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# SIMULATING AN AUTOMATED BREAKPACK SYSTEM IN A WALMART DISTRIBUTION CENTER

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## ABSTRACT

This case study focuses on the simulation of a soon-to-be implemented automation system within a Walmart Canada distribution center. Many SKUs cannot be sent to retail stores in full case quantities, as they are slow movers and would require individual stores to carry excessive inventory. Breakpack is the processes of breaking cases down to individual eaches, a term used in distribution centers to mean individual pieces, and combining them into mixed SKU cartons. Automating breakpack offers significant labor and quality savings, but also a high degree of complexity. SKUs should be grouped to minimize labor during the store put-away process, while also attempting to minimize labor and transportation cost for the DC and overall supply chain. This presentation will review the simulation model used to help the retailer understand the SKU profile that should be used for breakpack automation, understand the best way to schedule the decanting operation, and understand the store friendliness of cartons generated by the system.

## 1 OVERVIEW

As of July 31, 2020, Walmart Canada has 408 stores, including 343 supercenters, in almost every province and territory. Walmart Canada's network of warehouse and distribution centers keep these stores stocked with all the items Canadians need to "Save Money. Live Better."

One important function of retail warehousing and distribution is breakpack. Breakpack allows sending less than full case quantities to individual stores. This is necessary to reduce inventory carried at individual stores, along with significantly reducing the company's overall, aggregate inventory levels. Breakpack items are typically slower movers and/or physically small items where a single case sent to an individual store would simply be much more inventory than the store needs for a reasonable time horizon.

## 2 CHALLENGE

In order to meet the ever-increasing demands of customers, Walmart Canada is investing in a series of automation projects to develop the next generation of warehousing and distribution centers. One key area for effective use of automation is breakpack. Breakpack boxes sent to retail stores often contain very few eaches of a unique SKU and a significant mix of SKUs. The SKUs must be combined in such a way to reduce sorting and wasted travel at the store level, while still maximizing carton fill to reduce transportation costs from DC to store.

Automation can be used to correctly present source containers to pickers to pick and place items into the breakpack containers that will be sent to the store. Walmart Canada was already far along the design and implementation path for an automated breakpack solution, but realized they did not fully understand

how to make optimal use of this solution on day 1 of go live. Walmart Canada did not want to spend weeks or months fine tuning best practices on a live system.

## 3 SOLUTION

MOSIMTEC designed and developed a flexible, AnyLogic-based discrete-event simulation model to allow Walmart engineers to test the impact of storing various SKUs in the breakpack system's automated storage and retrieval system (ASRS). The model allowed engineers to test a variety of demand patterns and various SKU profiles. The tool allowed Walmart Canada to seed the model with specific, historical SKU data and also examine profiles that may only exist in the future.

The model contained a picking station class and a decant station class. Objects from these classes were connected together with other conveyor components to form the overall conveyor network of the model. The model utilized detailed 3D conveyors, but also had an analysis mode that treated a critical loop of the layout as a black box capacitated delay. Preliminary analysis indicated black boxing this area resulted in similar results to when it was modeled explicitly. While black boxing the main conveyor look resulted in accurate model results, it also significantly reduced model run time and enabled engineers to more quickly conduct their analysis. The detailed conveyor was kept as part of the model, and can be run in a demo mode, to better explain to stakeholders what the future system will look like.

The model can be run via an Excel user interface. This Excel user interface allowed engineers to change demand patterns, processing times, workstation schedules, ASRS capacities, and replenishment strategies. The interface also allowed engineers to understand key model outputs in the Excel environment.

## 4 BENEFITS

Via model analysis, Walmart Canada was able to quickly realize that previous perceptions regarding the system bottleneck were incorrect. Walmart engineers were able to consider how decanting operations may need to be offset from picking operations to alleviate the work load on the lift cells. A fundamental dynamic regarding empty bin turn-over patterns throughout the day was also uncovered, allowing engineers make recommendations in the managing of decanting.

The tool is also being used to understand the most attractive SKUs to send through a breakpack system versus a case pick system. The tool's ability to measure ASRS utilization is key to understanding when additional SKUs can be converted to breakpack SKUs.

The simulation tool allowed Walmart to understand the anticipated store friendliness of cartons out of this system. Store friendly cartons are those that do not require excessive walking or sorting to put away their contents. Previously breakpack cartons would arrive to stores with product for departments all over the store. With the new system, cartons will predominately be from one department, greatly reducing the travel distance and labor required by the store to stock its selves. With the modeling tool, Walmart leadership has been able to communicate to stores the anticipated level of improvement that will be coming once the automated breakpack system goes live.

The dynamics discovered with the simulation model would have been difficult, if not impossible, to uncover with traditional spreadsheet modeling. Walmart Canada was able to understand system behavior months before go-live, so they could better plan the operational use of the new system without having to disrupt live operations.