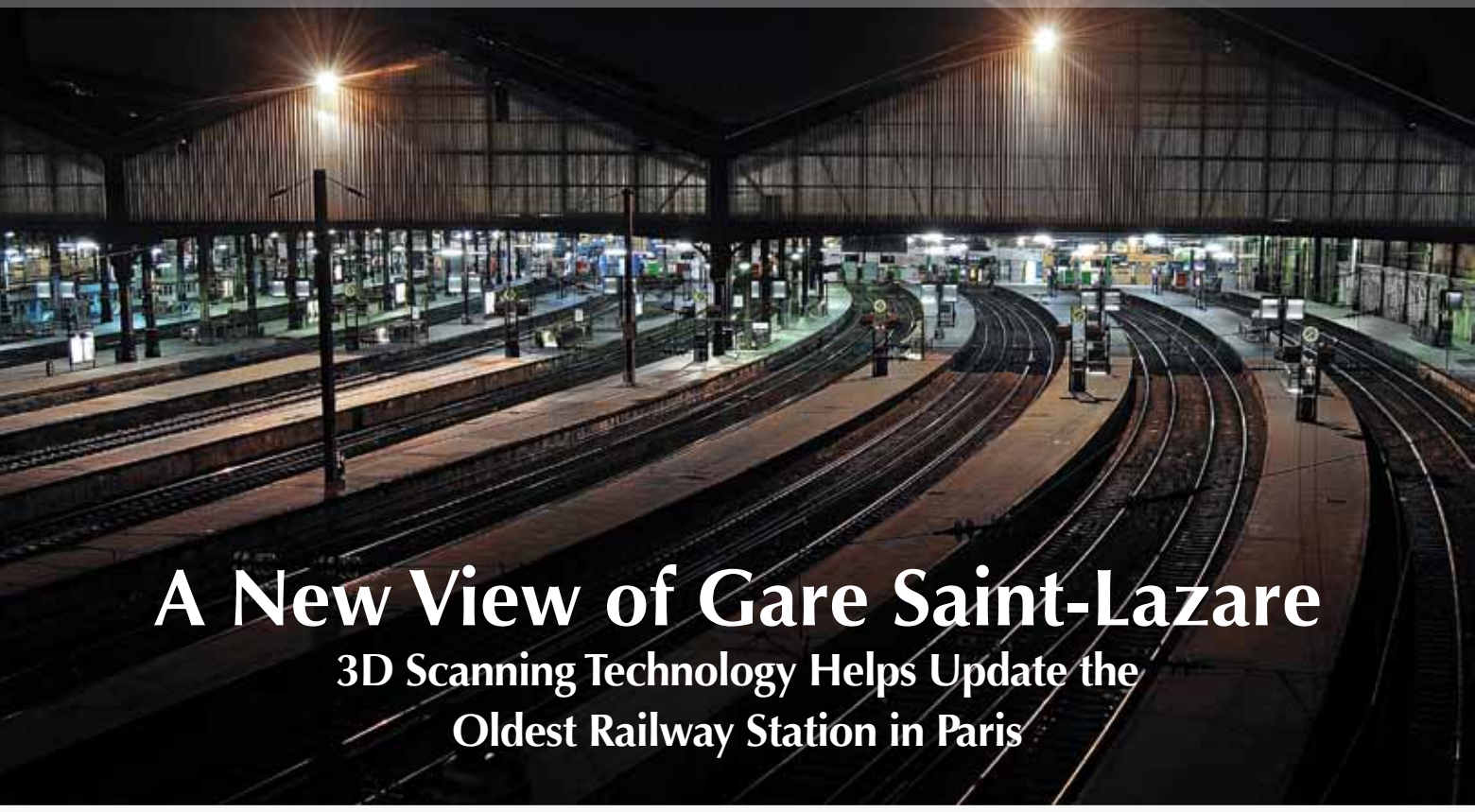

A New View of Gare Saint-Lazare

3D Scanning Technology Helps Update the Oldest Railway Station in Paris

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Since its opening in 1837, the Gare Saint-Lazare (Saint Lazare Station) in Paris has expanded over the years to become the second-busiest station in France and third busiest in Europe. The station's 27 platforms handle more than 100-million passengers every year and provide access to local, regional and intercity rail travel.

Now Gare Saint-Lazare is experiencing another change. As part of a modernization effort by SNCF (*Société Nationale des Chemins de fer Français*), France's national state-owned railway company, Saint-Lazare's familiar stainless steel trains will be replaced with new equipment. The new rolling stock is larger and longer than the current equipment, and Saint-Lazare must adapt to handle the new cars and locomotives.

Relocating the Gantry

To accommodate the larger trains, SNCF will modify equipment at the ends of the platforms and relocate the station's signaling gantry, an overhead steel structure that straddles the station's 16 tracks. The gantry, which is roughly 8 m (26 ft) high, holds the signal lamps, signs and other devices that inform train operators about speed limits and when their trains should enter or leave the station.

To plan the improvements, SNCF needed detailed information about the existing facilities. SNCF contacted Urbica, a leading French company in industrial laser measurement, to survey the station. The Urbica field team included surveyor Romuald Clavé and three 3D scanning technicians, each equipped with a Trimble FX 3D Scanner. Clavé used a Trimble S8 Total Station to measure a series of target points that would serve as reference control points for the scanners.

With the control in place, all field measurements were made directly in the national coordinate system used by SNCF. This made it simple to superimpose the new data onto existing drawings of the station. In addition to providing control for the scanners, the Trimble S8 collected information to check the correlation between the new measurements and existing SNCF data. Urbica Sales Manager François-Xavier Eeckman said that a key part of the

project's success was the ability to integrate data from the Trimble FX 3D Scanners and the Trimble S8 Total Station. "It saved a surveyor from spending several additional hours on site," he said.

Working Late

Busy train traffic and safety concerns forced the team to work late at night. The team used one of the Trimble FX Scanners to conduct short-range scans of the gantry. The other two scanners collected data around the rails and platform. These scans extended approximately 60 m (200 ft) down the tracks. When measuring far down the tracks, the angle of incidence for the scanners' laser beams became quite small. The Urbica team knew that the shallow angles and poor lighting conditions might affect the precision of measurements to the tracks. To ensure that these difficult measurements met required precision, the technicians used the 2-pass configuration of their Trimble FX Scanners.

In two nights' work at the station, Clavé and his team occupied 50 different instrument points. They collected roughly 300-million 3D points on a 5-mm (0.2 in) grid. Project specifications called for each point to have a precision of 20 mm (0.8 in) in horizontal and vertical components. According to Eeckman, the actual results were even better; most points had a deviation of roughly 10 mm (0.4 in).

3D Modeling and Video Simulation

Data from the scanners and total station were loaded into Trimble RealWorks® Software for processing and analysis. Urbica produced a complete point cloud and 3D view of the entire area. "Unlike a traditional survey, the scanner captures everything within its field of view," Clavé said. "SNCF had the benefit of a 3D view of the catenaries, the platforms and their accessories. We provided them with measured positions for all the equipment in the area."

Urbica used Trimble RealWorks to create simulations of the planned changes. The team combined measured data with dimensions of the future rolling stock to create simulated views of the lights and signals from the operator's cab onboard the new trains. A video camera simulated a train operator's head movements when reading the signals displayed on the gantry. The simulation helped assess whether a train operator could see the signals, and checked that the catenaries would not obstruct his or her vision.

Eeckman noted that SNCF was pleased with the results, and will incorporate the 3D information into reports for its infrastructure management teams. The ability to incorporate detailed field information into simulations is a major benefit for SNCF's processes for design, planning and construction.

See feature article in Professional Surveyor's February 2011 issue: www.profsurv.com