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Author: Defang Li

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Perspective for Smart Factory in Petrochemical Industry

Defang Li *

SINOPEC Information Management Department, 22 Chaoyangmen North Street Chaoyang District, Beijing 100728, China

ABSTRACT

Opportunities and challenges in the petrochemical industry and the emergence of massive disruptive technologies have triggered a new revolution that has the power to fundamentally change industrial processes including manufacturing, engineering, materials, supply chains, lifecycle management. Recently, the newly arisen smart factory adopted a disruptive manufacturing methodology and has become a key part of the petrochemical industry. The smart factory, which is different from the original production systems used in the petrochemical industry, needs to assess and position its future research agenda including its definition, intension, framework, and technology. Systems thinking and systems problem solving for the smart factory must be prioritized. Based on an analysis of the driving force for smart factory development, this paper proposes a lifecycle blueprint and consensus-based operating and technology roadmap. The definition and features of a smart factory in the petrochemical industry are presented. Furthermore, a summary of the technical systems and future-proof research field of the smart petrochemical factory from an academic and industrial viewpoint is presented.

Keywords: process system engineering; petrochemical industry; smart factory

1. Introduction

The petrochemical industry has been confronted with new challenges imposed by increasingly strict requirements on environmental protection and energy conservation, pressure of product cost reduction, diversified sources of raw materials, individualized customer needs, combination and optimization of supply chain and so on. A new round of scientific and technical revolution represented by the Internet of Things, cloud computing, and robot and big data technologies is on the rise (Bar-Cohen and Hanson, 2015). In addition, the integration of information technology (IT) with operations and manufacturing technologies has created new business forms and models, bringing revolutionary changes to the production mode in the petrochemical industry.

Major countries in the world have upgraded their manufacturing development into a national strategy, of which IT is an important component. In 2010, the EU announced the Europe 2020 strategy. In 2011, the USA proposed the Advanced Manufacturing Partnership (AMP) in 2011 and issued a research report entitled National Strategic Plan for Advanced Manufacturing in 2012 based on AMP; Germany published the Industry 4.0 strategy (Sendle, 2014) in 2013; the Smart Manufacturing Leadership Coalition (SMLC), made up of major petrochemical enterprises, IT

*Corresponding author.

Email address: Hansheng.suo@pcitc.com

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