

Modeling and Simulation - An Approach for Redefining the System

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The basic needs for the human being to survive are food, clothes and shelter. In addition to these the regime has been broadening as per the demand. There are many desired products which are being manufactured using different processes. One of the essential processing unit is environment itself, where many processes are observed simultaneously. The earth is filled with lots of wonderful resources which are mostly used to support the human ecosystem. However with increase in the global population, the available resources seems to be limited. The conventional processes are utilized to produce the goods and products with monotonous production approach. There are many unsolved issues which might have increased the capacity along with the efficiency of the system. Due to increase in demand of desired products, production houses are running continuously without proper maintenance which hazards to the environment. The major concern is to maintain the demand and supply ratio, irrespective of the production domain. In line to this, the present article is trying to focus on the hazard mitigation. The development of any process has to pass through several steps. It starts with identification of the resources to obtain the desired product. In addition to this there are several catalysts needs to be considered, for altering the desired or undesired situations. The major objective is to present the modeling and simulation approach for such processes. In this process we are focusing on the quality as well as quantity of the desired product. The desired approach which is to be followed consists of identification of process variables, parameters, assumptions, best fit and the most important comparison with the available data. The success of any process depends on final product obtained with optimized conditions. The optimized conditions may vary from process to process. The optimized conditions may be in terms of energy consumption, economics of the process, product quality, standards maintained etc. In the modeling approach the system is being represented in terms of process variables and it will be a small scale design which may be further scale-up for process and product development. The product and process modeling can be categorized as physical and mathematical modeling. The idea is to design a system with minimum resources and it can depict the nature of process at the early stage of investigation with minimum sets of actual experiments. The major concern is safety, which is taken care during this methodology as this approach facilitates the reduction in the direct intervention during the experimentation. In addition to this, economics of the process needs special attention which is answered in modeling and simulation of the proposed system at the initial stage of process development. Now a days everyone is expecting the results within a short time; the modeling and simulation helps to boost up the speed of the process. In general, it provides a solution which is safer, faster and more economical. The simulation refers to the use of designed model to visualize the effect of variables and parameters on the output. The mathematical models are used in different applications like chemical engineering and biotechnology [1]. The modeling approach also consists of Design of Experiments (DoE), this is a technique used to represent a systematic approach to perform the experiments. The DoE portray the interaction within the variables considered for the process building, which may not be possible by the conventional approach [2, 3]. One of the simulation approach is Computational Fluid Dynamics (CFD), this is used to visualize the actual process in terms of velocity-pressure contours, particle tracking etc. The CFD modeling includes the design and development of the process with mathematical models and algorithms available or constructed for the respective systems [4]. The recent development has suggested the extensive use of the artificial intelligence, big data for the system development to be a smart system [5]. The contribution of the modeling and simulation is significant in all the industries.

References

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