



Simulation project reveals surprising result.

An IET engineering team combined detailed work measurement and computer simulation to demonstrate that process variation can lead to unintended consequences when changing a production system.

The Customer

A leading designer and manufacturer of commercial / residential entry doors.

The Challenge

A high-speed production line had been underperforming. The client was targeting an accumulation conveyor just before the constraint operation as a primary culprit because the conveyor's transfer mechanisms contributed to product damage and its large storage capacity lengthened the feedback loop for defect detection. The client wanted to know if shortening the conveyor would affect throughput.

The Solution

Recognizing that a simulation's validity depends on accurate models of the system's input and output parameters, IET began the project by studying the variable arrival rate to the conveyor and the variable output rate from the conveyor. Using direct observation and traditional work measurement techniques, IET engineers spent several days measuring inter-arrival times for product flowing into the operation that preceded the accumulation conveyor and out of the operation that immediately followed the conveyor. The reason for each non-standard inter-arrival time was noted during the work measurement phase.

IET modeled the relevant section of the production line using the detailed, real-life data that had been collected and validated the model by showing that a single day's schedule took one full day to run. The team also isolated the effect of conveyor capacity assuming changes in standard work practices by manipulating the inter-arrival time distributions based on the cause of the delay. Numerous replications with different random number seeds provided average throughput performance under high-capacity and low-capacity conveyor conditions.

The client anticipated that reducing cycle time through the accumulation conveyor by decreasing its capacity would not affect throughput because it was just "storage waste". Under all scenarios, however, the lower capacity conveyor caused a drop in throughput. The conveyor functioned as a buffer in front of the constraint and upstream variability was such that starvation occurred with the smaller buffer. Using simulation, IET was able to highlight the importance of reducing upstream and downstream delays for improving overall throughput.

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Facilities

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Plan for improvement

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Consolidation

Vertical integration

Horizontal integration