## Solving Complex Operational Challenges with Optimized Scheduling

The manufacturing sector is no stranger to the impact of increased public demand on consumer goods caused by recalls, shortages of raw materials or disrupted supply chains. One example is the recent recall of <u>baby formulas by Abbott Nutrition</u> which has left parents scrambling across the nation looking for usable alternatives. To eliminate this shortfall, other food and beverage manufacturers have been urged to increase production but complaints about maxed out schedules and other scheduling challenges highlight the difficulties with immediately increasing production rates.

With increased demand and steep production deadlines comes the need to optimize production lines, supply chains, and the entire manufacturing process. Optimizing manufacturing schedules provide excellent short-term solutions to increasing throughput and meeting fluctuating demand. Simulation and digital twin models provide manufacturers with a powerful tool to analyze complex operational challenges and provide scheduling plans to mitigate them.

## **Scheduling Optimization Tools**

The ongoing digital transformation within the average factory which simplifies data collection processes empowers manufacturers with the data to understand scheduling challenges. Although diverse digital transformation solutions for analyzing operational challenges exist, simulation and digital twin modeling have been identified as the most powerful solutions for optimizing scheduling plans.

The empowerment simulation modeling offers lies in its unique capability to capture individual assets on the shop floor, personnel, raw materials, and their corresponding interactions across the entire production line. Capturing these parameters provide industrial enterprises with a virtualized facility for evaluating optimization plans to deal with foreseen and unforeseen production challenges. In scenarios where unforeseen occurrences are evaluated, the concept of risk-based scheduling comes into the picture. Here, schedules are developed to deal with risks and to ensure quality throughput at the required volumes. The digital twin is another powerful optimization tool that takes into account real-time changes for agile scheduling. As definitions go, digital twins are accurate virtual representations of real-world facilities where interexchange of data is made possible in real-time. Cutting edge digital twin solutions develop virtual representations from diverse enterprise data sources such as manufacturing enterprise systems (MES), enterprise resource planning systems (ERP), IoT devices, and data collated on Excel sheets.

## Solving Scheduling Problems with Simulation and Digital Twin Modeling

According to a survey by the National Association of Manufacturers, <u>approximately 36%</u> of manufacturers are facing supply chain challenges which impact a manufacturer's ability to fulfill production deadlines. Other challenges include forecasting demand, improving efficiency, and dealing with downtime. As the example of the baby formula shortage shows, forecasting demand is a tricky process due to its reliance on predicting real-world situations. Despite the challenges associated with demand forecasts, having an optimized schedule in place helps mitigate the problems associated with fluctuating demand.

A <u>forward scheduling approach</u> provides industrial enterprises with accurate evaluations to deal with fluctuating demand. The forward scheduling process involves assessing a facility's current conditions such as resource availability, inventory levels, work in progress etc. to develop an optimized schedule highlighting what is required to meet demand. The optimized schedule will provide the manufacturer with insight into the resources and time frame required to meet real-time demands.

A process digital twin brings a new level of fidelity to scheduling that is currently unavailable in resourcebased modeling tools. Using a process digital twin, resources within the manufacturing system can have busy, idle, or off-shift status that mimics real-world operational dynamics. Individual objects within the digital twin are also imbibed with accurate behavioral patterns and their associated constraints just like in a physical factory floor. The digital twin also leverages 3D animations to support the visualization of results when providing insight to decision-makers.

The high level of detail and agility a process digital twin provides empowers enterprises with the tools to develop actionable schedules. Here, actionable schedules refer to schedules that can be immediately implemented on the factory floor. Thus, with actionable schedules, the manufacturer gets an actionable plan which differs from feasibility studies that may only provide evaluated insight.

## Conclusion

Leveraging simulation and digital twin modeling will provide the average industrial enterprise with feasibility studies and actionable schedules to navigate through the challenges of fluctuating demand and other production bottlenecks. Successfully implementing actionable schedules ensure the production systems function optimally and are agile enough to deal with real-time changes.