Residual current monitoring
in one of the largest industrial power grids in Germany

Logistics you can rely on

Fraport

Frankfurt airport is the largest air traffic hub in Germany. Along with the baggage handling system operated by Fraport AG it houses one of the largest ever industrial power grids. The highly sophisticated logistics system is 73 km long in total and features thousands of electrical devices. To ensure a high level of availability and minimise costs, the operator opted for Bender power system protection technology.

TECHNICAL APPLICATION

Frankfurt Airport (FRA) is the largest airport in Germany. Servicing around 55 million passengers, it ranks third largest in Europe after London and Paris. Frankfurt is what is known as a hub airport, acting as a pivot for connecting traffic to other airports. As baggage handling can be a bottleneck in the chronological sequence of flight handling activities it is one of the most important services provided by every airport.

Highly sophisticated

The two terminals, with their approximately 400 check-in desks, necessitate around 73 km of baggage conveyor belt. Another 8 km will be needed for the new Gate A. There are currently around 300 personnel working to ensure the smooth running of the baggage handling system (BHS), making it one of the most extensive industrial power grids ever. Every year it processes more than 40 million items of luggage, 60% of which belong to passengers in transit. On peak days, the BHS has to process up to 110,000 inbound and more than 110,000 outbound baggage items, at a guaranteed transit time of maximum 45 minutes.

... and it does so fully automatically

These impressive figures for the BHS are underpinned by highly sophisticated logistical and technical concepts. The system is completely automated, apart from the weighing process at the check-in desks and the handling of last-minute baggage. To this end, every item of luggage is given a bag tag. Fully automatic scanners identify the barcodes on the tags. Baggage is transported in containers bearing optocoded numbers that are linked to the data on the bag tag during loading. The technical output of an automatic coding station is up to 1,380 items of baggage per hour, three times more than a manual system.

High potential for error calls for safety

A large-scale conveying system of this kind, with its fully automated control logic, is operated by drive motors, counters and actuators as well as control PCs. These devices communicate with one another using active network elements such as routers, switches and star couplers. The sensor technology for system control requires extensive control voltage supply networks. Wherever a high-voltage current controller (WETEC) is still in use, these voltage supplies are designed as unearthed systems (IT systems) with 230 V control voltage. It is obvious that electrical faults at one location can trigger a whole chain of faults in the entire system. This is why high-performance power system protection technology is absolutely essential for smooth operation in control-circuit voltage supply systems. To identify insulation faults in good time, IR420 / IR425 insulation monitoring devices are installed in the IT systems.

Central monitoring and transparency

Fault currents in the BHS are monitored via a residual current monitoring system (RCMS460). The 12-channel residual current evaluating unit continuously logs fault currents in the system. The individual system controllers pass on collective fault messages received from the RCMS via process variables to the control system of the BCC Baggage Control Centre. Connection via gateways (FTC470XET) is also available as an option. The baggage control centre (BCC) is the nerve centre of the entire baggage handling system. This is where all information about operating conditions converges and is visually represented on screens.

Minimum fault rectification time

The RCMS measures the fault current in the distribution systems. The PE is monitored separately, so that any overload can be identified at an early stage. As soon as the insulation resistance in the monitored system drops – due, for example, to electrical, mechanical or other environmental influences – resulting in the measured residual current exceeding the defined value, the RCMS460 sends an alarm message to the system controller (PLC). This passes on the fault to the control system in the BCC, where it is visualised on the relevant screens. The BCC then informs the responsible maintenance technician, who can then rectify the named fault source. Currently, technicians need on average just 5 – 10 minutes to eliminate faults occurring - a fantastic time in view of the vastness and complexity of the baggage handling system.

Reliable checkback signalling

There are two stages to the reporting of residual currents as they occur: when the selected rated fault current is reached, both the user-definable pre-alarm and the main alarm are output via separate relays, whose signals can be further processed. At the same time, the evaluation unit displays the existing residual currents via an LCD and alarm LEDs. The settings can be executed on the equipment itself. The RCMS permanently monitors the connection to the transformer, and faults in the connection are displayed immediately. Any residual currents that occur are recorded in the control system and are available for evaluation and fault analysis.

Overall, the benefits of the Bender residual current monitoring system (RCMS) are reduced maintenance costs, faster fault location and more reliable operation, even where highly sensitive technology is used. The bottom line, therefore, is that it is possible to cut costs while at the same time enhancing quality. Due to Fraport AG's positive experience with the RCMS, the device will also be installed in other areas of the airport. ■

Heiner Carnein
Hesse Engineering Office

ADVANTAGES
of preventive maintenance
using residual current monitoring

> High operational and system uptime

> Permanent monitoring instead of regular inspections

> Fault currents are identified and reported as they occur

> Rapid location of the faulty system section

> Lower consequential costs resulting from faults and downtime

> Reduced requirement for servicing by technicians

> Reduced maintenance costs

> Remote diagnosis via internet

> Ongoing monitoring of the insulation resistance to safety regulation BGV A3.