

## Summary

Airports contain substantial flow of both passengers and their baggage. To process these flows, airports have very large and diverse ground facilities. A large segment of the ground facilities is dedicated to baggage handling. To make sure baggage arrives at the right destination at the right time, a complex system of baggage carts is used to (un)load the incoming and outgoing aircraft.

The model presented in this paper, is a simplification of an airports airside baggage handling system. The model is programmed using Delphi and additional Thomas library. The model is built up as generically as possible, with the main goal, the ability to implement any airport worldwide. Once the specifications of an airport (number and location of piers, gates, unloadpoints etc.) are determined, a flight schedule can be read into the system after which a system of baggage carts start to process the aircraft baggage.

Key performance indicators of this system are the number of baggage carts, the total delay time of the aircraft, the occupancy rate and travel time of the baggage carts. All these indicators provide information regarding the efficiency of the model. Once the input variables (number of baggage carts, airport layout etc) are implemented, a series of runs will produce the required delays and occupancies.

To test the model, a theoretical aircraft schedule containing 500 aircraft (arriving and departing) in a 16 hour stretch is fed into the model. The model contains an airport (also theoretical) with 56 gates and 1 unloadpoint. A series of runs is then completed using various number of baggage carts, ranging from 5 up to 140 baggage carts. The data from the runs is analyzed and conclusions can then be made regarding the capabilities of the specific airport.

What becomes visible from the data, is that the airport has a specific threshold point. This point, is the number of baggage carts needed to fulfill the given flight schedule. Before this point the occupancy of the baggage carts is almost 100% and the aircraft delays are substantial. The threshold point is around 40 baggage carts. After this point there are enough baggage carts to cope with the incoming and outgoing aircraft and the aircraft delays, occupancy and travel times drastically decrease.

The travel time also changes at this threshold point; aircraft get assigned the baggage cart closest to their gate. Before the threshold there are barely any free baggage carts, so every free baggage cart is assigned to the first aircraft (whatever the distance to the gate). Once the baggage carts free up, and there are more baggage carts to choose from, they can be placed more efficiently and so the total travel time decreases.

The airport tested in this model, will need about 55 baggage carts to handle the given flight schedule with minimum delays.

Further programming of this model is needed to make it more realistic. Besides expanding the model towards the landside baggage handling, increasing the intelligence of the baggage carts (giving them their own planning) would also produce a more realistic model.