

## Faculty of Science and Engineering

### Profile report: Chemical Product Technology

Discipline: Chemical Product Engineering, Polymer Chemistry and Physics,  
Extrusion, Polymer recycling  
Level: Tenure-track assistant professor  
Fte: 1,0 fte

#### 1. Scientific discipline

Chemical product engineering focuses on the study and development of novel and improved chemical products. This often takes place in the well-defined perspective of an industrial application, which in turn determines the product functions/specifications. As such, chemical product engineering aims at providing reliable and well-defined structure-process-property relationships, thus linking the chemical structure and composition of a given product to its properties and to the process used to factually make the product. A relatively new feature in the field is the circularity of the designed chemical products and approaches for recycling plastics and polymeric products.

This position will focus on the introduction of product design elements (e.g. computer aided design and modeling for product requirements) for various courses in the Bachelor and Master programmes in Chemical engineering and Industrial Engineering and Management (particularly the Sustainable Process Engineering track). The research activities of the candidate should preferably support existing research lines in the research unit Product Technology within the Engineering and Technology institute Groningen (ENTEG).

#### 2. Vacancy

This position is opened by the Board of the Faculty (PT/gl/21/00100) and will be embedded in ENTEG, basic unit Product Technology. The criteria and conditions pertaining to the position are described in the document '[Assistant professor with an education profile](#)'.

#### 3. Selection committee (BAC)

- Prof. dr. F. Picchioni, Professor Product Technology, Educational director, ENTEG, chair;
- Prof. dr. H.J. Heeres, Professor Chemical Reaction Technology, Scientific director, ENTEG;
- Dr. G. Jonker, Programme Director Bachelor Industrial Engineering and Management;
- Prof. Dr. P.P. Pescarmona, Professor Sustainable Chemical Products and Catalysis, Programme Director Master Chemical Engineering, ENTEG;
- Prof. dr. P. Rudolf, Professor Experimental Physics, Zernike Institute;
- Prof. dr. L. Focarete, University Bologna, Italy;
- Student (tba)

Advisors:

- H. Haagsma, HR advisor, ENTEG
- Dr. K. Voskamp, Scientific coordinator, ENTEG

#### **4. Area of expertise**

Since the introduction from 2000 onwards of Product Technology as a leading concept in the Chemical Engineering curriculum at the RUG, many positive developments have been registered. The introduction of course units on product technology and a curriculum revision highlighting the Product Technology character of the MSc as well as the nice integration with the Chemistry curriculum represent examples of major developments. The original idea of Product Technology course units and BSc/MSc projects is to mimic the product design steps that are currently carried out in the industry. Product design in industrial settings is a group effort entailing the presence of multidisciplinary expertise according to an iterative approach. i.e. the product design cycle. This comprises definitions of product ideas, prototypes testing, analysis of results, re-design, and so on. These keywords (group, multidisciplinary, and product design cycle) are the cornerstone of industrial product design. The necessity to complete the integration of these as pillars of our educational concept in the curriculum is crucial in ensuring a smoother transition of our graduates to the industrial world.

The candidate is expected to contribute to the strengthening of the product design activities in relevant educational programmes. This will particularly involve the development of new ideas/concepts for example in the fields of computer aided design both in terms of structure property relationships and of products requirements as derived from the product function. Typical examples of courses for which involvement of the candidate is foreseen are “Product Technology” (BSc Industrial Engineering and Management and Chemical Engineering), “Advanced Product Engineering” (MSc Chemical Engineering) as well as new courses focusing on modeling aspects for the aforementioned fields. Also, the candidate will be involved in the development of product design learning lines in the relevant educational programmes.

#### **5. Embedding: institute (and base unit)**

The research institute ENTEG ([www.rug.nl/enteg](http://www.rug.nl/enteg)) is the engineering science and technology institute of the Faculty of Science and Engineering of the University of Groningen. ENTEG research is highly multidisciplinary in nature and focuses on fundamental and engineering research on the development of new and innovative processes and products. The research of ENTEG is conducted in three key research domains:

- the application of fundamental sciences to the design of new (sustainable) product and research in the area of product and production technology for (bio)chemical-based products,
- the development of quantitative and analytical theories and methodologies for model-based design and control of complex industrial processes and systems and,

- advanced production engineering aiming at improving the production processes of increasingly complex materials.

The candidate is expected to contribute to the existing teaching and research activities within the Product Technology (PT) group. PT currently consists of 2 senior professors and 3 tenure track assistant professors and a substantial team of PhD-students and postdoctoral fellows. The staff strongly links to the degree programmes in Chemical Engineering, Industrial Engineering and Management and Mechanical Engineering. The candidate is expected to contribute to the strengthening of the relevant educational concepts in Product Technology which mainly is linked to the Chemical Engineering programme (both at Master and Bachelor level).

Research within PT is focused on the design of new or improved chemical products. The research activities are generally framed in a comprehensive sustainability context. As such, the use of environmentally friendly processes (e.g. renewable sources, green solvents and recyclable catalysts) is a further objective of the research. In terms of research the candidate is expected to contribute to the existing activities within the PT group in the general field of material/plastic recycling.

PT will ensure that the candidate has access to all facilities and resources he/she may need for the research.

## **6. Local and (inter)national position**

The staff of the PT unit together with the Green Chemical Reaction Engineering unit of ENTEG are the core teaching staff of the Chemical Engineering BSc and MSc programmes of the University of Groningen. These programmes are the only ones in the Netherlands approaching the general concepts of Chemical Product Design and Technology through a relevant chemical basis and still within the general EFCE (European Federation of Chemical Engineers) guidelines for BSc and MSc Chemical Engineering programmes. Although recently similar programmes have been developed at the European level (e.g. University of Ghent, Belgium) the presence of integrative course units binding chemical elements with process design and technology also internationally is rather unique.

## **7. Expected contributions to teaching**

The candidate will at the level of Assistant Professor contribute 60% of his/her time to the degree programmes at the University of Groningen. More specifically, the candidate is expected to take a leading role in innovating the teaching and assessment methods for Product Technology courses at both the Chemical Engineering BSc and MSc programmes. This might include, although not limited to, computer-aided product design and development. Such Product Technology-computer aided tools are currently absent in our programmes and we aim to strongly innovate our Product Technology-related educational activities at least in two aspects:

- The more frequent use of digital tools including communication ones (as to dovetails common and current practices in the industry).
- The full integration of the three Product Technology pillars of the educational concept in our curriculum.

Innovation in the mode of assessment and instruction for BSc and MSc projects along the guidelines of product design processes in an industrial context is also highly desirable. In the same context, the candidate is expected to contribute to the further development of the learning line Product Technology (in BSc and MSc Chemical Engineering, and more specifically in the course units “Product Technology” in the BSc Chemical Engineering and “Advanced Product Engineering” in the MSc Chemical Engineering).

The candidate is also expected to be involved in the competence development of students and particularly those relevant for product design like teamwork. All activities should provide students with the required mindset, knowledge, competencies and skillsets required in the chemical industry of the future.

Finally, it is appreciated if the candidate applies for external funding, in particular for specific teaching grants (e.g. EIT, Erasmus plus, local funds) and contribute to strengthening the international reputation of the degree programmes.

### **8. Expected contributions to research**

The candidate will at the level of Assistant Professor contribute 30% of his/her time to provide relevant contributions to existing research lines in polymeric product design in general and reactive extrusion as the key technology for the recycling of plastic waste in particular. The PT group is already playing a pivotal role in industrial projects of this nature: several industrial partners are already collaborating with the PT staff on this topic, which is extremely attractive from an industrial perspective and particularly in the North of the Netherlands. The candidate is expected to reinforce these co-operations.

### **9. Expected contributions to the organization**

The candidate is expected to have an active interest and to provide a positive contribution to the management and organizational tasks of the institute. At the level of FSE, the candidate will contribute to the organization of the faculty, for example by participating in working groups and committees in the area of education. The candidate will participate in relevant national and international organizations.