



## Editorial

## Smart and Optimal Manufacturing: The Key for the Transformation and Development of the Process Industry

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In recent years, smart manufacturing has been the focus of competition and collaboration between countries around the world. The major developed and developing countries are speeding up their strategic planning and layout for smart manufacturing. Germany, the United States, and China have released the Industry 4.0, Smart Process Manufacturing, and Made in China 2025 initiatives, respectively, which aim at a deep integration of information and communication technology and man-

ufacturing technology, thus achieving seamless integration of products, equipment, humans, and organizations.

The process industry, which mainly includes elementary raw material industries such as petroleum, chemical engineering, steel, nonferrous metal, and building materials, is a foundational industry not only for China, but also for other manufacturing powers including the United States. After decades of development, the industrial structure of the Chinese process industry is gradually being upgraded and breakthrough technologies are emerging, making Chinese process industry a world leader in terms of scale. However, a gap still exists between the Chinese process industry and the international advanced process industry in terms of overall production effectiveness. In addition, the restrictions on China's energy and resources are becoming increasingly aggravated and problems in safety and environmental protection are surfacing at an increasing rate.

The international process industry is at a critical and historic moment of transformation, resulting in the development of accurate production operations, efficient and smart manufacturing processes, and system-optimized design with the integration of safety and

environmental sustainability. This special issue therefore focuses on the following issues: how to handle challenges and opportunities in the trend of global manufacturing; how to solve bottleneck problems in operating management, production operation, efficiency and security, and information integration using modern information technologies; how to develop the process industry at a steady pace in order to achieve efficient, green, and smart manufacturing; and how to realize the reform of the current modes of production, management, and marketing. With the support of the Chinese Academy of Engineering, it is our great honor to invite academicians and renowned researchers from countries including Belgium, Canada, China, Italy, Portugal, Spain, the United Kingdom, and the United States to report new ideas, new theories, and new technologies in smart and optimal manufacturing in the process industry. The topics in this issue involve visions for smart and optimal manufacturing in the process industry, scientific problems and key technologies in the industry, opportunities and challenges that confront process system engineers in smart manufacturing, big-data-driven industrial process optimization, the performance evaluation and fault diagnosis of process operation, and the global optimization of production planning and scheduling.

We express our sincere thanks to the authors who submitted papers to this special issue. Our goal for this issue is to report the state of the art in smart and optimal manufacturing in the process industry to our readers, and to outline some novel ideas in this field. In addition, we believe that this special issue will assist scholars at universities, research institutions, and enterprises to further understand the essence of smart and optimal manufacturing in the process industry and to reach a consensus regarding industry development. In this way, we hope to enhance the current level of understanding of smart manufacturing in the process industry and thus promote the entire manufacturing industry.