Operations | Retail | Improved process performance | Bayesian

Automated Guided Vehicles for Material Flow in Fulfillment Centers

Amazon

BUSINESS PROBLEM

The scale at which Amazon operates makes automation needed in the fulfillment centers (FCs) to increase efficiency, better utilize labor and lower safety risks. Currently, automated guided vehicles (AGVs), portable robots that can transport materials, are not utilized in majority of FCs in the network. Other industries such as automotive, have thoroughly integrated AGVs in their processes to limit heavy material handling by operators and increase the safety of the manufacturing environment. Amazon seeks to integrate AGVs across the network to improve process and labor utilization, efficiency, and safety.

APPROACH

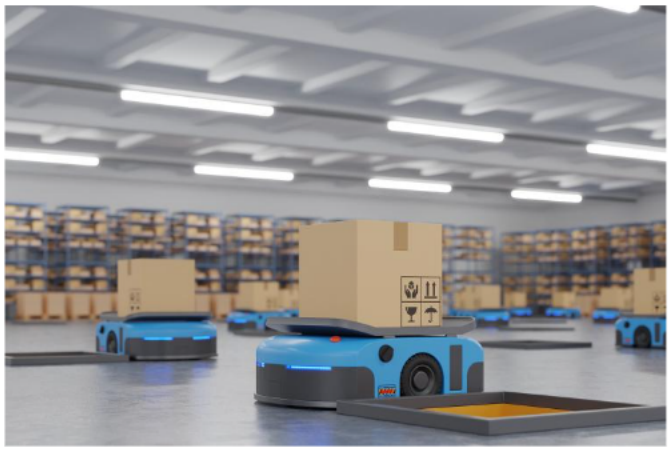
This project will use process flow analysis to identify the areas in which transport support associates, who move materials throughout the FC, are heavily utilized in the process. The analysis will then be used to determine the appropriate AGV technology that could be installed. Using discrete process simulation models, the AGV usage can be analyzed to determine the effect on process defects.

DATA SOURCES

Although Amazon has a plethora of data available, data specifically on manual transportation is limited because there are no rates associated with that part of the process. The researcher will utilize existing data for labor metrics which detail hours used for transport support for different areas of the FC process. The data on transportation waste mileage has to be manually collected at the FC.

Data Types and Format

The data is contained in SQL data bases that can be accessed programmatically or via Excel spreadsheets.



Author: Kaya Thomas Wilson

IMPACT

Without the installation of AGVs in the FCs, associates will have to continue manually transporting materials using pallet trucks and carts. Manual transportation increases human-PIT interactions which increases safety risk and adds more traffic in the facility. Manual travel time also adds additional labor costs. AGVs have the potential to significantly decrease manned travel, facility traffic and labor costs while improving material flow.

DRIVERS

The fulfillment and warehousing industry requires a lot of manual labor, technology integration is becoming essential in order to scale operations in a way that reduces the amount of manual work while still maintaining process efficiency.

BARRIERS

There are a lot of silos at the company that made it hard to track down past history/projects related to my work. There isn't a central team working on AGV integration across all of the FC network which made it difficult to find the right team members who have knowledge on related projects.

ENABLERS

The main enablers of the project were the associates and area managers who helped me understand the process and collect data for the research.

ACTIONS

I was not able to integrate the solution given the long timeline required for scoping, purchasing, training and integrating AGVs into the FCs.

INNOVATION

The innovation aspects of the solution are the ways in which the technology can be integrated into the process without requiring major changes to the process and making the processes simpler through the integration.

IMPROVEMENT

The simulation results indicate that the integration of AGVs in Inbound Stow process can increase individual throughput by 200-300 products per shift per associate and reduces total idle time. The results demonstrate the potential for AGVs to improve the productivity of FCs. The work concludes that AGVs can improve FC operations in the short and long term, with the potential for significant labor cost savings.

BEST PRACTICES

If someone was attempting to replicate the simulation in a real-world environment, the most important aspect would be obtaining buy-in from the associates on the floor to ensure they understand and believe the technology will help make their job easier. If they are not bought into the solution, there is a high likelihood the technology will not be successfully integrated.

OTHER APPLICATIONS

The solution can potentially utilized in other industries that have distribution and warehouse environments which are experiencing transportation waste in their processes.