Navigating Disruptions in the Manufacturing Industry with Risk-based Simulation and Scheduling

There's nothing certain but the uncertain. This ancient proverb coined the events that happened in 2020 and its effects which continue to spill over till this day. In manufacturing, a pandemic, drastic change to decades-old trade policies and increased demand for accountability from customers has created uncertainties.

The disruptive influence of these uncertainties has led to a disrupted supply chain, new production trends, and huge backlogs in producing the goods the public demand. What trends you may ask?

Today's pandemic-inspired trends include the need to accommodate remote work, redesign facility layouts to meet new safety standards, and create risk-based plans to deal with disruption. A growing demand backlog also disrupts the average manufacturing facility and its production processes. With increased demand comes the need to increase production capacity, source for more resources, and optimize resource allocation to satisfy demand.

Unlike the pandemic of the 19th century that grounded the manufacturing industry to a halt, manufacturers of this age have something that wasn't available then; digital transformation solutions.

Digital Transformation of the Manufacturing Industry

The digital transformation of the manufacturing industry focuses on the use of digitalization technologies to solve both simple and complex problems. The digitalization process enables the development of an interconnected factory floor where data is captured and shared across machines and computing platforms. The captured data is then analyzed to make data-driven decisions to bypass disruptions or even take advantage of a disrupted market.

The digital transformation of the manufacturing industry goes hand in hand with Industry 4.0. Industry 4.0 is defined by the need to apply industrial automation and data analysis to optimize industrial processes. The application of digital transformation technologies to capture data from even the deepest parts of the factory floor lays the foundation for implementing industry 4.0 business models.

Using captured data and data analytics tools, manufacturers can peer into the future with accuracy to plan around disruptions. Thus, leading to questions such as; what if rather than focusing on risk, a manufacturer can anticipate risk to address the disruption it causes head-on? What if a solution exists that manages disruption in real-time and makes it part of the manufacturing journey instead of the business-ending chaos it has the potential to be?

The answer to both questions is yes and the solution is risk-based scheduling and simulation modeling.

Navigating Disruptions with Risk-based Scheduling and Simulation Modeling

Simulation modeling and scheduling are not new concepts to the manufacturing industry. In fact, simulation has been applied for more than five decades to answer what-if questions by manufacturers but the digital transformation of the factory floor adds a new dimension.

Early simulation models relied on historical data which could be inaccurate and unstructured data generally went unaccounted for. With digital transformation technologies accurately capturing both structured and unstructured data, a new dimension has been added to applying simulation modeling as an analytical tool.

First and foremost, the ability to capture data from every aspect of a production cycle leads to the creation of accurate simulation models. The accuracy of a simulation model is directly proportional to the accuracy of the evaluation results it produces. Secondly, the ability to capture data in real-time and apply predictive analytics to evaluate captured data is the foundation for developing risk-based schedules and plans to navigate current and future disruptions.

For example, disruptions to maritime chokepoints can affect the world's global supply chain or to be precise a continent's supply as the Ever Given debacle has shown. Simulation modeling serves as a powerful tool for analyzing the effects of a blockage to major shipping lanes and supply delivery timelines. A manufacturer can utilize the results from these evaluations to develop accurate resource allocation plans to meet pending demand or to stretch available inventory across the estimated delay timeline.

And the above paragraph is not mere conjecture. A case study using simulation modeling to evaluate the effect of disruptions to the four major maritime chokepoints, the Panama Canal, the strait of Gibraltar, the Suez Canal, and the Strait of Malacca, was developed in 2019. The results showed that disruptions to

any of these chokepoints could lead to a month's delay and higher shipping costs across maritime supply routes. The study which was presented during the 2019 Winter Simulation has since been validated by real-world events at the Suez Canal two years later.

Moving closer to the factory floor, risk-based scheduling provides factory owners with the tools to deal with disruptions within a facility. Using risk-based scheduling software manufacturers can analyze the effect of increased demand or a defective machine on traditional production schedules. The software doesn't stop at analysis as it also provides an optimized schedule to navigate through disruptions in real-time. So, as an unplanned breakdown occurs, the production schedule is dynamically updated to continue production thus mitigating the risks associated with downtime.

Conclusion

Risk-based scheduling and simulation modeling tools are powerful digital transformation solutions with that provide manufacturers with the capacity to predict, understand, and navigate through disruptive forces. Their value-added proposition also includes the ability to anticipate opportunities, create and protect value, as well as, survive in an increasingly competitive manufacturing space.