaborate with the Centre for Compressor Technology at City St George's, University of London, from September 2016 to February 2023. This partnership played a pivotal role in elevating our technical capabilities in screw compressor design—both oil-flooded and oil-free—along with advances in rotor profiling, mechanical loss modeling, and AI-integrated multi-stage simulation approaches.

We sent some of our best and brightest engineers to work and learn at the Centre for Compressor Technology—not to take the quick and easy path of acquiring just the “know-how,” but to deeply understand the “know-why.” We firmly believed that this approach would empower us to build a preferred and sustainable future. The Professors at the Centre embraced this vision and transformed a group of energetic, curious minds into well-grounded, deeply capable professionals. The knowledge shared during detailed reviews of manufacturing practices and experimental results analysis was invaluable. It enabled our teams to deeply internalize core compressor engineering principles. This foundation did not end with the project’s conclusion—in fact, it became a Launchpad. The knowledge gained has empowered KPCL to build further, as reflected in the exponential rise in our intellectual property filings over the last few years.

The Centre’s tailored designs, experimental benchmarking, and access to their state-of-the-art facilities provided a strong platform for us to move from technology adoption to technology leadership. The collaboration also fostered academic excellence, with four PhD completions, numerous international publications, best student paper awards, and a patent, while nurturing a fully capable design team.

We deeply appreciate the Centre’s professionalism and its unique model of academic-industrial engagement. On behalf of KPCL, I extend our congratulations on the Centre’s 30th anniversary and look forward to continued collaboration in shaping the future of compressor technology.

Dr. Suraj Abdan (Deputy General Manager - R&D)

Neeraj Asati (General Manager - Technology)

Deepak Lokras (President & SBU - Head)

K Srinivasan (Managing Director)

Dr. Suraj Abdan
Neeraj Asati
Deepak Lokras
K Srinivasan

2017

What happened?

Prof Kovacevic received the President's Award for Teaching and Learning.

Why did it matter?

The Centre's impact beyond research—into education—was recognised once again.

In 2017, the Centre for Compressor Technology celebrated its reputation not only as a research powerhouse but also as a centre of educational excellence. Professor Kovacevic was honoured with the President's Award for Teaching and Learning from City, University of London—recognition of his dedication to mentorship, student engagement, and the integration of cutting-edge research into teaching practice.

Dr Sham Rane and Prof Kovacevic were awarded another Donal Julies Groen Prize by the IMechE, this time for the paper "Application of numerical generation for improved CFD analysis of multiphase machines".

The same year, the 10th International Conference on Compressors and Their Systems was held at City, University of London, from 11th to 13th September 2017. After a rigorous reviewing process, 92 papers were presented in technical sessions alongside 4 Keynote presentations, 8 Industry Day presentations and 13 presentations for the 3rd Short Course/Forum on Computational Fluid Dynamics (CFD) in Rotary Positive Displacement Machines.



OUR TEAM

Ms Afia Masood

PROJECT ADMINISTRATOR
2017-2021

Ms Afia Masood joined the Centre for Compressor Technology in 2017 as Project Administrator. She was a most outstanding collaborator who helped to consolidate the finances of our projects and promoted and administrated the Centre to the highest standard. She acted as the Compressors conference secretary in 2017 and 2019. During the Covid in 2021, she moved from the University to EPSRC and remained in contact since.



Ms Afia Masood (second to right)



Ms Afia Masood (in the middle)

2018

In 2018, Prof Kovacevic delivered 4 invited keynote presentations at leading international conferences:

- “Modelling of Multiphase Twin Screw Machines for Oil and Gas Industry” in the plenary session at OGE- 2019 Oil and Gas Engineering Conference, Omsk University, Russian Federation
- “Advances in Modelling Positive Displacement Machines” in the plenary session at the 5th International Conference on Refrigeration Technology, Zhuhai, P R China
- “Advances in Modelling of Screw Machines” in the plenary session at the International Conference on Screw Machines, TU Dortmund, Germany
- “Modelling of Multiphase Twin Screw Machines for Oil and Gas Industry” in the plenary session at 4th International Conference “New Technologies 2018”, ANU BiH Sarajevo, Bosnia and Herzegovina

Prof Kovacevic also chaired the Panel Discussion “I Robot” at BH Engineering Week, Tuzla, Bosnia and Herzegovina same year.

What happened?

Prof Kovacevic gave 4 keynote talks at major international conferences. The Centre also began a collaboration with Mayekawa Japan.

Why did it matter?

This marked the beginning of a long-term partnership with Mayekawa, resulting in multiple projects and ongoing research.

OUR TEAM

Aleksander Krupa

RESEARCH ENGINEER

Aleksander Krupa has been engaged with the Centre for Compressor Technology since 2018, where he currently holds a Research Engineer position. He graduated from the City, University of London with an MEng in Mechanical Engineering. Aleksander's focus is on machine design, prototyping and instrumentation. In addition, Aleksander contributes to the Formula Student Team, supporting the development of electric powertrains. Aleksander continually seeks opportunities to drive advancements in the field and contribute to impactful engineering projects.





In 2018, the Centre started a collaboration with Mayekawa Japan, initiated by Dr Kazuhiro Hattori and Mr Kuniaki Kawamura, with a small consultancy project on modelling of Mayekawa compressors. This developed in the long-term collaboration with 6 projects in sequence, of which two were Research projects with PhD students educated alongside the projects.

Currently in 2025, we are working on a 3-year research project related to water-injected compressors for water vapour recompression in collaboration with Prof Robert Wood from the University of Southampton. Two PhD students are currently studying, one on water-lubricated bearings at Southampton University and another on materials and rotor profiles for such machines at City.

2019

What happened?

Profs Smith and Stosic were honoured as “Icons of City” and the collaboration with Edwards Pumps started.

Why did it matter?

This recognition celebrated the Centre’s legacy, while the new partnership with Edwards Pumps expanded its industrial reach and resulted in commercial innovations.

In 2019, as part of the City’s 125-year anniversary celebrations, Professors Ian Smith and Nikola Stosic were proudly recognised by colleagues as Icons of City for their outstanding impact on research, education, and the engineering community.

The Centre organised another successful International Conference on Compressors and their systems in the same year.



Collaboration with Edwards Pumps, now part of Atlas Copco, started in 2019 with the project for the design of an oil-injected industrial vacuum pump utilising the “N” rotor profile. On this research project, Jean Pierre De Klerk defended his MPhil thesis and applied for a patent for rotor profiles for this application. Currently, this size of the pump is being commercialised and work has started on the design of larger pumps.



City Icons Awards Ceremony



City Icons Award and Report

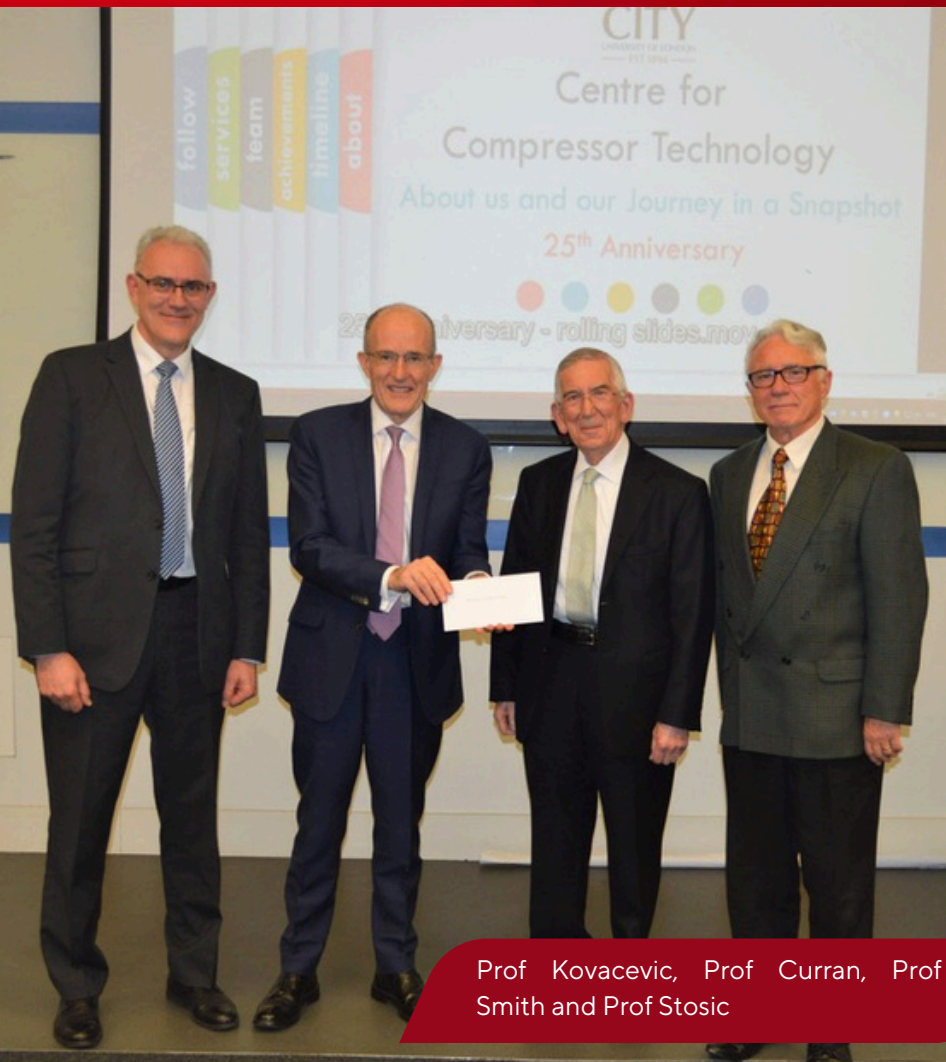
What happened?

Prof Kovacevic was awarded Howden/RAEng Research Chair and received the James Clayton Prize. Project SECRET started.

Why did it matter?

Project SECRET marked an important moment for the Centre, reinforcing its leadership in sustainable compressor innovation.

2020



Prof Kovacevic, Prof Curran, Prof Smith and Prof Stosic

In 2020, Professor Kovacevic was awarded the prestigious Howden / Royal Academy of Engineering Research Chair in Compressor Technology, reaffirming the Centre's leadership in advancing energy-efficient systems. The year also marked the launch of Project SECRET, a flagship five-year initiative focused on next-generation oil-free compressor technologies. Adding to these milestones, Professor Kovacevic received the James Clayton Prize from the Institution of Mechanical Engineers—one of the field's highest honours.

The Centre for Compressor Technology celebrated its 25th anniversary in 2020, marking a quarter-century of innovation, collaboration, and impact across academia and industry.

The year also saw the final retirement of Professor Ian Smith, co-founder of the Centre, who was honoured with the title of Professor Emeritus in recognition of his exceptional academic career. To commemorate his retirement and support future talent, Professor Smith donated £10,000 to establish the Compressor Centre Prize, an annual undergraduate award recognising outstanding achievement in the field.

Project SECRET

Smart Efficient Compression: Reliability and Energy Targets

This research project, funded by Howden and the Royal Academy of Engineering alongside the Research Chair of Prof Kovacevic, was set to improve the technology of rotating compression by developing methods to reduce their energy consumption, the impact on the environment, and improve their reliability. Conducted in close collaboration with the UK-based industrial sponsor, Howden Compressors and the Royal Academy of Engineering, the project has produced two patents on discharge valves for screw machines and an AI GAN-based method for generating screw compressor rotor profiles.

On the project, 9 journal papers and 33 conference papers have been published, 21 webinars, 11 keynotes and 103 public engagements at various conferences, trade shows and events.

Howden Compressors engaged in five New Product Development projects and achieved growth of the oil-free value chain by 175%. Ongoing development projects in Howden include project Solas related to screw compressors for the hydrogen value chain.

The Royal Academy extended the Chair of prof Kovacevic, which is continued to be sponsored by Howden, until 2030.



2021

OUR TEAM

Dr Thibaud Plantegenet

POSTDOCTORAL RESEARCH FELLOW

Thibaud Plantegenet joined the Centre in 2021 after graduating with a PhD from Poitiers University in France, where he was also a Teaching and Research Assistant. His PhD was related to the investigation of the Morton effect in hydrodynamic bearings, and this expertise aligned well with the project SECRET on which he was employed as a Postdoctoral Research Fellow within the Centre. Thibaud contributed to the development of novel concepts related to surface features, clearance monitoring, and additional fluid injection, as well as preparing and testing the compressor oil-free prototype for the project. Additionally, he worked on the Mayekawa project on bearings for Ammonia refrigeration screw compressors. In 2024, Thibaud moved back to the University of Poitiers, where he is now an Assistant Professor.



Centre and Carrier collaborated extensively in the first decade of the Centre. In 2021, we started a joint research project on internally geared screw machines (IGSM) led by Dr Matthew Read in collaboration with Dr Vishnu Sishtla and Jin Zu from Carrier.

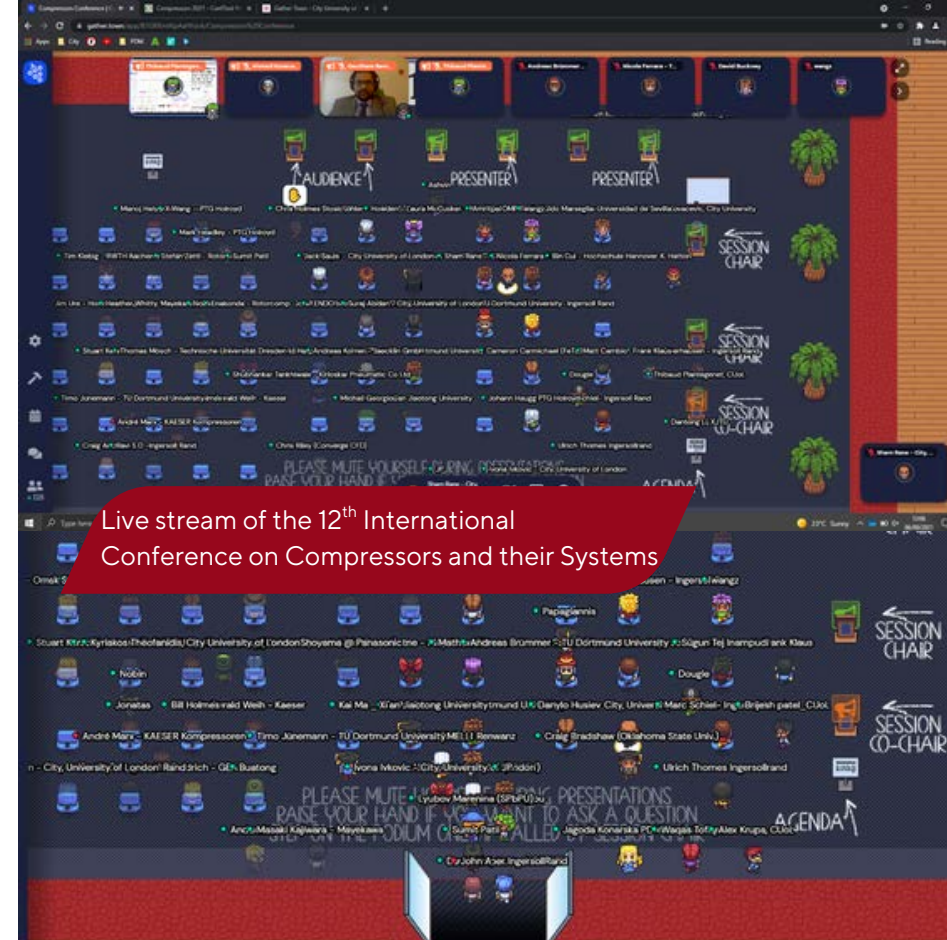
Two PhD students are being educated alongside this project: Halil Lacevic on rotor profiling for IGSM and Jin Zhu, an engineer from Carrier, on modelling of noise and vibrations in IGSM. The project, which lasted 4 years, is continuing from 2025 with another student who will be testing prototypes required for the commercialisation of this research.

OUR TEAM

Ivona Ivkovic-Kihic

RESEARCH PROJECT MANAGER

Ivona Ivkovic-Kihic joined the Centre for Compressor Technology in 2021, where she works as a Research Project Manager. She holds both an MSc in Computer Science and a BSc in Business. Ivona is the co-chair of the International Conference on Compressors and their Systems and the administrator of the CERES industrial consortium, where she focuses on fostering collaboration within the field. In her role, Ivona is involved in project administration, marketing, and communicating with stakeholders. Ivona is passionate about establishing strong, ongoing partnerships with both industry and academic bodies. She is currently expanding her knowledge through MBA studies.



The first project on the development of refrigeration compressors for aerospace refrigeration started with a feasibility study in 2021, which was followed by subsequent projects, gradually increasing the Technology readiness level of the system.

Despite the challenges posed by the COVID-19 pandemic, the Centre upheld its tradition of delivering the Conference every two years. The 12th edition was organised as a hybrid event, with over 190 registered delegates from around the world.

What happened?

Launch of CERES Industrial Consortium and Fellowship of the Royal Academy of Engineering awarded to Prof Stosic

Why it mattered:

This year reinforced both the Centre's forward-thinking collaborations and the legacy of excellence built by its founding leadership.

2022



Prof Stosic elected as a Fellow of Royal Academy of Engineering



Prof Kovacevic elected as an academician of the Academy of Sciences and Arts of B&H.

In 2022, the Centre for Compressor Technology launched the CERES Industrial Consortium for Precompetitive Research. Designed to bring together industry partners and researchers in a collaborative, non-competitive environment, CERES represents a new model for accelerating innovation in compressor technology while sharing knowledge across sectors. The initiative reaffirms the Centre's role as a bridge between academia and industry.

The year was also marked by a deeply meaningful recognition: Professor Nikola Stosic, one of the Centre's founders, was elected a Fellow of the Royal Academy of Engineering. This prestigious honour acknowledged not only his pioneering technical contributions but also his decades-long commitment to mentoring, innovation, and global engagement.

Furthermore, in December 2022, Professor Ahmed Kovacevic was elected as an academician of the Academy of Sciences and Arts of Bosnia and Herzegovina.

Industrial Consortium
CERES

Compressors and Expanders in futuRe Energy Systems

Through the Industrial Consortium, City's Centre for Compressor Technology provides a forum for industry and academia to coordinate pre-commercial (TRL 1-3) research on industry-relevant compression technologies for the energy transformation sector. The industrial partners can also benefit from a tailor-made service whilst fostering a broader cross-business sector understanding of compression technology developments.

The Centre started the Industrial Consortium to create a network of partners for addressing global challenges by performing world-leading research in compression and expansion technologies for future energy systems and expanding the scope by sourcing funds from research councils.



CERES Spring meeting, March 2025

Mayekawa really benefits from being a part of the Consortium as there is scope to investigate how to improve and overcome challenges whilst being able to compete in the refrigeration industry. It has allowed me as a young engineer to learn more about screw compressors and apply some of the knowledge here at my own workplace. The collaborative environment coupled with the enthusiasm of the Consortium members all working to attain similar goals allows for the seamless and some mutually beneficial sharing of information. CERES provides the initial research for the industry-specific problems to get the ball rolling in the beginning.

Lihini Seneviratne
Graduate Engineer
Mayekawa UK Ltd

As a founding member of the CERES Consortium, Howden sees a strong alignment between the long-term objectives of our business and the research areas being prioritised by the group. Our transition to a net-zero economy is one area where the leadership of the group is vital to cover areas not served by our legacy industrial groups. Working with our partners in the Consortium allows us to identify emerging trends in compressive technology and applications, enabling us to get ahead of the challenges these will bring to our industry through targeted research.

Donald Lawson
Head of Product Engineering & Technology
Howden, a Chart Industries Company

2023

What happened?

Prof Kovacevic awarded Fellowship of the Royal Academy of Engineering.

Why did it matter?

This milestone recognised exceptional leadership, innovation, and continued impact of the Centre in global compressor research and engineering.

In 2023, Professor Ahmed Kovacevic was elected Fellow of the Royal Academy of Engineering (RAEng). This prestigious recognition highlighted his outstanding contributions to compressor technology, his impact on both academic and industrial practice, and his long-standing leadership at the Centre.

The 13th International Conference on Compressors and their Systems held at the City in September 2013 was a full success, largely due to Ivona taking the role of the conference coordinator. Ivona's dedication and the hard work of the team from the Centre made the event memorable for 234 delegates attending the conference.



HRH Anne, Princess Royal and Professor Kovacevic at the Royal Academy of Engineering



13th International Conference on Compressors and their Systems

2024

What happened?

Prof Ahmed Kovacevic and Dr William Milligan received the Cornish Award.

Why did it matter?

The award recognised the strategic, long-term cooperation between the Centre and Howden.



Prof Kovacevic, Ms Smith, Dr Milligan, Mr Tam at the Cornish Awards Ceremony

In 2024, Professor Ahmed Kovacevic and Dr William Milligan from Howden, A Chart Industries Company, were jointly awarded the Cornish Award by the Institute of Measurement and Control (InstMC). This prestigious recognition, sponsored by the Worshipful Company of Scientific Instrument Makers (WCSIM), was granted in honour of their long-standing collaboration and leadership, which resulted in transformative advancements in compressor technology.

Their work, combining advanced simulation, precise measurement, and practical application, reflected the Centre's commitment to strong academic research with real-world relevance. The success of this partnership also drew attention from UK funding bodies, leading to multiple co-funded initiatives through Scottish Enterprise, the Royal Academy of Engineering, and a series of competitive prizes and awards.

The Cornish Award marked yet another milestone in the Centre's history of impactful industrial collaborations, reinforcing its standing as a leader in engineering innovation.

2025

What happened?

Prof Ahmed Kovacevic received the J&E International Gold Medal for his contribution to modelling and the application of HVAC&R compressors.

Why did it matter?

The award recognised the Centre's contribution once more.

In early 2025, Professor Ahmed Kovacevic was honoured with the J&E International Hall Gold Medal by the Institute of Refrigeration (IOR). This prestigious award recognises his contributions to refrigeration, air conditioning, heat-pump systems, and particularly high-fidelity modelling of rotary positive-displacement compressors.

The medal celebrates Kovacevic's leadership in bridging academic research and industrial innovation, including the development of advanced simulation software adopted by manufacturers worldwide. His work has driven improvements in compressor performance, efficiency, and reliability—benefiting both the industry and the sustainability agenda.

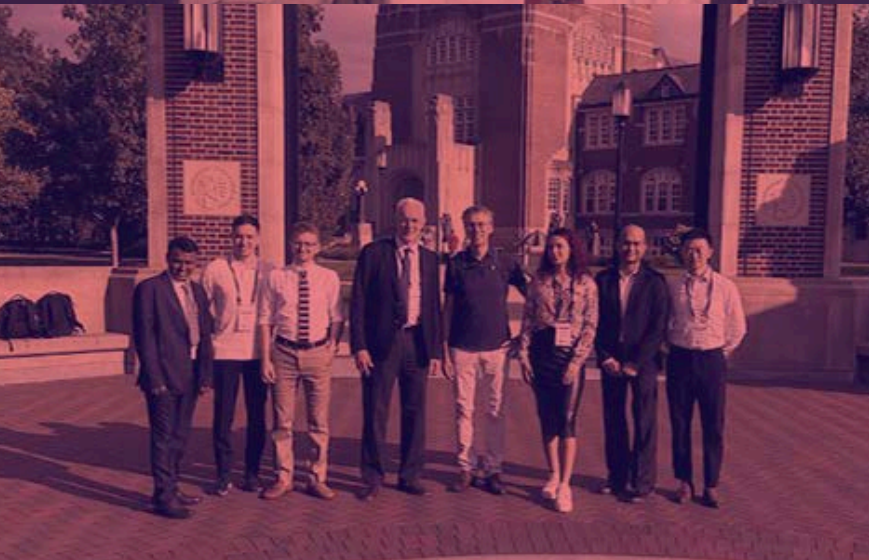
This book was completed at the time of preparation for the 14th International Conference on Compressors and their Systems. The conference is co-chaired by Ivona and Ahmed and is promising to be yet another enjoyable event.

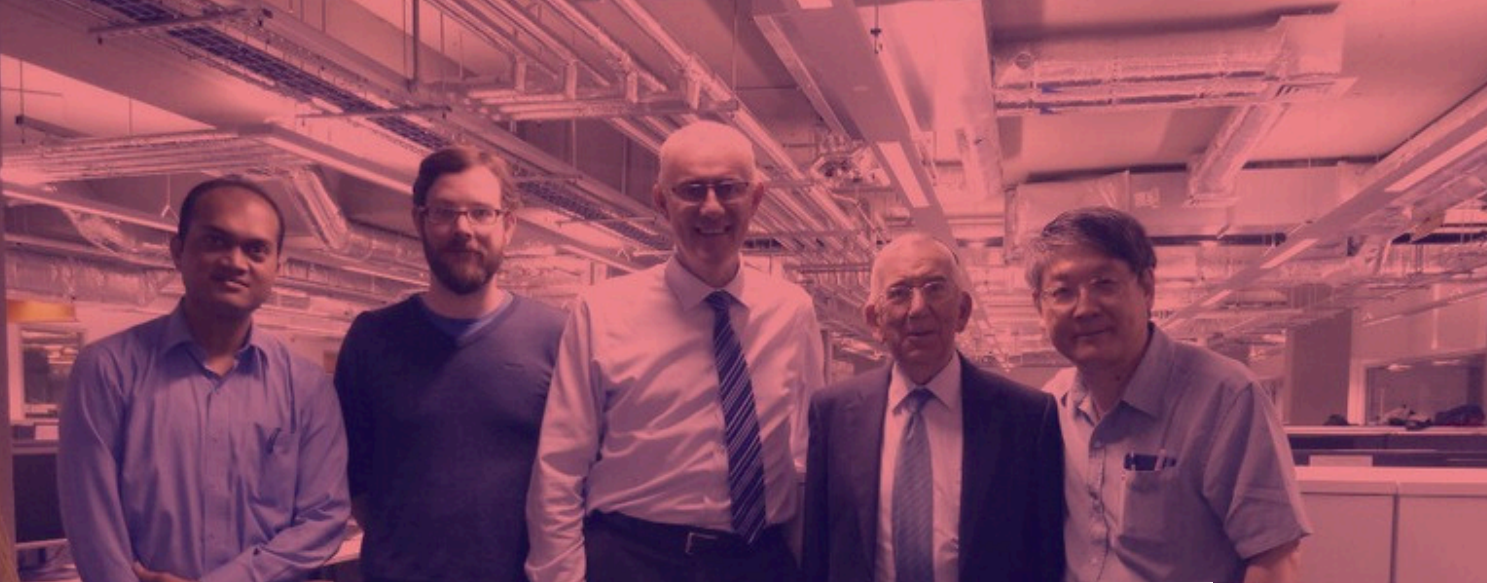


Prof Kovacevic receiving J&E International Hall Gold Medal



Celebration of the 30th Anniversary of the Centre, March 2025





ALUMNI & FRIENDS



Part of Our Journey – Colleagues, Students, Collaborators

The Centre for Compressor Technology owes its progress to the contributions of many individuals—those who stood at the forefront and those who supported our growth in the background. While this book could not mention everyone by name, these pages are dedicated to all who have shaped our story: our PhD students and alumni, academic collaborators, and partners around the world. Each one has played a part in building the Centre’s legacy, and we remain deeply grateful.

Alumni PhD Students of The Centre for Compressor Technology

Our alumni are perhaps the Centre’s most important legacy. Over the years, 25 PhD students have completed their research with us—each one contributing to the growth of compressor technology and carrying the Centre’s values into industry, academia, and beyond. These individuals now lead innovation around the world, extending our impact far further than we could have achieved alone. We are proud to acknowledge the PhD students who completed their research at the Centre and became part of our lasting legacy: Mohammad Arjeneh, David Buckney, Ekaterina Chukanova, George Karagiorgis, Sasa Zagorac, Ahmed Kovacevic, Kupachi Venu Madhav, Brijeshkumar Patel, Elvedin Mujic, Diego Guerrato, Anegar Panesar, Chima Okezue, Sham Rane, Ashvin Dhunput, Madhulika Kethidi, Evans Chikarakara, Sumit Patil, Syrifa Nur Aqida, Abdal Tamtam, Asnul Ahmed, Ahmet Aydin, Nausheen Basha, Suraj Abdan, Lu Yang, and Abhishek Kumar.

Our other Alumni

Beyond our PhD students, the Centre has welcomed and worked with an extraordinary group of researchers, visiting fellows, engineers, interns, and collaborators. Each of them brought their own ideas, energy, and expertise — helping to shape the Centre’s research, extend our global reach, and strengthen our role as a hub for compressor innovation. We are proud to have been part of their journey and grateful for the mark they left on ours. We warmly acknowledge the following alumni, visiting researchers, and collaborators: Dr Apostolos Karvountzis, Amar Leto, Lukas Richter, Jordan Christian, Dr Ermin Husak, Dr Elvedin Mujic, Dr Giuseppe Bianchi, Dr Yan Di, Mr Sasa Milojevic, I. McCimmie, K. VenuMadhav, Professor L Li, Professor V. Supin, Dr Xueyuan Peng, Dr G. H. Lee, Mr W M Zhang, Mr J Liu, Mr J Z Chen, Mr J. M. Sun, Mr A. D. Carlsson, Mr A Topcic, Mr Ming, Mr Xiajun Wu, Mr G Greenough, Dr Hyunki Shin, Mr G Stupple, Mr D Faksa, Mr Yan Di, Dr. Danqing Yin, Professor Fahmida Gulshan, Professor ASAW Kurney, Dr Kisorthman Vimalakanthan, Dr Gursharanjit Singh, Mohsen Ghavami, Jean-Pierre De Klerk, Thibault Tam.

Our Academic Collaborators

Our work would not have been possible without the insight, generosity, and partnership of our academic collaborators. Their shared knowledge, joint research, and continued support have helped expand the Centre's reach and impact. We are honoured to have worked alongside so many exceptional colleagues around the world. We gratefully acknowledge our academic collaborators: Professor Christoph Bruecker, Professor Tong Sun, Professor Kenneth Grattan, Dr Jafar Al-Zaili, Dr Sathiskumar Anusuya Ponnusami, Dr Juan Guzman-Inigo, Professor Qinwei Ma, Dr Mohammad Omidyeganeh, Professor Alfredo Pineli, Professor Jamshid Nouri, Professor Robert JK Wood, Dr Shuaihui Sun, Professor Andreas Brummer, Professor Matthias Möller, Professor Eckhard Groll, Professor Davide Ziviani, Professor Christiane Thomas, Professor Pega Hrnjak, Professors Stefan Elbel, Professor Craig Bradshaw, Professor Matthias Moller, Professor Kemal Hanjalic and Professor Abdulnaser Sayma, Institute of Mechanical Engineers (IMechE), Institute of Refrigeration (IOR), International Institute of Refrigeration (IIR), Royal Academy of Engineering (RAEng), EPSRC.

Our Industrial Collaborators

Our partnerships with industry have been at the heart of the Centre's mission. From early collaborations that shaped the Centre's foundations to ongoing joint research and commercial ventures, these relationships have translated academic insight into real-world innovation. We are deeply grateful to all the companies and individuals who have trusted us, challenged us, and worked alongside us to push the boundaries of compressor technology. Their contributions have been instrumental in helping us deliver impact that reaches far beyond our laboratory. We thank: Holroyd, Howden, Heliex Power, Kirloskar, PDM Analysis, Rotorcomp, Jaecklin, Comoti, Mayekawa, Megger, Chongqing Yuejin Machinery Co., Ltd, Termommecanica Pompe, VMC Italia, Elgi Equipments, Vmac, VMC, RefComp, Kobelco, Gamma Technologies, Simerics, Convergent Science, DV Systems, Ingersoll Rand-Trane, Gardner Denver, Carrier Corporation, Dalian Refrigeration, Wuxi Compressors, JiuYi machinery Co. Ltd, Dorin, Kyungwon Machinery, Total Energies, Rolls Royce.

A special thank you to all those who shared their kind words and best wishes for our 30th anniversary. Your reflections, featured on the following pages, are a touching reminder of the relationships we've built and the impact of our work. We are deeply grateful for your continued support.

It is with great admiration and heartfelt congratulations that I extend my commendation to the City Compressor Research Laboratory on the occasion of its 30th anniversary. Over the past three decades, the Centre has distinguished itself as a world-leading hub for research and development in compressor technology, contributing significantly to both scientific advancement and industrial innovation.

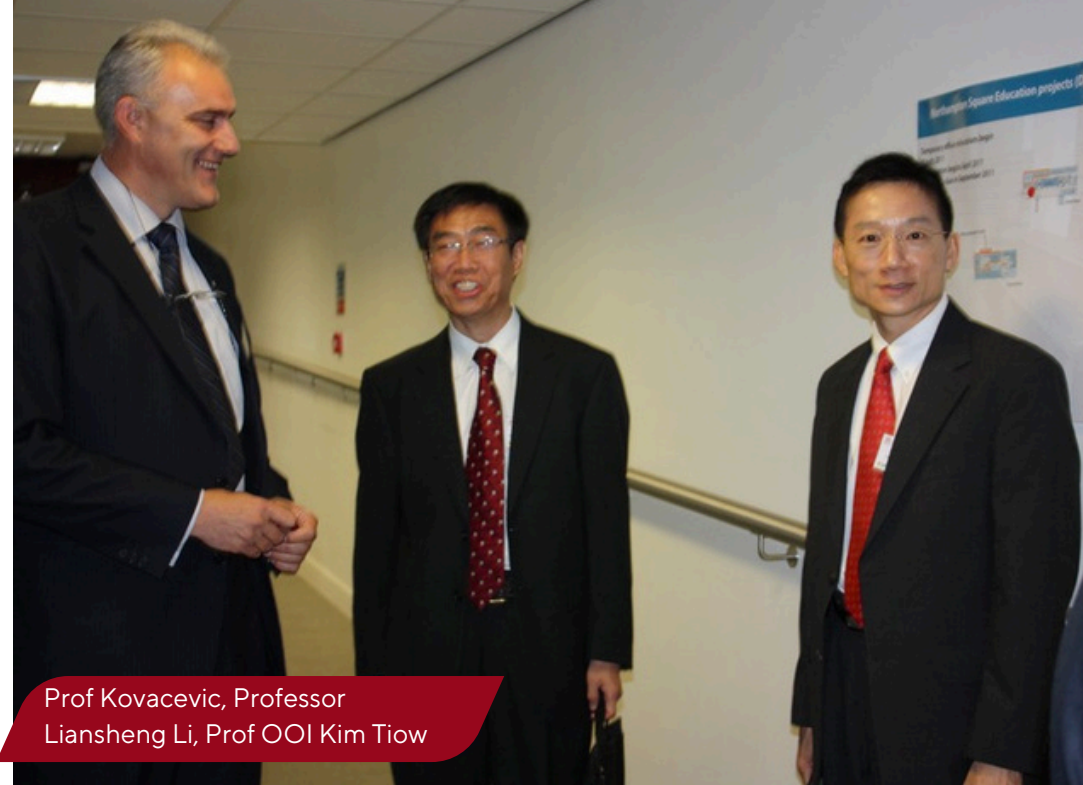
Under the visionary leadership of esteemed scholars such as Professor Ian K. Smith, Professor Nikola Stosic, and Professor Ahmed Kovacevic, the Centre has evolved from a modest laboratory into a globally recognised centre of excellence. Their pioneering work has not only elevated the scientific understanding of positive displacement machines but has also catalysed impactful collaborations with industry, helping to shape the future of sustainable energy systems.

Having first encountered the early foundations of this research group as a young doctoral student in Strathclyde, Scotland, I have had the privilege of witnessing its remarkable transformation over the decades. The Centre's commitment to rigorous research, experimental innovation, and the nurturing of new talent exemplifies the best traditions of academic excellence and engineering relevance.

As the compressor industry continues to face the challenges of energy efficiency, environmental sustainability, and technological complexity, the City Compressor Research Laboratory stands as a beacon of research leadership and enduring relevance. I look forward to seeing its continued impact in the years ahead.

Congratulations once again on this exceptional milestone.

Professor OOI Kim Tiow
Nanyang Technological University
Singapore



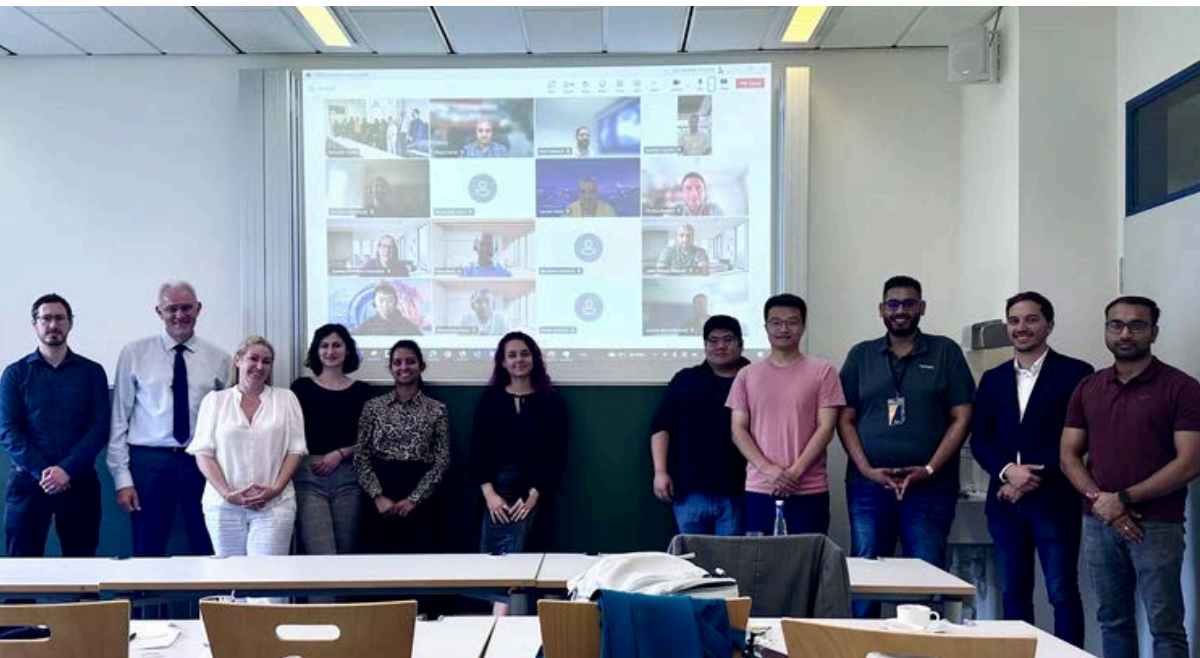
Collaborating with the Centre for Compressor Technology at City, University of London—especially with Prof. Ahmed Kovacevic and Dr. Sham Rane—has been, and continues to be, both a scientific privilege and a personal pleasure. From the very beginning, Ahmed and Sham fostered a culture of openness and intellectual curiosity, welcoming interdisciplinary perspectives and encouraging bold, unconventional ideas.

Our first exchange during the 2018 International Conference on Screw Machines laid the foundation for a journey that bridged advanced mathematics with real-world engineering. We introduced the idea of using isogeometric analysis—a novel computational approach—to generate high-order CFD grids tailored to screw compressor geometries. Though newcomers to the compressor domain, we were met with genuine enthusiasm and invaluable guidance that helped transform our theoretical work into applied innovation.

The outcome of this collaboration goes far beyond academic exploration. Together, we developed practical tools that culminated in the integration of our grid generation techniques as a plugin within SCORG. This success reflects the shared vision, mutual respect, and deep trust at the heart of our partnership.

Ahmed, Sham—thank you for your unwavering support, openness to new ideas, and the collegial spirit that makes working with you both productive and inspiring. We look forward to continuing this collaboration as we push new boundaries in compressor technology and computational modeling.

Dr. rer. nat. Matthias Möller & Dr. Ye Ji
Delft University of Technology
Department of Applied Mathematics
The Netherlands



30th anniversary of the Centre for Compressor Technology at City St George's, University of London



International Conference on Screw Machines 2010
(Schraubenmaschinen-Tagung) TU Dortmund

Prof. Ahmed Kovacevic, Jack Sauls, Prof. Andreas
Brümmer (right to left)

The collaboration between the Centre for Compressor Technology at City St George's, University of London, in celebration of its 30th anniversary, and the Chair of Fluidics at TU Dortmund University has been a remarkable journey over the past three decades. This partnership began with the founding of the Centre in London and marked the start of a fruitful relationship that has significantly advanced research and innovation in screw machine technology.

From our perspective at TU Dortmund University, this collaboration has fostered a unique synergy reflected in regular exchanges and visits during international conferences on screw machines. Members from both institutions actively participate in the program committees and the International Liaison Committee for their respective conferences in London and Dortmund. This ensures that cutting-edge research continues to be shared and discussed across borders. Ultimately, this spirit of cooperation has established both institutions as world leaders in screw machine research, driving significant advancements in the field.

As the head of the Chair of Fluidics, I would like to take this opportunity to express my heartfelt gratitude for the friendly cooperation and mutual support I have experienced over the past 20 years. The personal friendship between Prof. Ahmed Kovacevic and me serves as a testament to how collaboration within the scientific community can foster innovation and facilitate the transfer of knowledge to industry.

Finally, I would like to express my deepest appreciation for the outstanding achievements of the Centre for Compressor Technology at City St George's, University of London, in advancing the field of numerical simulation and the design of screw machines.

Yours sincerely,

A handwritten signature in black ink, reading 'A. Brümmer'.

Andreas Brümmer
Chair of Fluidics (head)
TU Dortmund University (Germany)





An Unforgettable Experience

Sponsored by the British Department for International Development (DFID), I arrived at City University, London on 12th September 1999 and began the Technical Co-operation Training (TCT).

My colleague Suping, who came from Xi'an too, and I shared an office with Dr. Ahmed, so we can see Dr. Ahmed almost every working day. Dr. Ahmed made a deep impression on me, full of energy, hard working and efficient.

Professor Smith speaks quickly and I took some time to get used to it. As director of the center, he has a lot to do. However, when I wrote my first paper intended for submission to International Journal of Refrigeration, Professor Smith still revised the draft very carefully. The paper he revised is not only much more fluent to read, but also more accurate in its expression.

Professor Stosic has been continuously studying the screw machinery, and the numerical construction method of screw profile was innovated. I had chances to attend the screw machinery seminar and gained a lot.

It was a warm team and everything I experienced in the Centre was unforgettable.

It's been 25 years since I left the center, I have been concerning about the development of the center, often attend the compressor conference at City every two years, and Professor Stosic and Professor Ahmed also visit China frequently.

Nowadays, Ahmed has become one of the most influential professors in compressor field in the World, the center has established cooperative relations with many well-known enterprises in China, and the design and analysis software for screw machinery developed by the center has been recognized internationally.

I am so proud of the progress made by the center and wish the center continues to develop and to lead the progress of global compressor technology!

Professor Liansheng Li
College of Electromechanical Engineering
Qingdao University of Science & Technology
Qingdao, Shandong, P.R.China, P.C.266061
email: lianshengli@126.com

It has been a pleasure to collaborate with Ahmed on a research project funded by Mayekawa as well as being his RAEng Howden Research Chair mentor. The Mayekawa project involves designing water lubricated bearings which has led to regular meetings between City, Mayekawa and Southampton. The Howden research project is called SECRET and aims to investigate the thermal effects on clearance flows to reduce leakage in compression machinery by (1) understanding the physics, (2) integrate concepts into machine designs and (3) create commercial prototypes. These projects are extremely well managed by Ahmed with regular progress being made and research outputs being published. The City Compressor Centre, led by him, is also extremely well run with an annual international conference on Compressor Technology and has established the CERES consortium that allows industry and academia to coordinate pre-commercial research on industry-relevant compression technologies for the energy transition sector. The consortium has 7 industrial partners and is running 9 research projects. It allows generic outcomes to be shared and knowledge translation between City and industry and is proving highly successful.

To strengthen collaborations, we are planning to work together on AI predictive maintenance technology (TriboAI -a potential spin out of my group at Southampton) and its use in compressors. As an alumni of City (Mech Eng) It has been great to be able to reconnect and also to hear how City is thriving as a part of the University of London and its recent merging with St George's Hospital.

Professor Robert JK Wood FREng CEng FIMechE FIMMM FHEA FICorr
Professor of Surface Engineering and Tribology
The national Centre for Advanced Tribology at Southampton (nCATS)
Department of Mechanical Engineering
Chief Field Editor, Frontiers for Coatings, Dyes and Interface Engineering
Faculty of Engineering and Physical Sciences
University of Southampton





I have worked on positive displacement compressors my whole academic career at Purdue University, so it's always great to meet colleagues around the world, who are on parallel paths. My colleagues at the Centre for Compressor Technology at the City St. George's, University of London lead the way in innovative and cutting-edge research of twin screw machines and other rotary positive displacement compression and expansion technologies. Our research team at Purdue visits City St. George's, University of London every other year for their compressor and their systems conference. This conference brings together academic, government, and industry experts to advance the state of the art of positive displacement compressors and address all kinds of challenges faced by the compressor industry. Similarly, the research team at the Centre for Compressor Technology attend to our Herrick compressor conferences at Purdue in their off years. I always look forward to exchanging ideas and research with technology leaders, and you won't find any better than at the Centre for Compressor Technology. I congratulate you on your 30 years of exceptional research contributions and look forward to the next 30 years.



Dr.-Ing. Eckhard A. Groll

**Reilly Distinguished Professor of Mechanical Engineering
William E. and Florence E. Perry Head of Mechanical Engineering
Purdue University
School of Mechanical Engineering
585 Purdue Mall
West Lafayette, Indiana 47907-2088, USA**



Pursuing my PhD at the Centre for Compressor Technology at City, University of London, under the guidance of Professor Ahmed Kovacevic, was one of the most rewarding experiences of my life. I still vividly remember my first conversation with Professor Kovacevic on LinkedIn after coming across the advertisement for a PhD position. That moment marked the beginning of a meaningful and impactful journey with the Centre.

Throughout my PhD, I received outstanding support and trust from the team, particularly in advancing experimental research on leakage flows in rotary positive displacement machines. With their belief in my work, I was given the opportunity to help develop a state-of-the-art optical measurement test facility, now a valuable asset to the Centre and future researchers.

In addition to my academic research, I was fortunate to engage in several consultancy projects undertaken by the Centre, where I had the privilege of working alongside Professor Nikola Stosic, a true pioneer in screw compressor technology and the inventor of the N-profile rotor design.

Collaborating with such esteemed professionals offered invaluable real-world experience and broadened my understanding of the industry.

What sets the Centre apart is its unique blend of academic excellence and industry relevance. Their approach ensures that students are not only equipped with theoretical knowledge but also prepared to deliver practical, tangible outcomes that have real impact in the field.

Even after completing my PhD, I have maintained strong connections with the Centre and continue to collaborate when opportunities arise. I am proud to remain part of this vibrant community.

Brijeshkumar Patel, CEng MIMechE, PhD
Mechanical Development Engineer,
Howden, a Chart Industries Company, Scotland





30th Anniversary for the Centre of Compressor Technology at City St. Georges University of London.

In 2003 I was given the task of developing a new range of screw compressors and, as head of R&D, building up a team of engineers and test facilities to develop the new product range.

As if by chance, a flyer promoting the services of the Centre for Compressor Technology landed on my desk and I followed this up. Looking back on more than 20 years in the screw compressor industry I now know that this was one of the best decisions of my career.

From the first very friendly meeting with Professors Ian Smith, Nikola Stosic and Ahmed Kovacevic it was clear to me that the engineering excellence on offer at the Centre was simply the best available, and this gave me the confidence to tackle the daunting task which lay ahead. This was for me, the start of an engineering journey which has lasted till the present day, and hopefully continues into the future. A successful and highly educational journey for which I consider myself to be very lucky indeed.

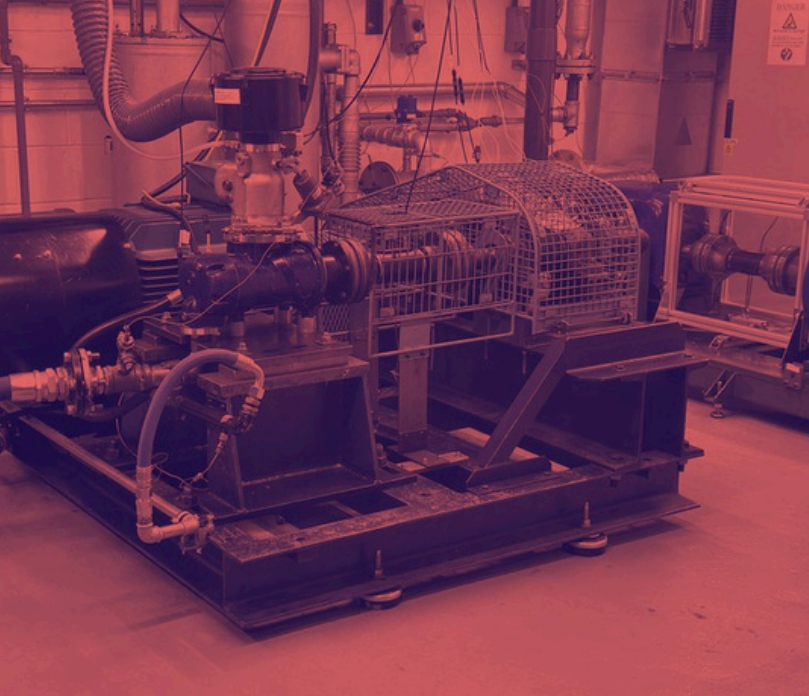
In those early days development of software design tools for compressor optimisation were relatively new and the Centre offered Scorpath to industrial partners, which opened the door to commercial use for engineers. In the field of positive displacement machines attributes such as engineering excellence, positive motivation, competence, vast experience, together with an extensive knowledge base, are reflected in many successful ongoing industrial partnerships.

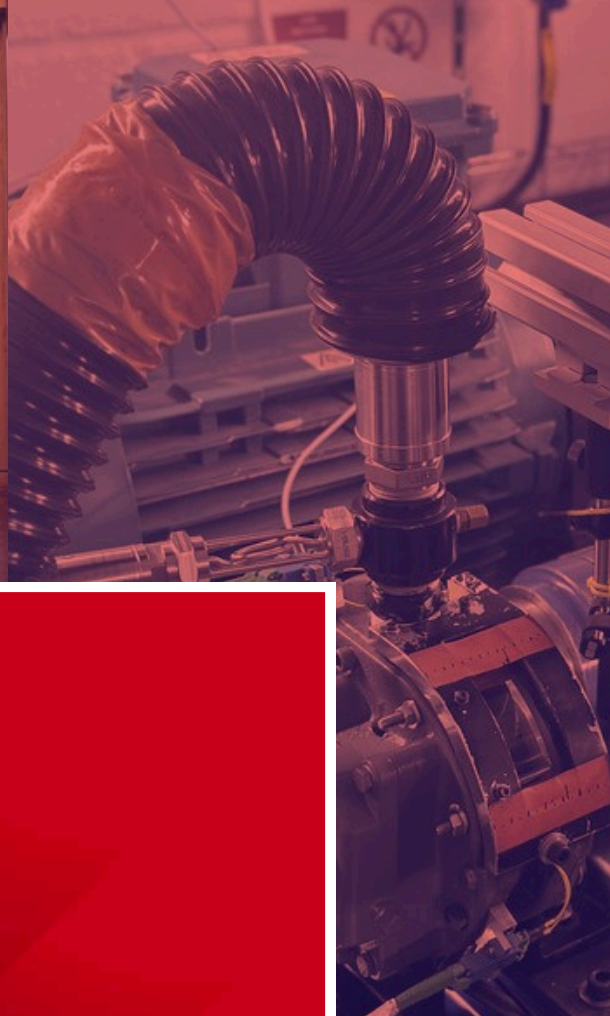
Progress continues today together with further development of software tools for compressor design such as the latest version of Scorg, and not forgetting the excellent real-world testing facilities which the Centre now possesses. My memories from over 20 years ago of the highs and lows during prototype testing together with Prof. Kovacevic will be with me forever.

*Thank you for this memorable journey to everyone who was involved.
Most important of all though are the long-lasting friendships which still continue.*



Graham Stupple CEng. MIMechE
2003 – 2014 Head of R&D Rotorcomp GmbH, Germany.
2014 – 2023 Head of R&D Jäcklin GmbH Germany.





CENTRE TODAY



Into the Fourth Decade: The Centre Today and Beyond

Today, the Centre has the largest team in its history. It includes four professors and lecturers, three dedicated researchers, nine PhD students, and a project manager overseeing Centre's resources and activities. Currently, the team is working on three large research projects with Howden, Mayekawa and Carrier and several consultancy projects with the UK and overseas companies.

The next decade of the Centre will be dedicated to exploring upcoming technologies to be used for advancement in positive displacement machines and their application, including artificial intelligence and machine learning, digital twins, quantum computing and new modelling techniques such as Lattice-Boltzmann, Spline mesh generation and others.

As we celebrate three decades of success, we remain committed to our mission: **Advancing technology, nurturing talent, and driving progress in compressor systems.**

Our Research

Current activities of the Centre include research projects funded by the UK funding bodies and industry including:

- Research and Development of new generation of oil free screw machines through project SECRET, funded by RAEng and Howden
- Research and Development of internally geared screw machines, funded by Carrier and PDM Analysis
- Research and Development of water lubricated screw compressors in collaboration with the University of Southampton, funded by Mayekawa
- Development of novel refrigeration compressors for aerospace applications
- TRL1-3 research studies funded by the Industrial Consortium for Compressors and Expanders in Future Energy Systems (CERES) including:
 - Rotor profiling using Artificial intelligence
 - Sustainable lubrication for rotary positive displacement machines
 - Sound and noise in rotary positive displacement machines
 - Characterisation of bearing technologies for positive displacement screw machines

Team today





PROF AHMED KOVACEVIC
DIRECTOR



PROF NIKOLA STOSIC



EMERITUS PROF IAN SMITH



DR MATTHEW READ
LECTURER



DR SHAM RANE
SENIOR RESEARCH FELLOW



ALEKSANDER KRUPA
RESEARCH ENGINEER



IVONA IVKOVIC-KIHIC
PROJECT MANAGER



HOSSEIN KESHTKAR
RESEARCH ASSISTANT

Hossein is a full-time PhD student at Brunel University working on the combustion of hydrogen. In 2024, he started as a Research Assistant in the Centre, working with Mayekawa and supporting consultancy projects.



DR YANG LU
POSTDOC RESEARCH ASSOCIATE

Yang completed his PhD in the Centre in 2021 when he started working for Vert Rotor in Edinburgh. In 2023 he joined the Centre as PDRA to develop routines for modelling of vacuum pumps.



NEERAJ BIKRAMADITYA

Neeraj's PhD research is part of the Project SECRET, funded by RAEng and Howden, Chart Industries Company, and focuses on Numerical fluid flow and bi-directional CHT analysis in leakage flows of rotary positive displacement machines.



HALIL LACEVIC

Halil is conducting research on the development of low- and high-order models for internally geared screw machines. His work is supported by Carrier and PDM Analysis. Recently Halil embarked on the project for use of AI in rotor profiling, sponsored by CERES consortium



JIN ZHU

Research topic: Noise and vibrations in internally geared screw machines. Jin is an industrial PhD Student employed in Carrier as development and new product engineer.



HAMID ABBASI

Hamid joined the Centre in 2024 as a PhD students sponsored by Mayekawa, Japan. He is researching on materials and rotor profiles for water-lubricated twin screw compressors.



MOHAMED HUSSEIN AHMED

Mohamed started his PhD in 2025 on noise identification and reduction in screw compressors. He is supervised by Dr Juan Ingio on this project funded by CERES consortium.



ADNA PECO

Adna's started her PhD in 2024 on sustainable lubrication of oil-injected positive displacement machines. Her study is funded by the CERES Industrial Consortium.



ANURAG KISHAN

His research focuses on Monitoring and controlling operational clearance for dry rotating positive displacement machines. Engineer in Howden and working on project SECRET.



ANDERSON LEAO

Research topic: PIV and PLIF monitoring of clearances in positive displacement machines. Anderson's PhD research is part of the Project SECRET funded by RAEng and Howden, Chart Industries Company.



MEER SOLANKI

Joining the Centre in 2025, Meer is starting his research on advances in bearing technology of screw machines funded by the CERES consortium.

Centre's Laboratory today

SCREW COMPRESSOR LABORATORY

Test rigs are built to meet CAGI and PNEUROP test standards and test procedure meet ISO 1217:2009 +A1:2016(E) standard (Displacements compressor – Acceptance tests).

The oil-injected test rig is equipped with a 2 pole AC motor of 75 kW with maximum rotational speed of 3600 rpm and torque up to 250 Nm. The compressor is driven through a belt pulley train drive.

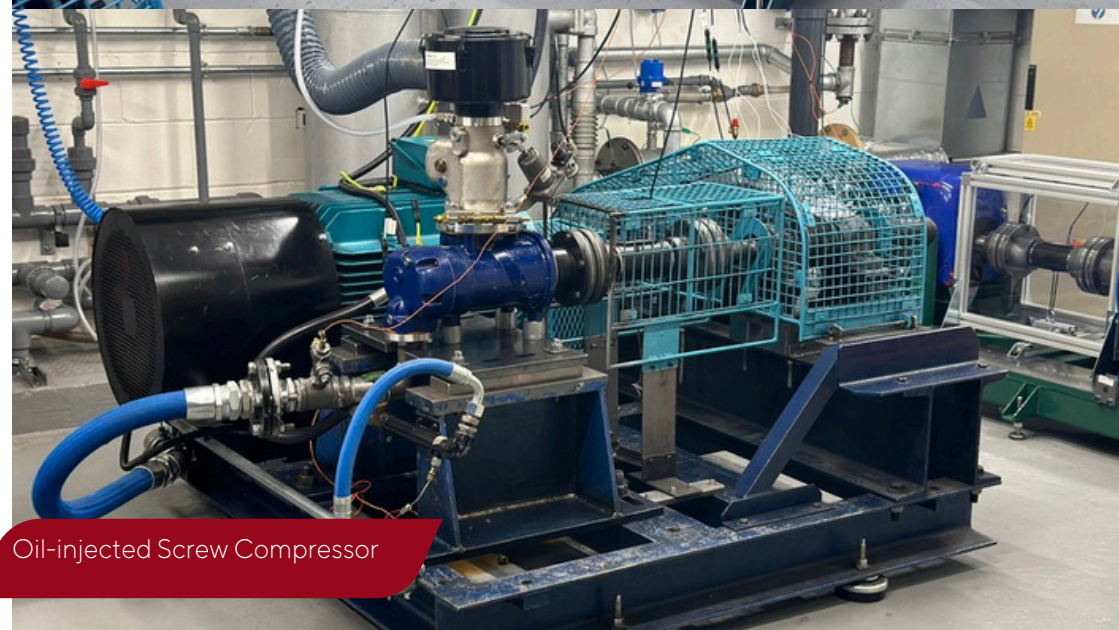
The oil-free screw compressors can be tested to the discharge pressure of up to 12 bar (g) and discharge temperature up to 100 °C. Air-oil mixture is separated after the discharge using a two stages oil separator (centrifugal + filter). The test rig is equipped with an oil-cooler to reduce oil temperature to a specified temperature.

The oil free test rig is equipped with a 4 pole AC motor of 75 kW with maximum rotational speed of 1800 rpm and torque up to 500 Nm. The compressor is driven directly by the motor.

Oil-free screw compressors can be tested to the discharge pressure up to 2.8 bar (g) and discharge temperature up to 200 °C. The maximum delivery airflow is 1000 m³/h (588 cfm).



Oil-free Screw Compressor



Oil-injected Screw Compressor

OPTICAL COMPRESSOR LABORATORY

State of the art optical laboratory is specifically dedicated to study the flow field and heat transfer phenomena in leakage flows as well as main flow in actual running condition of the positive displacement machines using high-end techniques such as Particle image velocimetry (PIV), High speed infrared thermography (IR) and Planar laser induced fluorescence (PLIF). This enables us to understand the flow physics inside the rotary machines. This facility can be leveraged to other applications such as turbines and aerodynamics.



INTERNALLY-GEARED MACHINES LAB



Currently, at City, a new test laboratory is being established to investigate a revolutionary new type of screw machine. An in-house designed test bed will allow testing of oil-injected IGSM with power up to 11kW. Internally-geared screw compressors have a number of potential advantages over conventional twin-screw configurations, including reduced leakage areas, co-directional thermal expansion, reduced rotor deflection, reduced viscous losses, and higher swept volume for a given machine envelope. The laboratory is expected to be ready and first tests performed by the end of 2025.

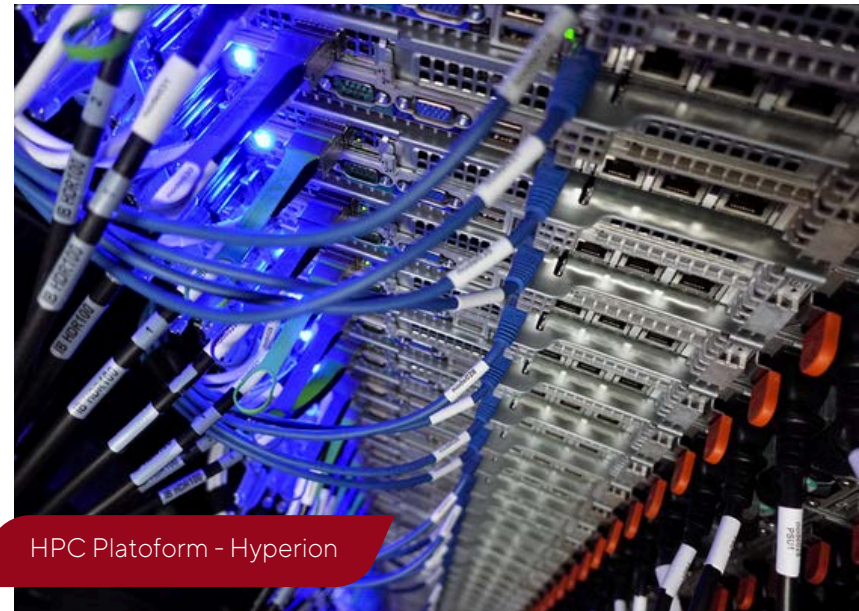
REFRIGERATION AND ORC TEST LAB FOR COMPRESSORS, EXPANDERS AND TURBINES

The expander test facility is a modified vapour-compression system with partial cooling/condensation using modern refrigerants. This test facility can replicate typical operating conditions within an ORC system, and will be used to conduct experiments on two-phase expansion using twin-screw expanders.



ORC Test Lab

HPC PLATFORM – HYPERION



HPC Platform - Hyperion

The Centre, through the School of Science and Technology has access to the powerful High-performance computing (HPC) platform – Hyperion. This infrastructure is available for research and development since early 2021 and continues to be the main CFD platform where all necessary software and licensing facility is made available by the University. Additionally, the Centre also has dedicated hardware for pre-post processing of data, running smaller computations etc. Software such as GT-SUITE, GT-SCORG, Simetrics-MP+, ANSYS are made available to the research team via such dedicated hardware resources based on specific project goals.

Looking Ahead

As we look to the future, we are reminded that no single person can solve the challenges ahead alone. Each of us brings different strengths — researchers, students, industry partners, colleagues — and it is through our combined efforts that we will continue to make meaningful progress. As Mother Teresa said,

"I can do things you cannot, you can do things I cannot; together, we can do great things."

This spirit of collaboration has brought the Centre to where it is today, and it will guide us as we move forward into the next chapter.

30 YEARS OF EXCELLENCE
CENTRE FOR
COMPRESSOR TECHNOLOGY