

Transformative Measures in Chemical and Petrochemical Industry Through Agile Principles and Industry 4.0 Technologies

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Abstract : The immense awareness of the global climate change has compelled traditional fossil fuel companies to develop strategies to reduce their carbon footprint and simultaneously consider the production of various sources of clean energy in order to mitigate the environmental impact of their operations. Similarly, supply chain issues, the scarcity of certain raw materials, energy costs as well as market needs, and changing consumer expectations have forced the traditional chemical industry to reexamine their time-honored modes of operation. This study examines how such transformative change might occur through the applications of agile principles as well as industry 4.0 technologies. Clearly, such a transformation is complex, costly, and requires a total commitment on the part of the top leadership and the entire management structure. Factors that need to be considered include organizational speed of change, a restructuring that would lend itself toward collaboration and the selling of solutions to customers' problems, rather than just products, integrating 'along' as well as 'across' value chains, mastering change and uncertainty as well as a recognition of the importance of concept-to-cash time, i.e., the velocity of introducing new products to market, and the leveraging of people and information. At the same time, parallel to implementing such major shifts in the ethos, and the fabric of the organization, the change leaders should remain mindful of the companies' DNA while incorporating the necessary DNA defying shifts. Furthermore, such strategic maneuvers should inevitably incorporate the managing of the upstream and downstream operations, harnessing future opportunities, preparing and training the workforce, implementing faster decision making and quick adaptation to change, managing accelerated response times, as well as forming autonomous and cross-functional teams. Moreover, the leaders should establish the balance between high-value solutions versus high-margin products, fully implement digitization of operations and, when appropriate, incorporate the latest relevant technologies, such as: AI, IIoT, ML, and immersive technologies. This study presents a summary of the agile principles and the relevant technologies and draws lessons from some of the best practices that are already implemented within the chemical industry in order to establish a roadmap to agility. Finally, the critical role of educational institutions in preparing the future workforce for Industry 4.0 is addressed.

Keywords : agile principles, immersive technologies, industry 4.0, workforce preparation

Conference Title : ICCE 2023 : International Conference on Chemical Engineering

Conference Location : Tokyo, Japan

Conference Dates : June 15-16, 2023