



Pier A-Plus: Unique Scanning Project

by Theo Drechsel

Frankfurt Airport is one of the most important aviation hubs in the world. Europe's third-largest airport opened its new pier "A-Plus" in October 2012. Spread over a length of 790m (2,600ft) and six floors, its gross floor area is 240,000m² (2,600,000ft²). The airport operator, Fraport AG, used the advantages of 3D laser scanning to produce specified/as-built comparisons of the CAD data for the newly built pier. During the "A-Plus Pier" project – probably Europe's big-

gest-ever "scanning construction site" – up to four Leica Geosystems laser scanners were used simultaneously.

The Building Data Management Team, part of Fraport AG's Property and Facility Management Department, is responsible for the new pier's building database. "We must maintain and make available the airport's architectural and building technical services data held in the database," explains Evelyn Happel, Head of Building Data Management. "It is very much in our interest to provide up-to-date, consistent data

Fraport AG, Pier A-Plus: Scanning project key data

3D Laser Scanners used:

Leica HDS6000 series, HDS7000 and
Leica ScanStation C10

- Up to four scanners in use simultaneously
- 24/7 scanning in shift operation for more than 240 days
- Up to five scanning phases per room
- Data volume: approx. 36TB
- Over 16,000 stations in the project
- An average of 2,000 target points per floor, 12,000 in total

Gross floor area: 240,000m² (2,600,000 ft²)

Construction: 2009 – 2012



of our existing buildings to our design consultants and construction contractors. The specified/as-built comparison performed during construction is crucial to this.”

3D Laser Scanning in Shifts

Data for the specified/as-built comparison was captured exclusively by 3D laser scanners. Fraport commissioned two local firms of consulting engineers to carry out the scans during construction. One of the consultants opted for the Leica ScanStation C10 from the beginning and later added the newer model of the proven Leica HDS6000 series, which was also the choice of the other consultant from the start. In the course of the project, both sets of engineers also used the faster HDS7000 laser scanner to keep up with the work on site.

“One scanner per consultant would not have been enough for the rapid pace of construction,” says Thomas Konetzki, Manager of the Department “Geo-information, Building Data Management, Engineering Surveying and Main Archive”. “After all, we are talking about an airport pier here – quite different to a family home – with layers of technical building services infrastructure anything from 1–2 m (3–6.5 ft) deep in the ceiling space.” Technical building services include heating, ventilation, water, sanitary and elec-

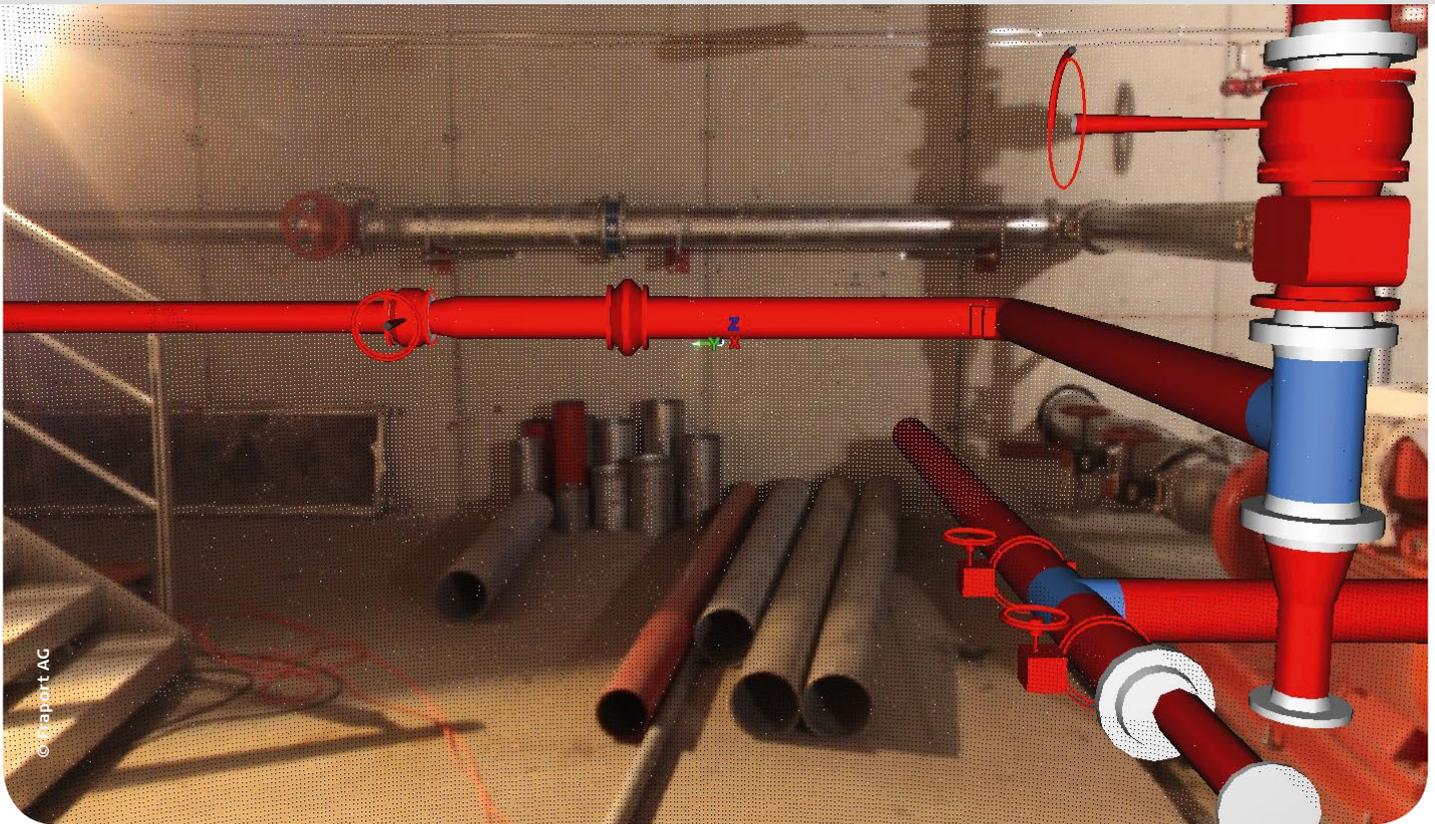
trical equipment as well as measurement and control technology. Scanning also captured positions of the completed walls, deck slabs, penetrations and podiums. Due to the rate of installation of the technical equipment, each room was captured in several scanning phases to ensure high quality and completeness of the scanned data. Coordination and timing of the scanning phases were therefore extremely important.

The two scanning service-providers contributed considerably to the success of the project, not only by acquiring a second laser scanner but also through their flexibility and commitment. A further substantial advantage was their high level of knowledge gained through earlier commissions and their willingness to liaise continuously and directly with the contractors. In this way, they always had relevant information, such as the progression of work on each floor. Fraport placed great emphasis on close cooperation and continuous coordination between site management and the consultants to ensure smooth operations on site.

Leica Geosystems 3D Laser Scanner for Quality Management

In addition to the two scanning service providers, the 3D laser scanners from Leica Geosystems were





■ A deviation of the sprinkler pipe layout in the CAD data compared to the actual situation captured by the scanner.

key contributors to the success of the project. "It is very impressive how the technology has developed in recent years. Today's generation is significantly quicker and performed particularly strongly in the capture of object data, both at close and at long ranges," says Evelyn Happel. The scanners had to prove themselves on both of these tasks, as they were used in a variety of different situations: one of the consultants was responsible for the so-called "core building" (the existing hall and short pier of Terminal A) while the other consultant scanned the new long pier. After capture of the scan data, a specialist CAD services consultant checked the results against the as-built data.

The checked data played an important role in quality assurance of the as-built building data: to perform this check, data from all contractors (specified) was compared with the physical as-built situation on site (actual) captured by the laser scanners. Based on the list of deviations, the contractors could set about reworking, correcting and continuing their plans and drawings.

Continued Benefits of Scanning Data

Save for a few remaining tasks, the scanning work on Pier A-Plus is nearly complete. Captured data is used in several different ways: the TruViews produced from them, which allow views and measurements to be made from the scanner station positions in the

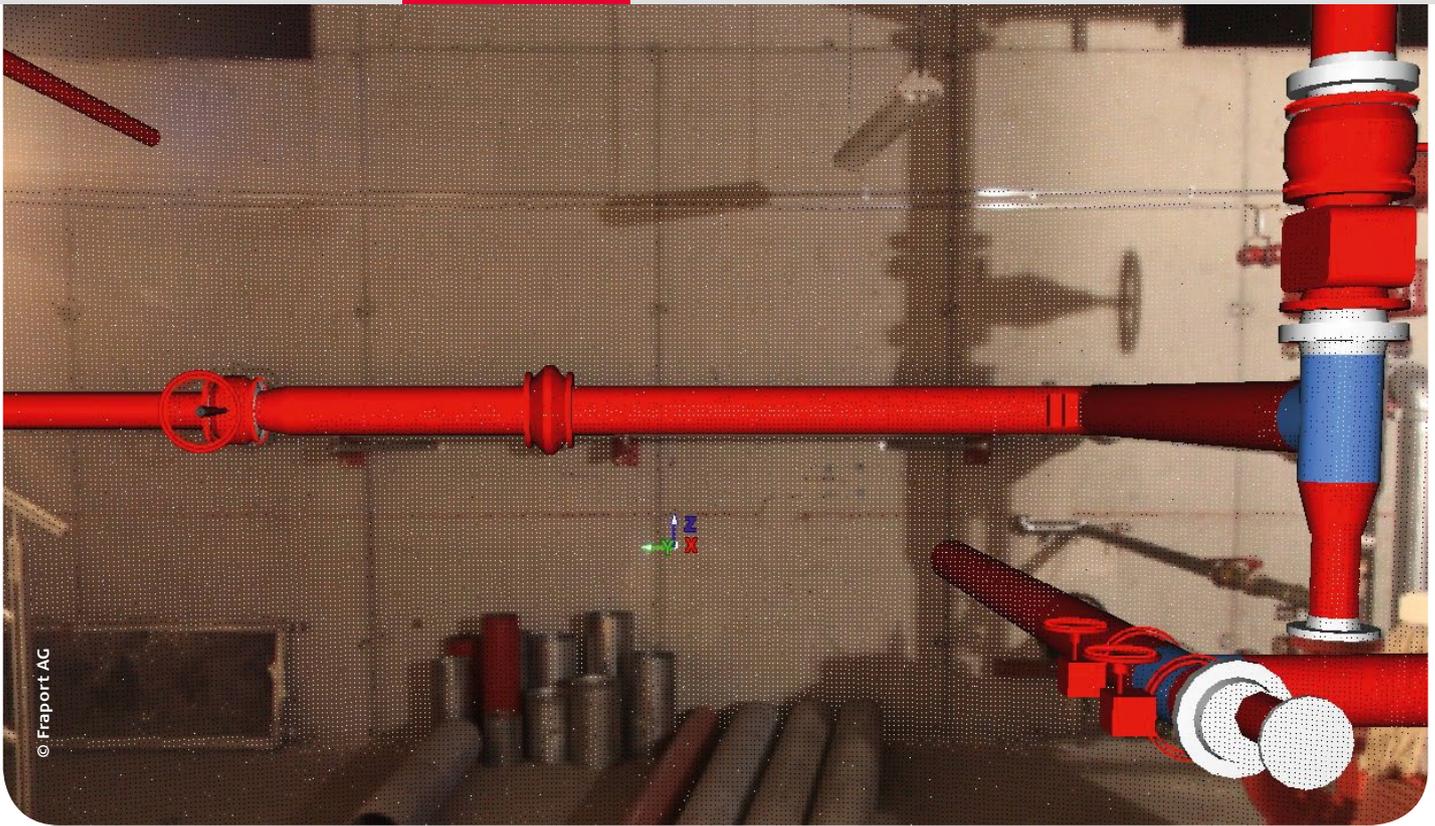
point clouds, are used in many departments at Fraport AG – for example in case of failures – as well as by the numerous contractors involved. TruViews are perfect for performing as-built data comparison and they provide better orientation than point clouds. Moreover, for the first time scan data is being used in the release of floor areas for retail units in Pier A-Plus, where they augment total station surveys.

Construction in Existing Buildings using meaningful Scan Data

For the most part, Fraport builds within existing buildings, which have to be kept continuously operational because the airport is open 24 hours a day. 3D laser scanners allow all airport operations to carry on smoothly and reliably. This already proved the value of their use on the construction site, where up to 1,700 people were working at any one time. The Building Data Management Team makes laser scanning data available to project managers and specialists working in various parts of the airport to make their tasks easier. Using scanning data they can, for example, check how well their building services equipment fits above a suspended ceiling without having to physically go there and open it up.

Further Development of Leica Cyclone and CloudWorx

In close cooperation with Fraport AG, Leica Geosystems has been able to develop the functionality of



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■ CAD data updated by contractor.

its Cyclone and CloudWorx plug-in software considerably. With improved import/export routines, plan data can now be read directly into the software. The software adjustments immediately benefitted the scanning project and data evaluation.

The infrastructure management staff at Fraport AG were able to use the knowledge gained to considerably improve their guidelines for scanning services. "The continuously updated guidelines state that we work only with Leica Geosystems products," says Evelyn Happel. "Compared to manual surveys, scan-

ning is considerably quicker, much more accurate and less error prone. For these reasons, we will always use 3D laser scanning for future surveys of existing buildings," explains Evelyn Happel. ■

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Pier A-Plus at Frankfurt Airport

Pier A-Plus at Frankfurt Airport offers capacity for up to six million passengers and is used by Lufthansa and its Star Alliance partners. It provides up to seven aircraft gates, four for the A 380 and three for the A 340-600 or B 747-400, with the ability to accommodate the new Boeing 747-800 aircraft. Passengers are spoiled with exclusive boarding facilities with state-of-the-art interior design. High-tech features include boarding bridges, which not only operate automatically, but are also the first to allow

separate boarding of economy, business and first-class passengers.

Frankfurt Airport is Europe's third-largest and the world's eleventh-largest airport. Every day, approximately 1,300 aircrafts take off and land here. Last year more than 57 million passengers used the airport to fly within Germany and to or from around 300 destinations worldwide.

www.fraport.de