



Bart van Overbeeke Fotografie

Professor of Multiphase & Reactive Flows

TU / **e**

Technische Universiteit
Eindhoven
University of Technology

Where Innovation starts



Eindhoven University of Technology

Eindhoven University of Technology (TU/e) is a research-driven, design-oriented university of technology with a strong international focus. The University was founded in 1956 and has around 8,500 students and 3,000 staff. The University's education, research and knowledge valorisation contribute to:

- **science for society:** solving the major societal issues and boosting prosperity and welfare by focusing on the University's Strategic Areas of Energy, Health and Smart Mobility;
- **science for industry:** the development of technological innovation in cooperation with the industry;
- **science for science:** progress in engineering sciences through excellence in key research cores and innovation in education.

The Executive Board comprising the President (Jan Mengelers), the Rector Magnificus (Professor Frank Baaijens from 1st May 2015) and the Vice President (Jo van Ham) govern Eindhoven University of Technology (TU/e). TU/e comprises nine Departments, namely:

- Biomedical Engineering;
- Built Environment;
- Electrical Engineering;
- Industrial Design;
- Industrial Engineering and Innovation Sciences;
- Chemical Engineering and Chemistry;
- Applied Physics;
- Mathematics and Computer Science;
- Mechanical Engineering.

Further details about the University can be found at www.tue.nl/en/university/about-the-university/

Department of Mechanical Engineering

The Department of Mechanical Engineering is one of the nine Departments of Eindhoven University of Technology (TU/e). The Department was established at the Foundation of the University in 1956.

The current staff includes 13 Full Professors, approximately 50 Associate and Assistant Professors, and administrative and technical support staff. There are approximately 1,500 Engineering (BSc and MSc) students, more than 150 PhD students and 30 post-doctoral researchers. The annual departmental budget amounts to approximately €22 million.

The Department currently has eight research groups, which are discipline-oriented, and therefore have a high resilience to rapid changes in application areas. A research group typically consists of a Full Professor, a part-time Professor and several Assistant and/or Associate Professors. This offers optimal conditions in the sense that they have sufficient critical mass and short communication lines.



Multiphase & Reactive Flows Research Group

There are many activities in the field of Multiphase & Reactive Flows in the Netherlands, ranging from large multinational industries to smaller regional companies. Typical application areas are oil and gas extraction, production and conversion, automotive, food and chemical industry and power plants.

Research in these fields can therefore have a large impact on the Dutch economy and the societal relevance of this field is huge. The field is embedded in two of the three key strategic areas of the University, being 'Sustainable Energy' and 'Smart Mobility'.

Important topics are:

- the development of efficient separation techniques;
- the design of two-phase heat exchangers, optimisation of heat and mass transfer in reactors;
- the development of sustainable types of fuel;
- the design of efficient and clean combustion systems like engines and gas turbines.

Innovations in these application areas are only possible if the investigations are supported by fundamental research on the underlying physical mechanisms, in particular multi-component and phase-transitional flows, turbulence, reaction kinetics, combustion and combinations thereof.

In such flows, phenomena on very different time and length scales play a role. The smallest scales are for example the scales of the interface between two phases or components, the Kolmogorov scale in turbulent flows, or the thickness of a reaction layer or flame front, which are in general much smaller than the large scales determined by the flow and the geometry. The behaviour at the small scales, related to heat and mass transfer and chemical reactions at an interface between two phases or at a flame front, is important for large-scale processes since the small-scale processes have a large impact on the system as a whole. Both scales must be studied simultaneously.

Multiphase & Reactive Flows Research Group *continued*

These phenomena are studied in full depth within the two current research groups on Combustion Technology and on Process Technology at the ME department. It is possible that these groups could be joined to form the new Multiphase & Reactive Flows group and the new Chair may have the opportunity to head this group. The existing Process Technology and Combustion Technology groups cover the entire range of research from fundamental to design-oriented. This is illustrated by their publications, by the wide range of international research collaborations in combination with close cooperation with industry, by the patents and by the spin-off companies.

FACILITIES AND COLLABORATIONS

A joint laboratory is shared with the Energy group and has state-of-the-art measuring techniques, such as 3D PTV, LIF, PIV, high-speed cameras, and with specialised experimental facilities, such as two optically accessible diesel engines. Research at TU/e in the fields related to the new Chair is performed in the Research Area (OGB) 'Process Technology', mainly positioned in the Chemical Engineering, Mechanical Engineering and Applied Physics Departments. The formation of new collaborations and interdisciplinary contacts between these Departments is of utmost importance.

RESEARCH

Research in Multiphase & Reactive Flows will focus on dedicated experiments, supported by analytical and computational techniques. Applications are described above and design issues may be related to all these topics. Both large-scale equipment and microfluidic devices are considered. Experimental techniques will be applied to various length and time scales, and the focal point of the Chair is the development of measuring strategies to reveal the physical phenomena underlying the multi-scale phenomena. In the new research group, numerical methods for multi-scale techniques have been and will be developed to facilitate analysis and interpretation of measurements. Apart from a strong embedding in the scientific community, it is considered to be vital that the Chair has an open eye for industrial applications. Strong ties with major industries related to process and combustion technology facilitate the identification of new research themes in which the Chair and the group can play a pioneering role.



Appointment of Professor in Multiphase & Reactive Flows

The Chair is a full-time, permanent position, and is financed by the Department of Mechanical Engineering. The appointee will have the opportunity to be the scientific leader of research activities in the broad topic of Multiphase & Reactive Flows, but may have a personal scientific profile within one of the sub areas in the field.

You take part in the teaching activities of mechanical engineering and will play an active role in the partnerships of the Mechanical Engineering Department. The appointee is also expected to establish/strengthen research contacts with partners within and outside of TU/e, including industry and other non-academic institutes.

The new Chair will be asked to:

- actively lead the research in the Multiphase & Reactive Flows group. This research will focus on dedicated experiments, supported by analytical and computational techniques;
- stimulate a strong embedding in the scientific community and strong ties with major industries related to process and combustion technology;
- facilitate the identification of new research themes in which the Chair and the group can play a pioneering role;
- provide and coordinate courses and student projects in fluid mechanics, thermodynamics, heat transfer and combustion (BSc and MSc curriculum), together with colleagues from Energy Technology and Multiscale Engineering Fluid Dynamics.

Appointment of Professor in Multiphase & Reactive Flows *continued*

You:

- have a PhD in engineering sciences, in (applied) physics or applied mathematics, and several years of experience thereafter;
 - are an authority in the development and application of modern methods in process and/or combustion technology, as evident from awards, papers in reputed scientific journals, invited keynote and plenary lectures, membership of editorial boards, scientific committees, filed patents, etc;
 - have a proven record in the acquisition and the management of research grants on a national and international level;
 - have a proven record in content-wise coaching research work of PhD students;
 - have ample experience in teaching courses at different levels and proven didactic skills;
 - have the ambition and ability to attract and inspire MSc students;
 - are able to create and maintain scientific relationships with other disciplines, industry and international institutions;
 - are willing and able to co-operate with other Chairs in the Thermo-Fluids Engineering Cluster, and within the J.M. Burgerscentrum/OSPT;
 - are willing and able to play a key role in the general management of the new group.
- excellent research facilities, including a joint laboratory shared with the Energy Technology group and the Multi-scale Engineering Fluid Dynamics group with state-of-the-art measuring techniques, such as 3D PTV, LIF, PIV, high-speed cameras, and with specialised experimental facilities, such as two optically accessible diesel engines;
 - a full-time tenure appointment, in accordance with the Collective Labour Agreement for Dutch Universities;
 - a salary based on the rank of full professor plus 8 per cent holiday allowance and 8.3 per cent end-of-year allowance;
 - support with your professional and personal development;
 - an attractive package of fringe benefits (e.g. excellent technical infrastructure, child care, savings schemes, parental leave packages and excellent sports facilities);
 - assistance in finding accommodation (for international employees).

We offer:

- a challenging job in a dynamic and ambitious university, and a stimulating research environment;
- a unique opportunity to combine your research, educational, network and coaching skills in an inspiring environment where cooperation plays a key role;

WOMEN IN SCIENCE

TU/e strives towards a diversified workforce at all function levels. Part of this endeavour is to appoint more talented women to professorial positions. The Women in Science (WISE) network at TU/e is very actively promoting the dissemination of knowledge and experience which may further assist newly appointed female professors in their further professional and personal development.



Appointment process and how to apply

An executive search exercise is being undertaken by Perrett Laver to assist the advisory committee in the discharge of its duties, both to assist in the assessment of candidates against the requirements of the role and to identify the widest possible field of candidates. Applications should consist of a covering letter explaining motivation and qualifications for the position and a full curriculum vitae, including a list of publications.

Perrett Laver may be contacted for informal enquiries and questions about the post on +44 (0)20 7340 6208 or louise.evans@perrettlaver.com.

Applications can be uploaded at www.perrettlaver.com/candidates quoting reference number 2012.

Applications will be considered by the advisory committee and preliminarily shortlisted candidates will subsequently be invited for informal conversations with the University, after which a formal shortlist of candidates will be invited for interview and campus visits. Selection of and negotiations with the preferred candidate will take place thereafter.

For details about working at TU/e, visit: www.tue.nl/en/university/working-at-tue/