Track Access Services Creates Virtual 3D Models and Desktop Signal Sighting for Network Rail

Bentley Software Enables TAS to Create Complete, Accurate 3D Rail Models for Faster, Safer, and More Accurate Signal Sighting

Project Summary

Organization:
Track Access Services Ltd.

Solution:
Rail and Transit

Location:
United Kingdom

Project Objective:

- Create more flexible track layout and optimize signaling to reduce journey times, segregate traffic flows, reduce conflicting movements, and cut reactionary delays and average lateness
- Provide a full positional video survey of tracks and existing signals
- Operationalize virtual track modeling and desktop signal sighting to increase design efficiency and quality and minimize trackside safety risks

Products used:
Bentley Rail Track, MicroStation, ProjectWise

Fast Facts

- Used specialized video devices to capture detailed track data from trains and import it into Bentley Rail Track for signal and OLE sighting
- Created realistic 3D models of track areas where video cannot be utilized

ROI

- Faster project delivery and lower project costs by enabling teams to work at their desktops using highly accurate track models
- Lower operational costs by using cutting-edge, highly accurate data collection technologies
- Reduced trackside risk by minimizing the need for on-site visits and information gathering
- Achievement of regulatory compliance by implementing desktop design capabilities

Create a More Flexible Track Layout and Signaling System

Derby Station, located in the United Kingdom, currently handles 16 passenger trains in a typical hour and 30-40 freight trains per day using tracks and signals constructed many years ago. In 2014, Network Rail, the Derby Station operator, had a once-in-a-generation opportunity to create an improved track layout at Derby, in conjunction with new track and signaling. The goal was to put in place a more flexible track layout and optimize signaling to reduce travel time for passengers, segregate traffic flows, reduce conflicting movements, and cut reactionary delays and average minute lateness. To achieve this goal – and meet new compliance requirements in the U.K. for desktop design capabilities – Network Rail turned to Track Access Services Ltd. (TAS), a Bentley development partner. Together, they created an innovative desktop-driven, 3D virtual reality modeling, and signal design process.

Re-imagining the Track Visualization and Signal Design Process

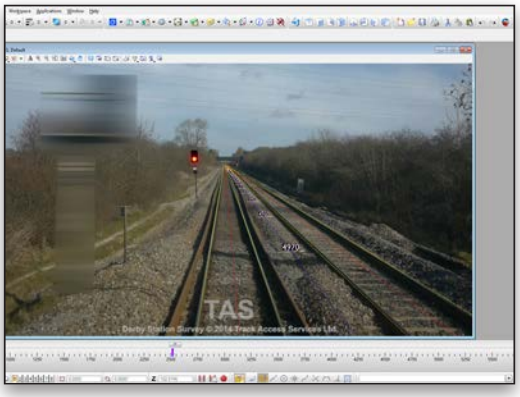
For TAS, the project involved conducting a full positional video survey of the re-signaling schemes, including train planning, train hiring costs, bringing in camera operators, provisioning equipment, downloading data, processing positional data, and video data post processing, including blurring of redundant signals and signs.

TAS technology is unique in that it supports full information mobility. It can capture positional video that can then be imported into MicroStation for sighting purposes, as well as exported for other uses such as driver training. TAS also created visual 3D models of track areas where video could not be utilized. "Information mobility in virtual modeling is a unique breakthrough made possible by TAS," explained David Reed, managing director of Track Access Services Ltd. "Models can be created externally to MicroStation and imported for sighting. Complex 3D models existing within MicroStation can be converted into fully functional simulation models that designers can use to determine optimal signal placement."

Taking Model Simulations to the Next Level

TAS began the project by collecting track and signal data using special video cameras, inertial units, and laser scanners that were fitted to a locomotive to capture positional video. TAS then digitally removed images of existing signals in the original track video. Next, using tools developed in association with Bentley, TAS calibrated the video to all current grid systems. This video was then imported into MicroStation and to create a 3D rail model.

Additional data was added to the models, including chainage lines and various types of signals, complete with flashing lights, to test the effectiveness of signal placement within models. Obscuration models were also added to aid understanding of exactly how trees and other barriers will affect the ability of train drivers to see signals from different distances and areas of track. Insight gained from these types of models greatly reduces the risk of design errors while boosting driver safety.



Bentley Rail Track modeling capabilities were used to d etermine optimal signal placement.

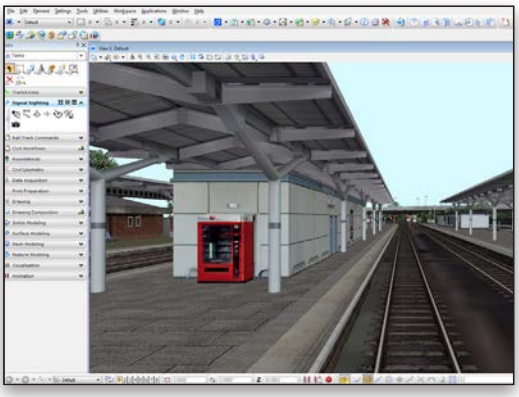
Realizing the Benefits

Virtual track modeling and desktop signal sighting will provide many benefits that go beyond compliance with regulatory requirements. First, fewer trackside visits are needed to collect data and make design decisions. "Virtual modeling and

"Using Bentley products, coupled with TAS positional video and reality modeling, brings a new level of visualization to CAD designers. They provide photo-realistic background imagery to help designers accurately create and confirm proposed layouts in the most direct and effective way."

— David Reed, Managing Director, Track Access Services Ltd.

desktop signal sighting enables as much work as possible to be completed at the desktop rather than out on the track," said Reed. "This not only minimizes trackside safety risks, but it also ensures that placement and design errors are typically addressed early in the design process, when they are inexpensive to fix." Safety is also improved because when people do need to perform on-site visits, they can review video and models in advance to understand prospective track access points.



Using MicroStation and Bentley Rail Track, designers can create realistic 3D models to accurately design and efficiently confirm proposed layouts, minimizing operational costs.

In addition, by bringing additional video and modeling data and resources to the design teams, TAS technology has created a tangible link between CAD designers and engineering users. "Through this link, we've been able to increase the skills of the Network Rail design staff," explained Reed. "They've learned to use Bentley applications, which has enabled even greater collaboration with the engineers."

As a result, greater collaboration has contributed to reduced project delivery timeframes. "Desktop signal sighting has helped Network Rail teams work together to complete the requirements for detailed deliberation and planning of new signaling schemes," explained Reed. "Now, the planning is initiated by CAD modeling, which enables the sighting exercises to be performed in the CAD toolset offering the most efficient workflow.

Shorter delivery timeframes are also lowering the overall costs of Network Rail's new signal design process – another key benefit of the solution. "In addition, because TAS positional video surveys can be used in Bentley sighting software, we can offer the most effective solutions for video collection that simultaneously minimize operational costs." Now, train planning efforts can target precise areas of surveyed track and leverage the latest information coming in from bi-directional shoots from the locomotive. "We're also seeing lower costs due to the efficient workflow enabled by desktop signal sighting in CAD," noted Reed. "For example, now signal sighting can be performed interactively over both video and virtual modeling."

Looking Ahead

The track access survey and sighting project is currently under way. "The first stage of sighting has been completed successfully using Bentley software," explained Reed. "Looking ahead, we're planning on using laser video surveys – positional video, point cloud overlays, tunnels and bridges on routes, and point clouds – for model building." The video and point clouds will be synchronized in MicroStation. As the signal positions are determined by the design team, they will be approved by the signal sighting committee – and construction will begin.