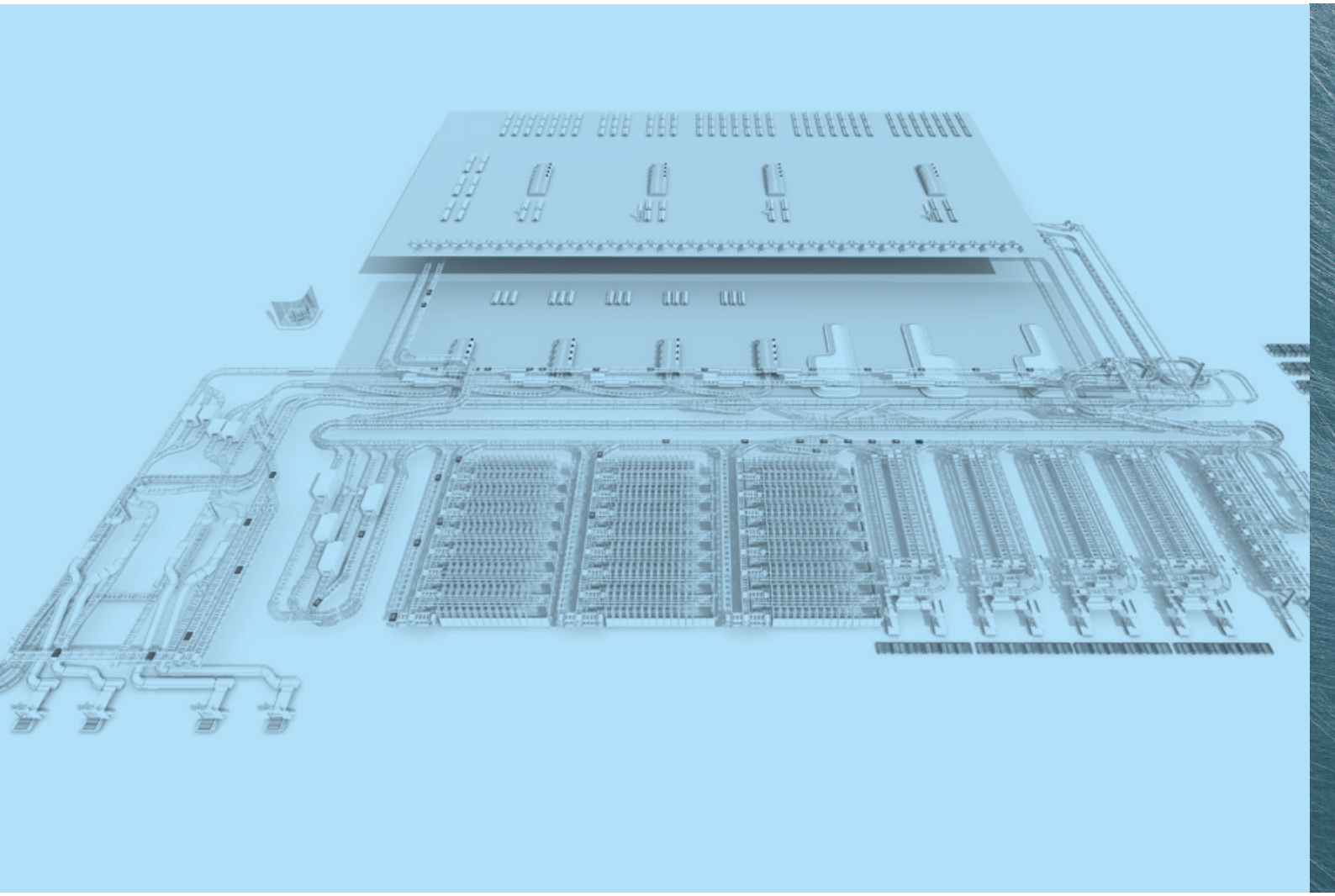
BEUMERGROUP

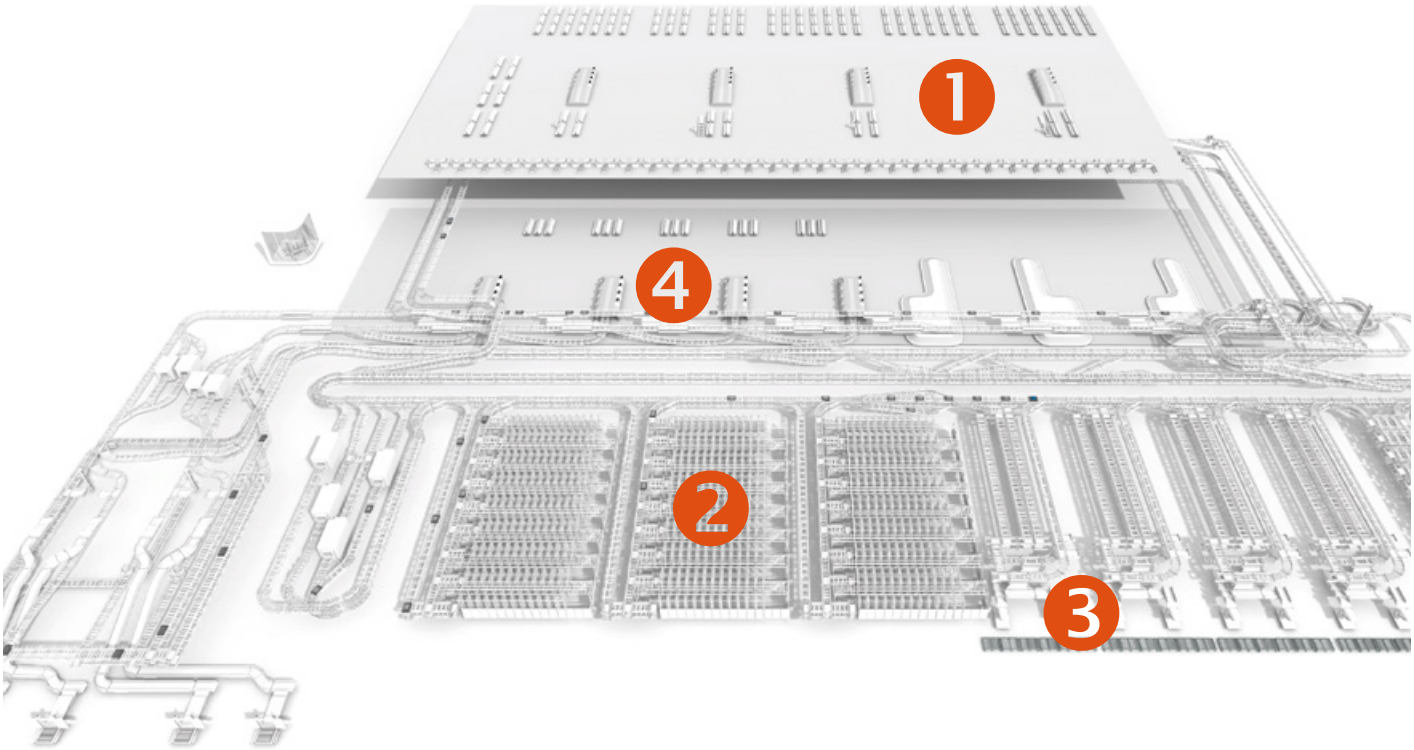
Author: Moritz Bender



THE ULTIMATE BAGGAGE HANDLING SYSTEM
PULLING AIRPORTS INTO THE FUTURE

› This White Paper outlines how new technology will transform the baggage handling process for hub airports which aim to deliver class-leading efficiency and passenger satisfaction.

AIRPORT
WHITE PAPER



OVERVIEW

THE SCOPE OF THE TRANSFORMATION

In the airport of the future, the efficiency that is achieved through automation will become much wider than optimising the baggage sortation process. Automation today has a broader perspective and will reach upstream into never-before automated areas such as check-in, as well as downstream into the arrivals and make-up halls. The efficiency of the storage and make-up area will also be impacted by a new approach which revolutionises the traditional concept of baggage flow.

THE BUSINESS CASE FOR GREATER BAGGAGE HANDLING AUTOMATION IS GROWING

- 55% of checked baggage travels as bulk in the cargo hold
- 45% of checked baggage travels in containers (ULDs)

These figures are based on a BEUMER Group case study which analysed the baggage handling capacities of the total number of passenger aircrafts available for commercial use; and this number is on the rise, not only due to Covid-19, but also because more and more airlines have placed restrictions on the number of bags in cabin luggage.

The transformation will be based on the Ultimate Baggage Handling System (Ultimate BHS) which integrates new and emerging technologies, as well as different concepts which combine functional areas. This approach will provide unprecedented levels of operational efficiency in addition to re-defining the effective use of manpower and offering a more flexible passenger experience.

In the last few years airports have focused on security upgrades but the impact of Covid-19 impact has also changed the picture. Social distancing holds an even broader challenge for airports to look at baggage and passenger traffic. Particularly in mega-hubs there will be the need to handle more luggage and to enable passengers to maintain distance within the same footprint that is used today. Where footprint is not limited, the new mega-hubs will grow in size and be forced to face longer baggage connecting times if the baggage handling system is not optimised correctly.

TOTE-BASED SELF-SERVICE BAG DROP

- Higher check-in capacity in less footprint
- 100% read rate and tracking from check-in
- Higher percentage of conveyable items
- Baggage updates to passengers' mobile phones
- Improved passenger flow and experience
- Significant increase in manpower productivity

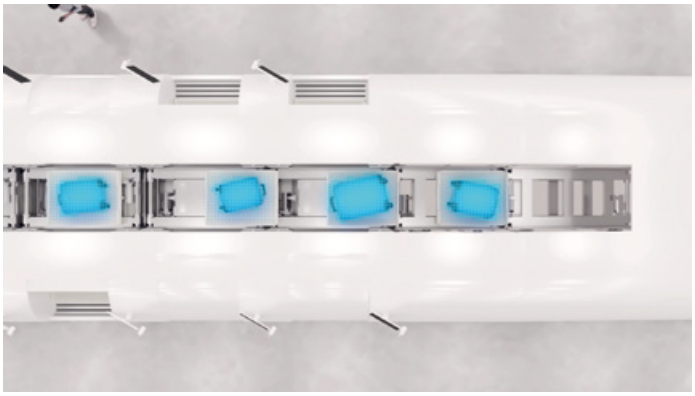
The integration of the tote-based sortation system into the self-service bag-drop process will extend the benefit of 100% tracking all the way upstream to the bag drop in the check-in hall.

In the current generation of self-service bag-drop kiosks, the bag is tagged, placed on a conveyor and transported to the induction of the main sortation system where it may be placed in a tote. The bag tag is scanned and linked to the RFID tag on the tote. This provides 100% traceability of the bag and tote throughout the baggage handling system.

In future, the Ultimate Baggage Handling System will effectively move the baggage induction upstream into the check-in area. Instead of placing the bag onto a conveyor, the passenger will place the bag directly into the tote. The boarding card on the passenger's mobile phone can be used to verify their identity and to open the gate to the self-service bag drop. The tech nology used in the tote-based self-service bag drop is both tamper proof and security approved.

Self bag drop directly into a CrisBag® tote system

This small change to the process will deliver major operational advantages as the system has the potential to double the check-in and bag-drop capacity. It is also combined with 100% conveyability.



The advantage is that the baggage handling system will automatically link the bag tag to the RFID tag on the tote register as soon as the passenger places the bag into the tote.

This will initiate the tracking of each bag from the bag-drop process and extend the point at which the bag becomes visible to the control room to the very start of its journey.

The weight and size of each bag will be checked, automatically, to avoid unidentified bags entering the automated system. The 100% read rate will result in the highest possible level of baggage identification which supports baggage security. In addition, the bag drop will also eliminate the need for the time-consuming and labour intensive process of managing unreadable tags after they have entered the sortation system. The totes allow complete conveyability with each bag fully contained and eliminate the risk of mis-aligned bags or loose straps. By removing these issues, the Ultimate Baggage Handling System will avoid a cause of sorter jams and damage to baggage.

Focusing manpower where it is needed

Focusing manpower where it is needed by automating the bag-drop process will eventually eliminate the level of manual intervention which is required at bag drop and inside the sortation system. By using a contour scanner to double-check that the bag in each CrisBag® tote is correctly positioned, the airport gains the direct benefit of ensuring that each bag is correctly positioned before entering the baggage hall.

Freeing staff from fixed check-in desks will allow staff to focus their attention on passengers. A staffing ratio of one operator to ten self-service bag-drop kiosks will be the norm. Even with fewer check-in staff, passengers will find that tote-based self-service bag drop is faster than the manual check-in process. The additional speed and passenger flow will result in shorter wait times, fewer check-in queues and increased passenger satisfaction. At the same time, the physical distance between drop-off kiosks will support social distancing.

Integrating out-of-gauge baggage

In most hubs, the number of Out-Of-Gauge (OOG) bags and non-conveyable items is typically between 2% and 5% of the total number of bags handled. Despite this low percentage, these special bags demand significantly higher levels of staff resources and processing time than a standard bag.

With the tote-based self-service bag drop, large bags and non-conveyables will be loaded manually by the passenger. This will avoid the cost and time of separating OOG bags from the main flow of baggage and will reduce the percentage of non-conveyable items. Seen from a passenger's point of view this operation will offer an increased service level for the passenger who must no longer use another bag-drop point to check-in an OOG item.

For airports with a high percentage of OOG items, such as skis and golf bags, the automatic handling of oversize baggage can also be integrated into the overall BHS design.

Higher system availability

To maintain higher system availability, the self-service bag-drop and CrisBag will continue to operate without interruption in the event of a failure in the Departure Control System (DCS) and/or Common Use Terminal Equipment (CUTE). The baggage handling systems will use the information in the Bag Source Message (BSM) which has been created when the passenger scans the baggage tag and the boarding card. Together, these hold enough information to create a valid BSM. The moment that the DCS or CUTE reboots, the CrisBag control system will automatically exchange the Baggage Processed Message (BPM) with the host system as a receipt for handling the baggage.

DYNAMIC BAGGAGE STORE (DBS)

- DBS pulls baggage based on downstream demand
- Batch-building supports just-in-time make-up efficiency
- Peak-shaving enables greater capacity
- Reduces the number of make-up positions
- Increases operator productivity

The airport of the future will change its conventional lane- or conveyor-based Early Baggage Store (EBS) to become a dynamic, rack-based store which is used for early bags as well as for the building of batches. In addition, the use of rack-based stores generally results in a 50% reduction in footprint, which provides room for larger storage to hold more bags.

The impact of the dynamic store cannot be understated. The system of pulling bags puts the control of the bag in the operator's hands by enabling the operator to decide when the bag is pulled. By contrast, the operator must wait for each bag to be pushed randomly through a conventional baggage handling system. Transforming baggage flow from a push to a pull process will significantly increase the efficient use of manpower as well as the physical size and design of the make-up area. It will also provide passengers with check-in flexibility which offers considerably greater personal choice and convenience.

The key to the new DBS is a just-in-time approach to the make-up process. The DBS will not only hold bags which have been checked-in early and transfer bags waiting for a connecting flight. Instead, every item of luggage will be routed via the DBS, with the exception of rush bags which will move directly to the appropriate queueing lane.

RATIONALISING THE MAKE-UP PROCESS

The batch-building of baggage will provide the biggest distinction between today's airports and the airport of the future. This is where the Ultimate Baggage Handling System transforms the conventional push approach to baggage flow into an ultra-efficient pull process.

Loading in a conventional 'push' baggage handling system

In the conventional make-up process, baggage is pushed through the system the operator must wait for bags to arrive from the check-in desks. As bags for multiple flights are mixed together when they arrive at the make-up area, each make-up position must remain open for up to 120 minutes before the Standard Departure Time.

Outside of these times, early bags are stored in the conventional EBS and late bags are routed to special expedite chutes. This system requires an operator to clear bags from the conveyor or carousel to make space for the next bags which are being pushed through the system from check-in via security screening.

Dynamic, rack-based store for early bags as well as for the building of batches

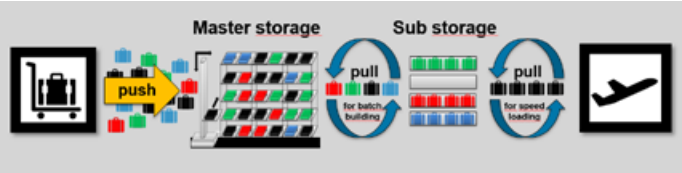
In a hybrid system, the DBS is used to store a portion of the of bags from check-in and to pre-sort some of the early bags to prepare for the pull command. The system notifies the handling agent when there are enough bags allocated to the same flight to fill a ULD. This allows the handler to pull the batch of stored bags from the dynamic storage to one of the loading lanes for speed-loading onto dollies or ULDs.

The hybrid push/pull system creates a more streamlined and productive make-up area, but the airport will also man a dedicated make-up position to load the remaining bags which did not form a full batch.

Loading with batch-building

In a hub airport, batch-build baggage can account for around 90% of the workload. The airport of the future can totally transform its make-up process by using the DBS to batch-build every item of baggage. The benefits of the pull system become most apparent here. The system will optimise the downstream baggage process; increase the productivity of operators and systems; and reduce the BHS footprint.

The same pull process which is used to batch-build early baggage in the hybrid system will be extended to every bag in the baggage handling system.
Batches of bags will be created simultaneously for multiple flights and bags which are checked-in late will be moved directly to the queueing lane.



The DBS transfers control of the loading of bags from the control room to the ground handlers. This will not only ensure a more efficient use of out-feed make-up positions but also improve productivity. Instead of manning loading positions in the traditional way, operators will load continuously released batches of bags. Adding automatic or semi-automatic loading aids will also make loading faster and improve working conditions by eliminating the need to manually transfer bags into the ULD. Estimates suggest that that batch-building will virtually halve the time that baggage operators would need to spend in the make-up area. It will also result in a reduction in the number of missed loads.

The automated and faster batch-build process will also provide an opportunity to automate baggage reconciliation.

PEAK-SHAVING WITH BATCH-BUILDING

Pushing baggage through the baggage handling system based on the in-feed from the check-in desks inevitably creates a variable workload which has both peaks and troughs. This is because bags continue to be pushed into the system regardless of whether there are the downstream resources or manpower to handle them.

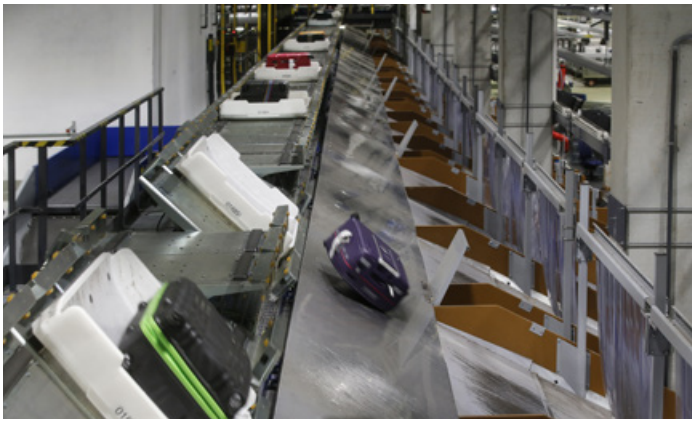
Batch-building will reverse this by providing the operator with the ability to pull batches of bags when the space, time and manpower are available to handle them. Peak-shaving will be achieved by allowing the downstream resources to determine the workload rather than the upstream workload dictating the manpower. The entire system can be designed to handle lower ‘shaved’ peaks and have a positive impact on saving space, as well as on reducing investments.

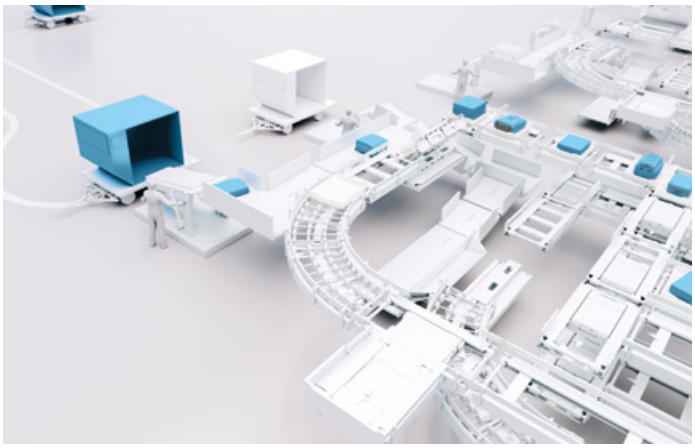
The batch-build process will essentially smooth the flow of bags through the system to reduce the peaks by increasing the minimum flow of bags.

Higher efficiency in a smaller footprint
With peak-shaving, the airport can achieve more operational efficiency with better use of the manpower in the make-up area. The overall BHS capacity can also be increased in the same or smaller footprint.

The dynamic storage will enable a faster, more efficient make-up process in which loading lanes replace the need for multiple laterals and make-up positions. This will deliver a 30% to 50% reduction in the footprint of the make-up system in the airport of the future.

The additional floor-space created in the make-up area will also allow the Ultimate Baggage Handling System to extend automated batch-building to the handling of ULDs and trolleys.





Batch-building into ULDs and automated transport by AGV

AGVs and ULD batch-building
Conventional airports rely on a vast number of tugs, trolleys and drivers to transport baggage from make-up to the ramp of the plane. This is a complex operation demanding tight cooperation between the operators on the ramp and the operators in the make-up or arrivals halls.

In the airport of the future the baggage process may be extended to automate the movement of ULDs and carts by using Automated Guided Vehicles (AGVs). Supporting ULD handling in the so-called 'last-mile' with AGVs will increase the efficiency of the operation at the airport apron.

Premium passenger experience
The increased level of efficiency provided by the DBS will allow the airport to offer passengers more choice and flexibility in addition delivering to premium services. These services will include day-before check-in to allow passengers who are leaving on an early flight to check-in baggage the night before departure.

Perhaps, however, the most important transformation in the passenger experience will be the convenience and flexibility introduced by Reclaim on Demand where the arrivals bags are stored in the DBS. This offers a unique service to the passenger who can leave their baggage at the airport until it is convenient to reclaim the bag. It also adds the benefit of maintaining social distancing in the crowded baggage reclaim areas.

RECLAIM ON DEMAND

- Passenger waits for an in-app message to go to a Reclaim on Demand kiosk
- Message can be combined with, or used for, social distancing
- The kiosk is opened by a QR code which confirms the passenger's identity
- Reclaim on Demand offers a more relaxed passenger experience
- Reduces the number and cost of lost baggage reports

Just as the Ultimate Baggage Handling System extends automation and traceability upstream into the check-in area, so it will automate and transform the downstream process with Reclaim on Demand.

Reclaim on Demand eliminates the need for passengers to wait beside a carousel for their hold baggage to arrive. Instead, passengers will be able to relax in the arrivals hall retail area while they wait for the in-app message on their mobile phone to confirm that their bag is ready for collection. The passenger will use a QR code sent to their mobile phone to verify their identity and open the Reclaim on Demand kiosk to collect their bag.

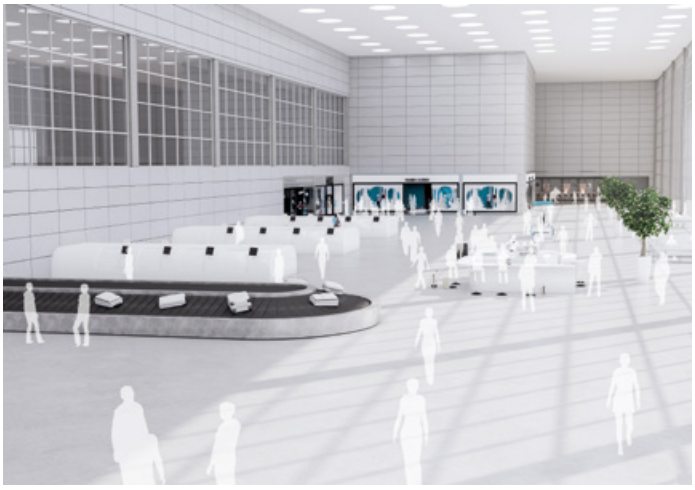
In addition to driving more revenue in the arrivals area, Reclaim on Demand will reduce cost for the airport by cutting the number of missing bag reports. Bags will be automatically scanned as they are unloaded from the ULD in the arrivals hall. This will allow the airport to help the airline to comply with IATA Resolution 753 by demonstrating delivery of baggage when custody changes. It will also reduce the high percentage of missing bag reports which are filed if there is a delay in transferring a bag to the carousel.

The airport could decide to offer Reclaim on Demand to all passengers or to reserve Reclaim on Demand as a special service to premium passengers. This would strengthen the distinguished service and could generate more revenue for the airport.

THE AIRPORT OF THE FUTURE

The airport of the future is different to even the most advanced airports of today. The extension of the tote-based baggage handling system into the check-in and arrivals areas, and the ability to pull baggage through the system, will offer unprecedented levels of efficiency and flexibility.

This transformation will be achieved by the Ultimate Baggage Handling System's effective integration of new and emerging technologies. Most importantly, it will be achieved by the shared vision of the airport and BEUMER Group that baggage handling can be 'made different'.



BEUMER Group A/S
P.O. Pedersens Vej 10
DK-8200 Aarhus N
Phone: +45 87 41 41 41
info@beumergroup.com

www.beumergroup.com

Ident. no.: 10798-AA-600-V02-1EN-0920-SB-4249