

UPS Background

United Parcel Service Inc. (UPS) was founded in 1907 and has grown to become the largest express carrier and package delivery company in the world.

It is also a leading provider of specialized transportation, logistics, capital, and e-commerce services that manages the flow of goods, funds and information in more than 200 countries and territories worldwide everyday.

Warehouse Environment



Project Background

Material Handling Equipment (MHE) typically used in a warehouse include **Reach Trucks**, **Forklifts** and **Pallet Runners**. Determining the optimal number of each MHE in a warehouse can help UPS to attain competitive advantages over rival companies when competing for project tenders.

The **objectives** of this study are:

- To create a model that simulates closely to UPS's warehouse environment.
- To enable UPS's resource planner to determine the optimal number and types of MHE required for a general operating warehouse.

Material Handling Equipment (MHE)



Reach Truck

- RR5000 Series
- Speed: 2.54 m/s



Forklift

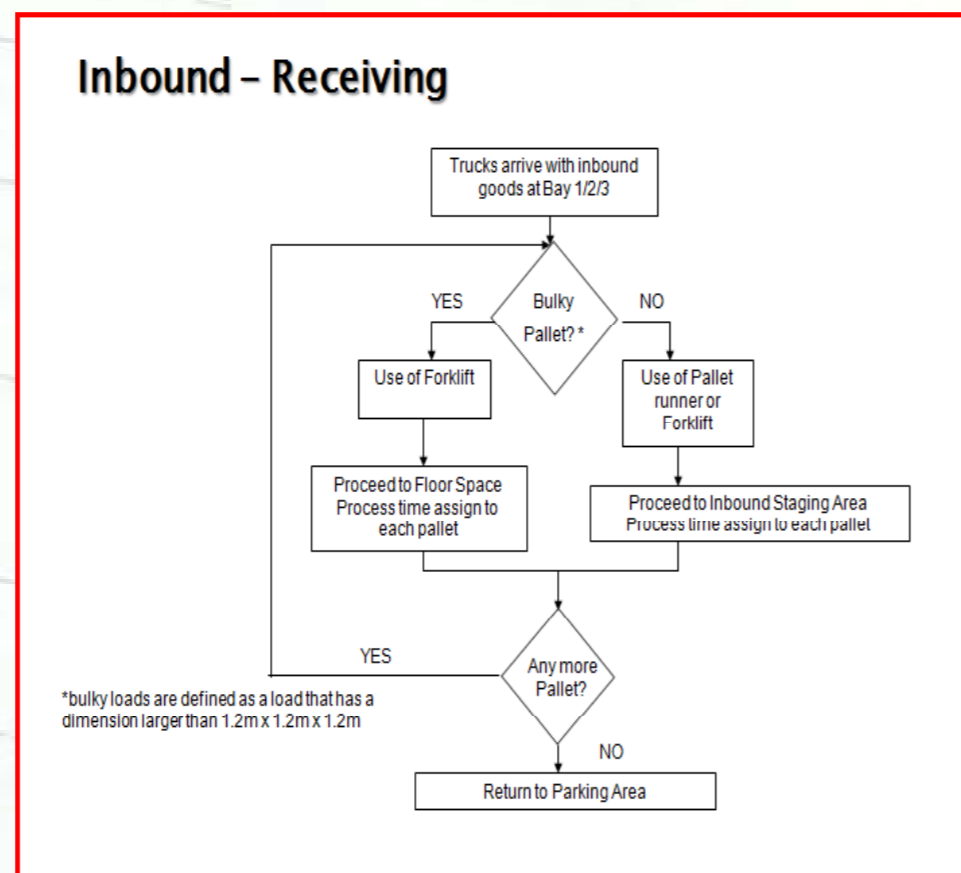
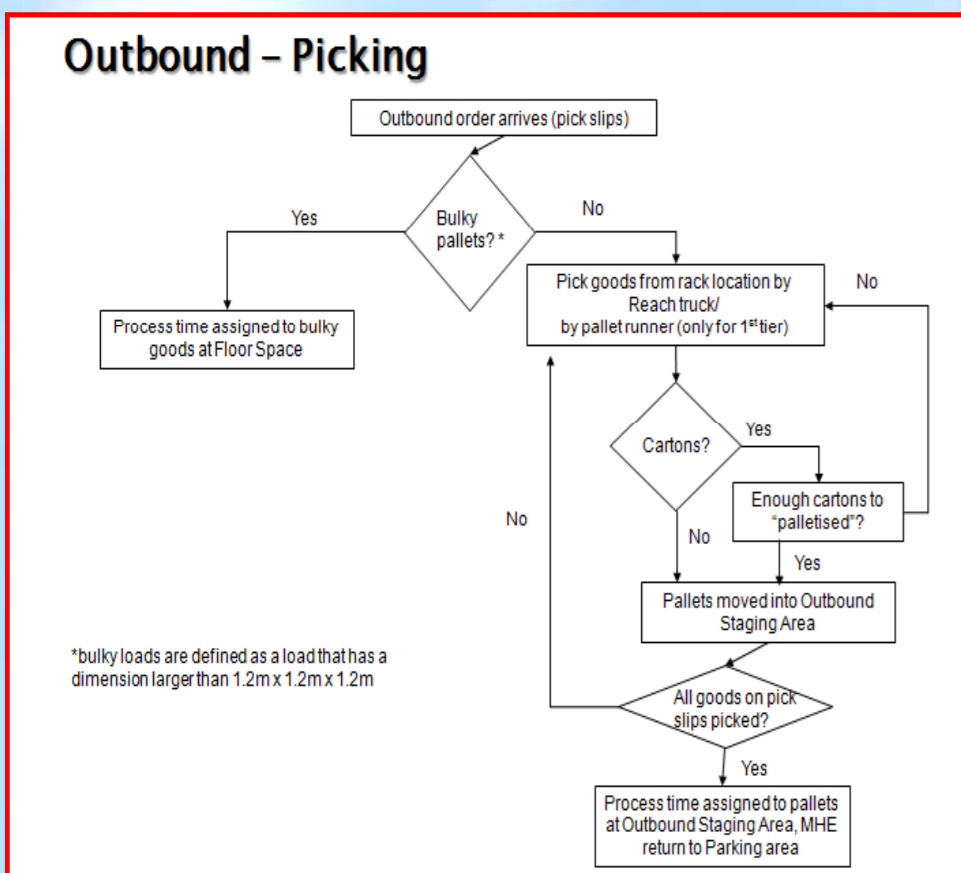
- FC 4000 Series
- Speed: 2.33 m/s



Pallet Runner

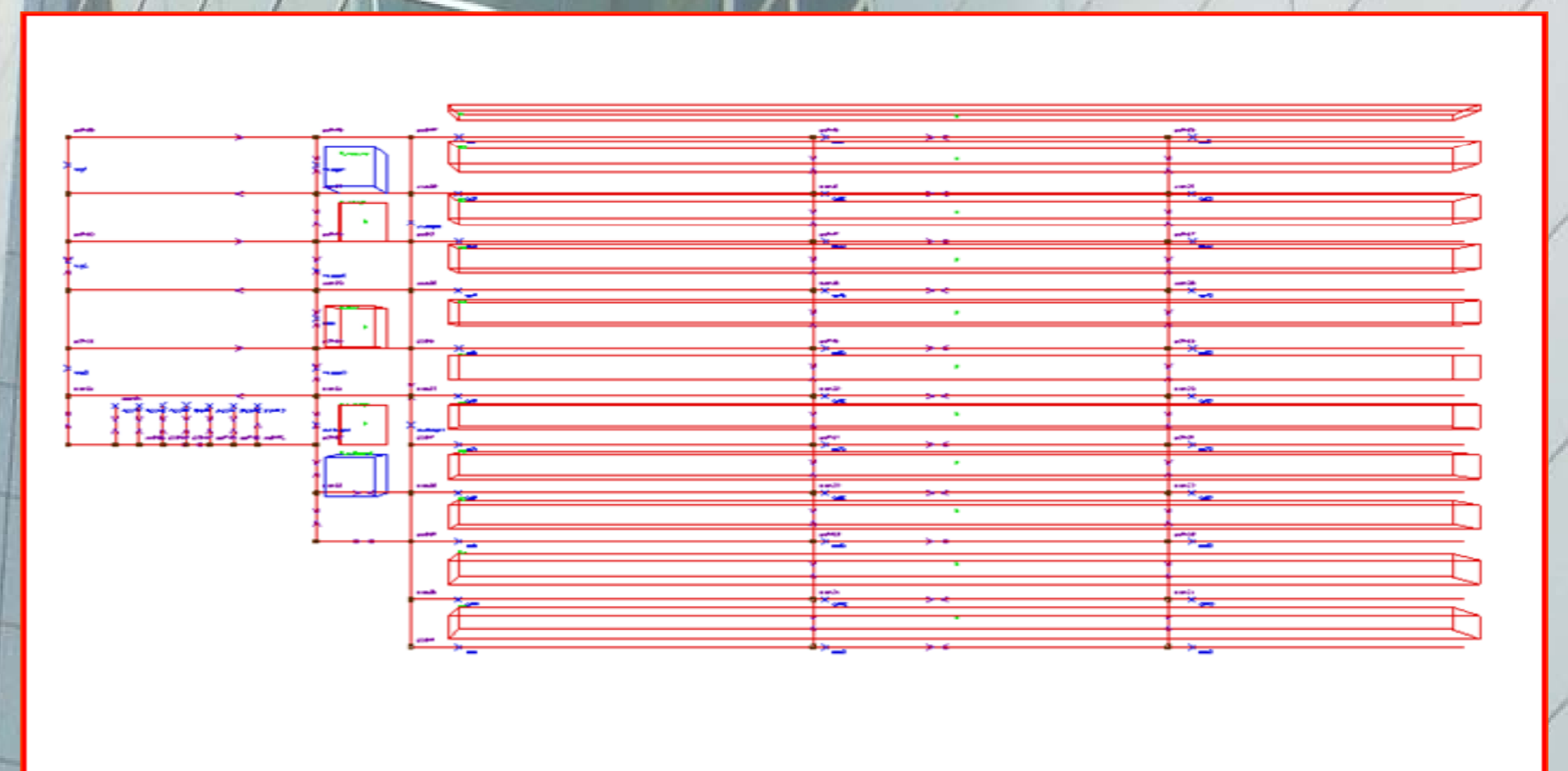
- PE 4000 Series
- Speed: 2.45 m/s

Process Flowcharts



Above are examples of process flowcharts used for our Automod simulation model of the warehouse.

Automod Screenshots

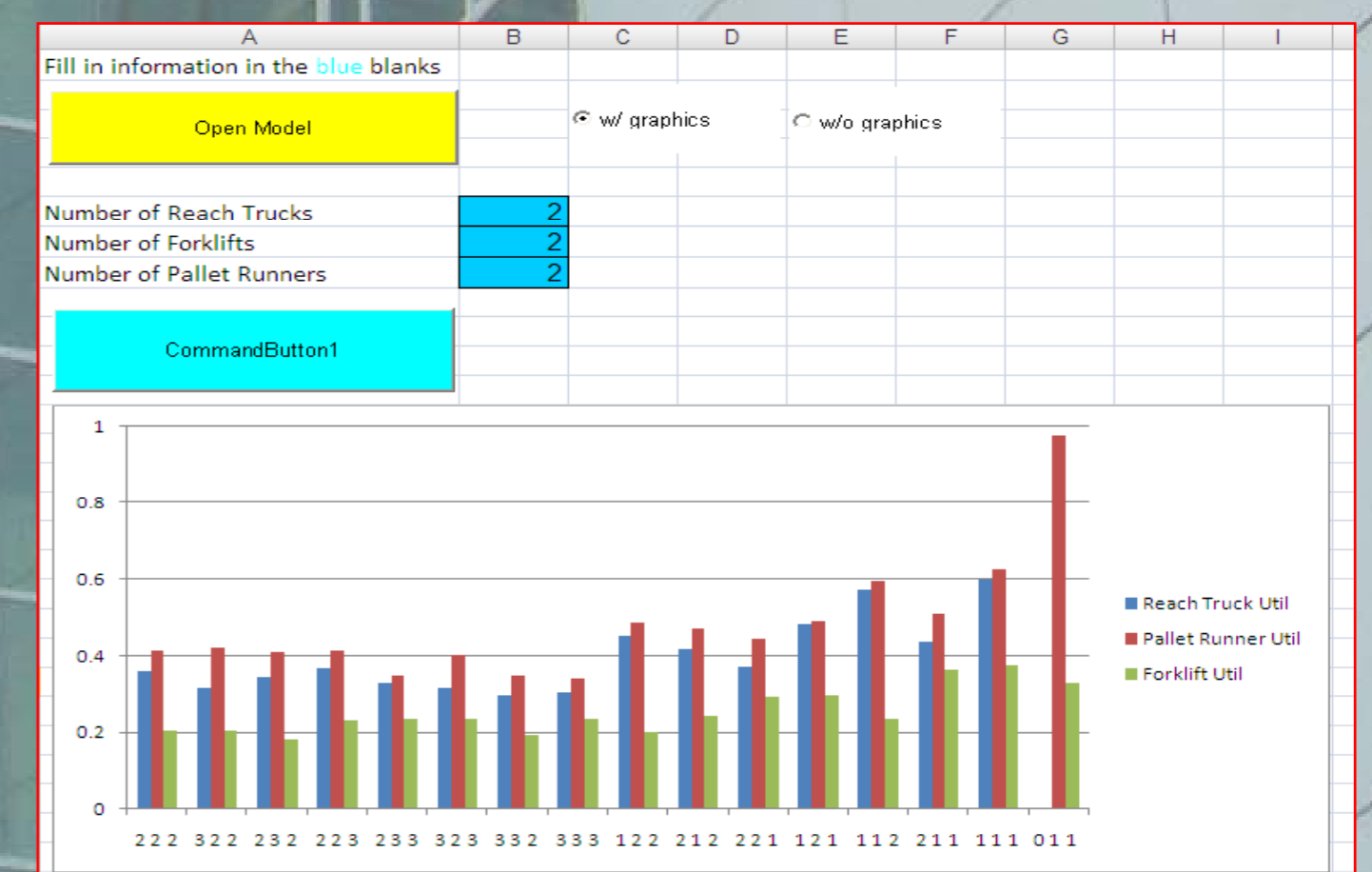


Above is a screenshot of the Automod simulation of a generalized warehouse.

Excel User Interface

We have provided an Excel user interface so that UPS engineers can interact easily with the simulation model.

	A	B	C	D	E	F	G	H	I	J	K
1	No. of shipments	10		No. of people processing outbound goods			2				
3	Shipment	Customer id	Picking Slip Received at this time	Deadline (Arrival of Trucks)	Bulky Items	Processing Time/pallet (secs)	No. of Pallets	Processing Time/pallet (secs)	No. of Cartons	No. of Cartons per Pallet	Processing Time/pallet (secs)
4	eg.	2	11:37:00 AM	3:37:00 PM	3	15			30	10	140
5	1	1	3:30:00 PM	4:30:00 PM	3	15					
6	2	2	3:12:00 PM	4:15:00 PM			1	30			
7	3	2	3:00:00 PM	3:45:00 PM	3	17					
8	4	2	3:05:00 PM	4:15:00 PM			11	43			
9	5	3	3:00:00 PM	3:33:00 PM	3	55					
10	6	3	3:05:00 PM	4:00:00 PM			5	73	5	5	78
11	7	3	3:00:00 PM	3:50:00 PM			6	50	10	5	90
12	8	4	3:00:00 PM	4:05:00 PM					7	7	120
13	9	5	3:15:00 PM	4:25:00 PM			10	105			
14	10	5	3:00:00 PM	4:00:00 PM	2						
15	11										



Conclusion

Our project improves on previous studies by UPS engineers by simulating the dynamic environment of a warehouse. Our improved model offers practical estimates of the optimal number of each type of MHE in warehouse operations.