

PROLOGUE

In this new century the process industry faces three major challenges: increased competition in the global marketplace, pressure for keeping operating costs and product prices low, and pressure for reducing environmental, safety and security risks. If the process industry is to remain successful, it clearly will need to innovate and strengthen its technological basis. Given these competitive concerns, there is an increasing focus for optimizing and integrating the supply chain in order to achieve reduced costs and a tighter level of coordination in the operations. One of the essential components for accomplishing these objectives is new Process Operations methodologies and tools that are currently the subject of intense research and commercialization through software and services.

Process Operations is a relatively new area within Process Systems Engineering that deals with the development of tools for the management of medium and long-term operation of processes and supply chains. Major concerns of this area are the planning, scheduling, and diagnosis of these systems. Optimization methodologies and information technologies are core tools that are used to tackle these problems. Process Operations has of course a close relationship with the areas of Process Design and Process Control. When dealing with operational problems, often a logical extension is to consider design of new systems or retrofit design modifications. Process Operations has also a close relationship with Process Control, because both areas deal with operations. The difference, however, lies in the time scales. Process Control typically deals with time scales of the order of seconds-minutes. Process Operations typically deals with time scales of the order of weeks-months. Furthermore, Process Control tends to be dominated by differential and continuous models, while Process Operations tends to be dominated by algebraic and discrete models. One could of course argue that these are artificial differences, and it is clear that in the long term one might envisage a convergence of the two areas.

Over the last decade the scope of the Process Operations methodologies and tools has expanded from operational issues in manufacturing plants to the management and optimization of entire supply chains. Furthermore, its scope has also been expanded towards R&D activities on the one hand, and towards distribution and logistics of products on the other hand. The new expanded scope of process operations offers exciting possibilities at the practical and research levels. At the practical level it has promoted the integration of computer and information technologies with large-scale modeling and optimization tools that are being translated into large economic savings by improved coordination of operations, decreased inventories and higher levels of service. At the research level process operations has given rise to a number of modeling, algorithmic, and integration challenges in order to effectively tackle large and complex systems that are characterized by dynamic changes and uncertainties.

It is in the context of the evolving and changing nature of process operations described above, that the Foundations of Computer Aided Process Operations (FOCAPO) 2003 conference has been organized. This conference is part of a series that has been organized under the auspices of the CACHE Corporation with joint sponsorship by the CAST Division of AIChE. For the first time FOCAPO 2003 is also co-sponsored by INFORMS to recognize the importance of Operations Research in this area.

The first FOCAPO Conference took place at Park City, Utah, in 1988, and was co-chaired by Rex Reklaitis and Dennis Spriggs. The major theme of that conference was an initial definition of the area of process operations, led by the efforts of the late David Rippin and by Rex Reklaitis. An important area of emphasis at that meeting was data management. The second FOCAPO Conference took place at Crested Butte, Colorado, in 1993, and was co-chaired by David Rippin and John Hale. A major theme of that conference was planning and scheduling. Also, for the first time the concept of supply chain was introduced by Professor Bryant from the Management School at Imperial College. The third FOCAPO Conference took place at Snowbird, Utah, and was co-chaired by Joe Pekny and Gary Blau. This conference was characterized by a high level of industrial participation, and the emphasis was on computing technologies, and exposure to electronics and bioprocessing technologies. If one were to summarize the first three FOCAPO conferences, they have had an emphasis on exposure to new problems, in addition to academic and industrial reviews of state-of-the-art in the field.

The title that was selected for the fourth conference FOCAPO 2003 is *"A View to the Future Integration of R&D, Manufacturing and the Global Supply Chain."* This was to reflect the fact that, as opposed to previous conferences, a major goal was to go beyond the plant level, and address the chemical process enterprise at the global market level. In this way, a significant shift compared to past meetings is the consideration of business aspects in the operation and management of the supply chain, while at the same time maintaining a process technology focus. Another major goal of the conference was to expand the scope of the supply chain by taking into account the upstream activities of R&D, particularly the pipeline of new products in the pharmaceutical and biotechnology sectors. Another major goal of this conference has been to promote strong industrial participation, which is a crucial element given the nature of the area of Process Operations. In FOCAPO 2003 there has been significant representation from industry in the Technical Programming Committee and in the Industrial Advisory Committee. In addition, panel discussion sessions have been added to promote dialogue between industry, the vendors and academia.

In these proceedings the invited papers, which are written by leading researchers and practitioners, cover topics on supply chain optimization, integration of R&D and new product development with manufacturing and operations, advanced optimization tools, strategies for handling uncertainty, modeling of process operations, safety and control in operations, and information technology. It is hoped that the papers from this conference will stimulate new research ideas and directions, as well as practical developments that will have an industrial impact. We have also included almost one hundred contributed papers to disseminate new research ideas and industrial applications in the area of Process Operations. We hope that in past FOCAPO meetings, FOCAPO 2003 will prove to be valuable to academics and to industrial participants.

Finally, we would like to express our gratitude to the National Science Foundation and to companies that have provided financial support, ExxonMobil, Eastman, Dupont, Bayer, Mitsubishi and ILOG. We would also like to acknowledge the participation of the Technical Program Committee, the Industrial and Advisory Committees, the invited speakers, panelists and authors of contributed papers, the chairs of invited paper sessions, and Stratos Pistikopoulos and Joe Pekny, co-chairs of the contributed paper session. We are also indebted to the great help of Robin Craven (Alliance LLC), Christos Maravelias (Carnegie Mellon), Janet Latini (Carnegie Mellon), Heather Widmayer (Spinneweb), Cristina Romano (Imperial College), George Applequist (Purdue) and Jodi Ray (Omnipress). Additional information on the conference can be found in <http://www.cheme.cmu.edu/focapo>.

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