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## A Digital Twin Approach to Improve Performance in Food Processing

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Digital Twin (DT) concept and its practical applications have been evolving rapidly due to advances in computer science and digitalisation in industries. The technology has gotten vast amount of attentions from both academia and companies. Targeted potentials and opportunities are acknowledged, however due to complexity of the industrial processes, define a virtual prototype of the physical unit operations may be still difficult or time consuming for real time simulation, optimisation, monitoring, controlling, and improving decision making. There is also a need for an infrastructure platform to join all parts of the specified DT framework. In this article, we addressed an application of the DT in food industry, its challenges, and benefits. An in-house DT framework has been developed as a host for simulator, Programmable Logic Controller (PLC) and Human User Interface (HMI). Simulator includes semiempirical models for process components including mass, energy, and momentum conservations. All the models have been adapted to the Tetra Pak suppliers' specifications. A statistical or machine learning approach has been also developed to capture more complex phenomena such as Fouling development and removal.

The technology has targeted different areas of design and operation to improve the performance of the process line. Training our commissioning engineers reduces the delivery time, cost, and in-site tests. Customer's operators can get familiar and have hands-on practice with HMI before the production starts. The technology can provide valuable information regarding testing real time new conceptual design of the line, new products, trouble shooting of the line such as aseptic risk assessment and possible improvement of PLC/HMI codes.