Abstract

of the habilitation thesis

Contributions to the mathematical modeling and dynamic simulation
of the reactive distillation with potential liquid phase splitting process
for automatic control

Candidate: prof. PhD eng. Gabriel Rădulescu

This habilitation thesis is an important scientific contribution in the large field of industrial processes modelling, simulation and control, which I dedicated to after getting the PhD title in 2002.

My PhD thesis, with the title ''*Contributions to the crude oil plant model-based control*'', was supervised by the esteemed Professor Vasile Marinoiu, and was defended on the 25th of October, 2002 at the Petroleum-Gas University of Ploiești. I was granted the doctoral title in the field of Automatic Control, with the *cum laudae* distinction, on the basis of Order no. 3896, dated 24th of April, 2003, of the Ministry of Education and Research.

Subsequently, between 2004 and 2006, I was part of an international post-doctoral programme at the Max-Planck Institute in Magdeburg, Germany, under the supervision of Professor Achim Kienle (whom I have known since 2000, after working abroad, in the same institution, for my PhD thesis). The research activities focused on nonlinear modelling of the reactive distillation process. This was the starting point of my personal research in this wide area, which now covers the reactive distillation modelling, simulation and control.

The thesis is structured in three parts and five chapters as follows.

The first part, entitled *"Personal Scientific and Professional Achievements"* puts together all my contributions in the field of reactive distillation modelling and dynamic simulation.

Chapter 1 presents an outline of the most important aspects related to these distillation processes which motivates my choice of theme for the present habilitation thesis. It also refers to a short literature review regarding the applicability of reactive distillation. The chapter continues with an extensive presentation of my research results concerning the mathematical model formulation for such a physical/chemical process combining both fundamental theoretical issues and personal experimental results. Thus, an especially complex view over this research is detailed, accompanied by challenging aspects to which further research will find suitable answers.

Chapter 2 deals with an overview of scientific results published in the field of modelling, simulation and control of reactive distillation. Special consideration is given to the acknowledgement of scientific achievements of the author of this habilitation thesis.

The second part, entitled *"Career Development Plan"* dwells on the professional growth in the context of my future position of PhD advisor, fully involved in the evolution of the academic community to which I belong. After a short presentation of the candidate (in Chapter 3), I am describing the didactic trends that I wish to follow, which are shown in detail in Chapter 4. Furthermore, in Chapter 5 I underline the main contributions regarding my future research paths.

In the third part of this habilitation theses, entitled *"Bibliography"*, I have gathered the most important resources quoted in the present paper and which represent an important contribution regarding my personal achievements.