BEUMERGROUP



BAGGAGE HANDLING SYSTEM MAKES FAST CONNECTIONS

Terminal 3 offers a swift, pleasant and modern airport experience reinforcing Changi's award-winning reputation for exceptional service.

A major aviation hub in Southeast Asia, Changi is recognised as one of the most advanced and passenger-friendly airports in the world. The ultra-modern facility has 19 Airbus A380-compatible gates, including eight in the new Terminal 3. In fact, the world's first A380 commercial flight operated by Singapore Airlines made its debut in Changi Airport.

HIGHLIGHTS

- BEUMER Group personnel operates the baggage control room 24/7 to ensure optimum system availability and performance.
- Terminal 3 is designed to accommodate the requirements of a growing hub operation.
- Baggage remains in the same dedicated totes during transport and storage.
- Changi Airport continually meets the expectations of the passengers whose feedback contributed to the airport's tradition of excellence.

AIRPORT
SINGAPORE CHANGI AIRPORT

SUPPORTING AN AWARD-WINNING REPUTATION





With such an impressive pedigree, expectations for Changi's baggage handling system were high. Maximum operating performance, security, efficiency and reliability were musts for the chosen supplier.

LEADING THE PROJECT

The Civil Aviation Authority of Singapore (managing Changi Airport at that time) awarded the contract to BEUMER Group, who designed and engineered the new inter-terminal baggage transfer system, including a state-of-the-art computer control system. BEUMER Group was also appointed leader of a consortium to build and the fully automated the baggage sorting system for Terminal 3.

In addition, BEUMER Group was awarded sole responsibility for the operation and maintenance of the baggage handling systems in both Terminals 2 and 3 and the inter-terminal baggage transfer system, following installation. BEUMER Group personnel operate the baggage control room 24/7, providing operational management and preventive maintenance to ensure optimum system availability and performance.

EMULATION SHORTENS LEAD TIME, ENSURES ROOM TO GROW

Terminal 3 is designed to accommodate the requirements of a growing hub operation. By conducting numerous tests using specialised simulation and emulation software technology, BEUMER Group has been able to ensure that the baggage handling system will cope confidently with passenger growth forecasts through Terminal 3's design capacity and possibly beyond.

The extensive use of emulation also helped BEUMER Group deliver the extensive project both on schedule and much faster than the normal lead-time required for projects of such scale and complexity. Emulation can push the speed of the system to a level far beyond the demand for performance, forcing everything to run faster than real time and thereby submitting the system to a stress level higher than the actual mechanical system.



BAGGAGE HANDLING SYSTEM SCOPE

Among Changi Airport's specifications for Terminal 3, the highest priorities were fast, safe, reliable and flexible transport of baggage. Short processing time was required to handle each bag from check-in to selected make-up position.

To meet Changi's requirements, the system for Terminal 3 is based on two tilt-tray sorters, a 13,000 m (42,651 ft) CrisBag® system for the high-speed connection between terminals and for early baggage storage, check-in conveyors, racetracks, claim carousels and a SCADA control system.

FIRST CRISBAG™ INSTALLATION IN ASIA

Changi Airport uses the CrisBag® system from the Crisplant® product range as an extensive inter-terminal transfer baggage system to connect Terminals 1, 2 and 3 as well as for sorting baggage in Terminal 3. In addition, the system stores up to 4,000 pieces of luggage at a time in a fully integrated early bag storage (EBS) system.

The CrisBag® tote-based system enables 100% track and trace at all times. When loaded in the system, each item of baggage is placed in a numbered tote and the bag's IATA barcode data is merged with the tote's RFID information. A special tote design allows gentle transportation of all baggage types, shapes and sizes, including out of gauge (OOG), at speeds of up to 7 m/sec (23 ft/sec), boosting Changi Airport's competitive advantage.

BAGGAGE HANDLING
WORKFLOW





CHECK-IN

During baggage check-in, the baggage handling system (BHS) interfaces with airlines' departure control systems to obtain the baggage source messages (BSM).The BHS processes the BSMs, which are used to identify, route and track the bags all the way to their intended destination. The baggage handling system allows 100% hold baggage screening.

TILT-TRAY SORTERS IN MAIN BAG ROOM

The two tilt-tray sorters in the main bag room are our quiet, highly reliable from the Crisplant® product range with a low-maintenance electronic tilt mechanism. The induction conveyors feed bags from the conveyor lines into the two tilt-tray sorters.

Bags are tracked on the conveyors and sent to the sort conveyor. Based on the bag identity, the baggage handling system determines whether baggage should be directly sorted via the sorters, should go to early baggage storage or should be transferred between terminals.

Automatic barcode scanners on the tilt-tray sorters enhance the tracking information for even higher levels of sorting accuracy. Bags can be sent to the manual encoding stations if tracking information is lost, while rush and odd-size bags are sent to their respective outputs.

TRANSFER INPUT FACILITY (TIF)

Transfer baggage accounts for approximately 53% of the total amount of baggage processed in Terminal 3.

At the TIF, five dedicated transfer input lines with barcode scan and HBS screening route bags into the CrisBag® system for EBS, sortation to make-up or time-critical racetrack.



TUNNEL TRANSFER

Transfer operations always become more complicated with three terminals, and transfer speed is clearly of the essence. With a point-to-point transport speed of 7 m (23 ft) per second, the CrisBag® is ideal for high-speed baggage transportation. The 1,200 m (3,937 ft) underground tunnel connecting Terminals 1,2 and 3 features a two-storey track in each direction and is optimised for the highest possible throughput. The conveyance time for baggage of transfer passengers making connections at different terminals is required to be as short as possible without compromising reliability.

EARLY BAGGAGE STORAGE (EBS)

BEUMER Group integrated an EBS solution for intermediate storage of baggage. Unlike most systems, the fully automated CrisBag® EBS system makes it possible to pick out single totes at any time.

A fully integrated storage facility, the CrisBag® EBS allows passenger bags to be checked in hours before flight time as well as storage of transfer bags with long connecting time.

Baggage remains in the same dedicated totes during storage. The 100% accurate track-and-trace system ensures that each bag's exact location is always known, and any item can be quickly called out from the storage system at any time, such as in the case of re-booking.



ENERGY-CONSCIOUS BAGGAGE HANDLING



SOFTWARE AND CONTROL SYSTEM

The airport's challenging software demands have been met by using BEUMER Group's advanced high-level control system.

The control system, a vital component, ensures flexible and reliable performance in the new terminal. The sort allocation computer (SAC) allocates baggage destinations and automatically performs continuous updates based on the current flight schedule via an interface to the flight information system (FIS). The SAC also handles the CrisBag® early bag storage, including optimum use of the storage. The control system is built for more than 99.99% availability.

The SCADA, known as MDS (maintenance and diagnostic system) in Changi Airport, enables the operator to visualise and supervise the entire baggage handling system and to handle error situations quickly and effectively.

44 redundant machine controllers (PLCs) are used to provide real-time control of the sections in the CrisBag® system. This ensures full track and trace of the 4,000 totes that transport passengers' bags. To ensure easy replacement and smooth operation, all individual settings for the frequency inverters are controlled and downloaded from the CrisBag® CSC (Crisplant Machine Controller).

ENERGY-CONSCIOUS BAGGAGE HANDLING

CrisBag® offers the potential for significant energy savings. Rather than running continuously, the belts only start when prompted by the arrival of baggage, stopping again once the bag has moved on to the next module. The fact that bags are loaded onto light totes also help ensure lower system energy consumption.



By ensuring uniform speed at both sections where a tote travels from one section to the next, the control system prevents unnecessary tote wear and tear and extends tote lifetime. Longer lifetime of working components has also been achieved by dividing the transport lines into modules, each with a motor.

SERVICE FIT FOR A WINNER

To ensure maximum operational security for the airport's baggage handling system, Changi Airport Group (Singapore), who has taken over from the Civil Aviation Authority of Singapore as the licensee to operate Changi Airport, entered a full operations and maintenance service contract with BEUMER Group personnel stationed round-the-clock on site where the control system monitors and controls the entire system and server rooms.

BEUMER Group is solely responsible for ensuring optimal operation and maintenance of the baggage handling systems. Preventive maintenance is carried out as required and the latest technological upgrades made available as they arrive.

A BEUMER Group team manages the job in three shifts, seven days a week. Their role is to secure optimum system availability and to ensure the baggage handling system's long-term capabilities. With the full service contract, airport staff can concentrate on their primary tasks, knowing that the service and maintenance of the highly specialised baggage handling system is under control. With the mission critical baggage handling system soundly in BEUMER Group's hands, Changi Airport can continue to meet the expectations of the passengers whose feedback contributed to the airport's tradition of excellence.

TERMINAL 2 OVERVIEW

- Two S-2000M tilt-tray sorters
- 16 automatic inductions
- Belt conveyors
- Early baggage storage for 2,200 bags
- 100% automatic HBS system
- Capacity: 10,800 bags/hour

TERMINAL 3 OVERVIEW

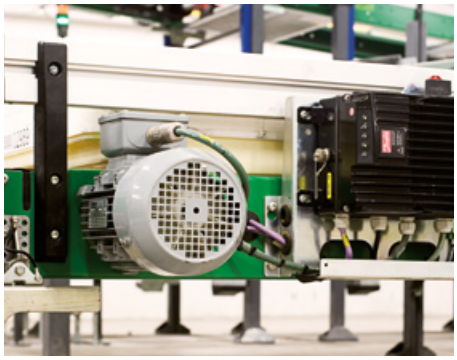
- CrisBag® system based on standard and oversize totes running on same track
- Transport speed: Up to 7 m/sec (23 ft/sec)
- Length: 13 km (8+ miles)
- Early baggage storage capacity: 4,000 totes
- High-speed transfer lines between Terminals 1, 2 and 3
- Capacity: 2,700 totes/hour per line
- Two S-3000E tilt-tray sorters
- Check-in conveyors
- Automatic inductions
- Racetracks
- Claim carousels
- 100% automatic HBS system
- 102 make-up chutes
- 14 make-up carousels
- 13 manual encoding positions
- 76 redundant machine controllers (PLCs)
- 32 machine controllers
- SCADA control systems
- Capacity: 10,400 bags/hour



CUSTOMER SUPPORT OVERVIEW

Full-service operation and maintenance contract in Terminals 2 and 3

- 24/7/365 support and operational reliability
- Spare parts
- Full programme of preventive maintenance
- System analysis and optimisation
- New technology upgrades
- Consultancy services
- Supplementary stand-alone products



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BEUMER Group reserves the right to make modifications that serve technical progress.

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