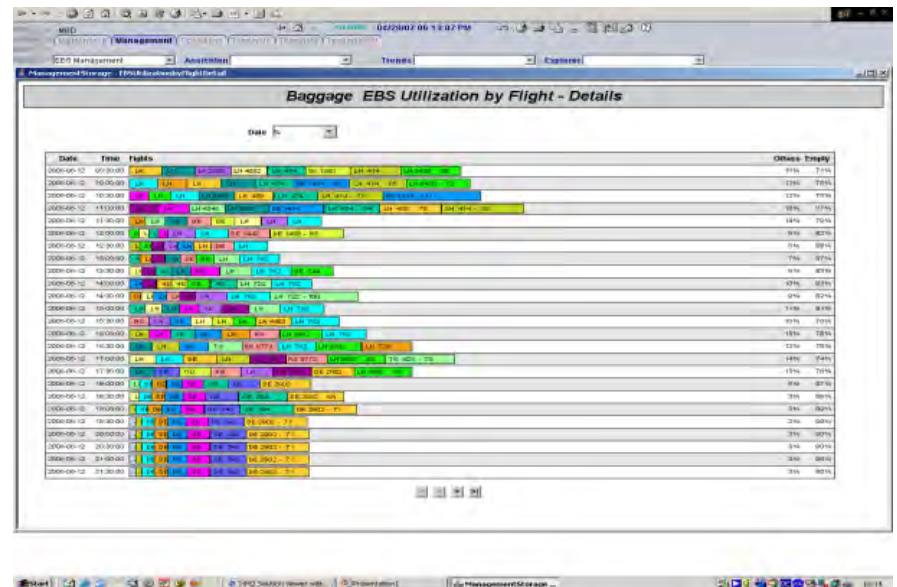# Technology & Innovation Early Bag Storage (EBS)

January 12th 2017

What is Early Bag Storage

- Term used to describe concept for storing bags that are not immediately due for Aircraft Loading.

- Also referred to as Cold Bag Storage (CBS)

Manual EBS

- Bags are accumulated at Check-In and manually processed (retrieved and loaded) when needed

- Bags are accumulated at Make-Up Area and Manually processed (retrieved and loaded)

- Bags designated for EBS are manually identified and tracked

CON's of Manual EBS

- MBR figures increase
  - No visibility to individual bag location, bag retrieval delayed
  - Bags incorrectly retrieved and loaded, bag tags mis-read
- Manpower costs increase due to Manual Handling Requirements
- Bag damage costs increase due to accumulation
- Ergonomic concerns for bag retrieval
- Unsightly "bag mountains" in Ticket Lobby or Make-Up Area

CON's of Manual EBS
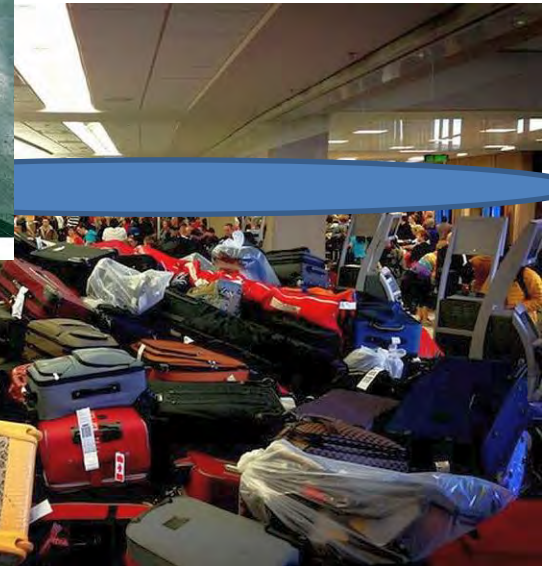
PRO's of Manual EBS

- Capital Expenditure is saved as no form of transportation or software system is required to implement

- Equipment Maintenance Costs are saved

- Real Estate is available for other uses

- Less training on new technologies

Automated EBS

- Early bags are identified and processed by the system to the EBS

- Bags are stored in certain locations with the BHS until required for processing

- Bags are released for screening and/or Aircraft Loading by Flight or Timeslot designation

CON's of Automated EBS

- Expensive Capital Investment in Automated Bag System

- Real Estate taken from other uses

- Training Requirements for New Technologies

- Increased Maintenance Costs for Automated Equipment

- Increased Energy Costs on Running Automated Equipment

PRO's of Automated EBS

- No "Bag Mountains". Bags are inducted into system anytime and only released for Aircraft Loading when ready

- MBR numbers are decreased

- Bag location is known 100% of time

- Staffing is reduced
  - Reduced Manual Handling
  - Reduced Make-Up Area

- Bag pick times improved as only bags for a flight are at a pier / make-up

PRO's of Automated EBS

- Bag hygiene is improved as bags are not stacked and at risk of damage

- Ergonomic issues are addressed as bag retrieval is simpler

- Can be used to feed automated ULD make-up

- Can be used to buffer bags during system faults

- Individual Bags are automatically transferred for flight changes / re-routes / missed flights

- Can improve overall system throughput by removing bags from a sortation system that are not ready

Technologies for Automated EBS

- Belt lanes

- "Virtual store" in sorting loops

- Tray lanes (ICS)

- Tilt-Tray/Cross-Belt Loops

- Tray carousels (ICS)

- AS/RS

- Lift and run

Belt Lanes

- Bags are stored on lanes of conveyor belt

- Lanes can be designated by Flight or Timeframe

- Bags are "inched" onto the lane to maximize storage space

- IT System tracks each bag onto and off the Lane

- Lanes can be released as a whole or partially (FIFO)

- Individual bags can be retrieved by physically picking the bag off the belt or by "Flushing" a Lane

- Bags are stored in a static configuration (Low Energy Consumption)

Belt Lanes
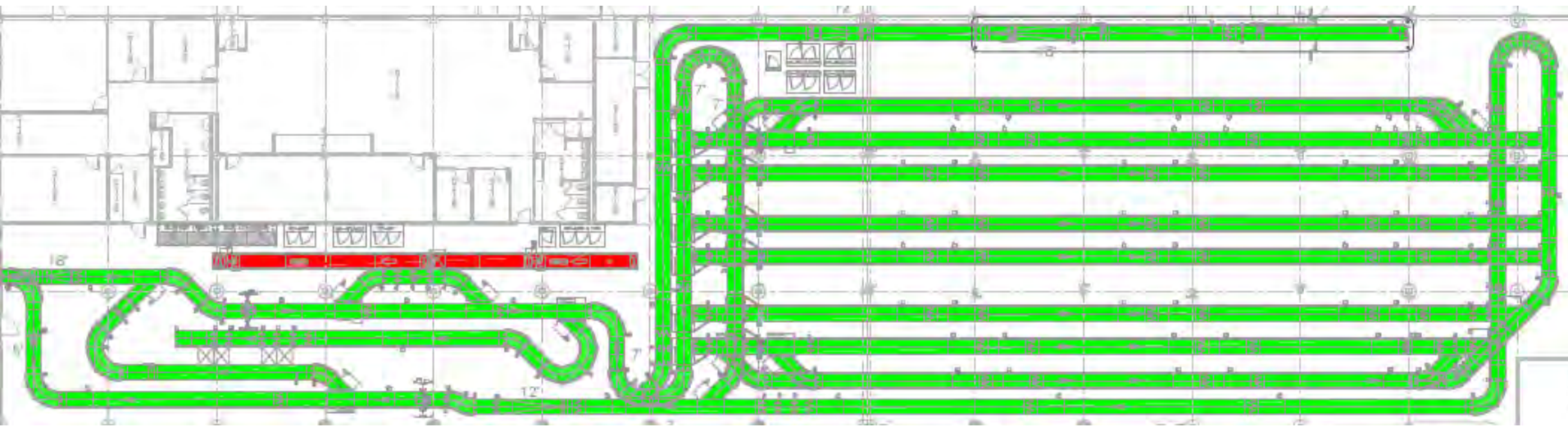
"Virtual Store"

- Bags are "held" within sortation loops pre or post screening

- IT System tracks the bags onto and off the sortation loop

- Bags are not stored in any particular order and are released as required

- IT System tracks each bag onto and off the sortation loop

- Throughput is reduced on the sortation loops if more bags are stored

- Individual bags can be retrieved on demand

- Bags are stored in a dynamic configuration (High Energy Consumption)

Tray Lanes (ICS)

- Trays are stored on Lanes of designated track or conveyor

- Lanes can be designated by Flight or Timeframe

- Trays are sequentially loaded from the furthest end to the entry

- IT System tracks each tray onto and off the Lane

- Lanes can be released as a whole or partially (FIFO)

- Individual bags can be retrieved by "Flushing" a Lane

- Bags are stored in a static configuration (Low Energy Consumption)

Tray Lanes (ICS)

Tilt-Tray / Cross-Belt Loops

- Dedicated Loops are utilized for EBS

- Bags are not stored in any particular order and are released as required

- IT System tracks each bag onto and off the storage loop

- Throughput is improved as Early Bags are outside of the mainline

- Individual bags can be retrieved on demand

- Bags are stored in a dynamic configuration (High Energy Consumption)

Tilt-Tray / Cross-Belt Loops

Tray Carousels (ICS)

- Dedicated Track or Conveyor Loops are utilized for EBS

- Trays are not stored in any particular order and are released as required

- IT System tracks each Tray onto and off the storage loop

- Throughput is improved as Early Bags are outside of the mainline

- Individual bags can be retrieved on demand

- Bags are stored in a dynamic configuration (High Energy Consumption)

AS/RS (ICS and BELT)

- Dedicated Warehouse Type Storage Racks are Purpose Built
- Can be used on ICS systems or Belt (Bags are transferred to ICS at entry to storage area and loaded back onto belt at exit)
- By the use of an AS/RS Crane Trays are stored in racks
- Trays are not stored in any particular order and are released as required
- IT System tracks each Tray onto and off the storage loop
- Throughput is optimized as Early Bags are outside of the mainline
- Individual bags can be retrieved on demand
- Bags are stored in a static configuration (Lowest Energy Consumption)

Lift and Run (ICS and BELT)

- Dedicated Warehouse Type Storage Racks are Purpose Built
- Can be used on ICS systems or Belt (Bags are transferred to ICS at entry to storage area and loaded back onto belt at exit)
- By the use of a Lift and Shuttle setup Trays are stored in racks
- Trays are not stored in any particular order and are released as required
- IT System tracks each Tray onto and off the storage loop
- Throughput is optimized as Early Bags are outside of the mainline
- Individual bags can be retrieved on demand
- Bags are stored in a static configuration (Lowest Energy Consumption)

Uses of Technology

	Early	Overnight	Buffer on bottleneck	Build cell	Empty tray	Throughput
Lift & run	+	+	+	+	o	+
AS / RS	+	+	+	o	-	o
Tray lane	+	+	+	o	+	+
Tray carousel	+	+	+	+	+	o
Virtual store	o	-	o	+	+	o
Belt lane	+	+	o	-	-	o
Manual store	o	+	-	-	-	-

AS/RS

Lift & Run

Lane Storage

AS/RS

Beumer AS/RS CrisStore System

Daifuku AS/RS Storage System (1min37s)

Vanderlande AS/RS BAGSTORE System (4min15s to 5min0s)

Siemens Tray Carousel and Lift & Run VarioStore System (40s)