



Project

- **Name:** Jingwen Expressway Project
- **Total length:** 67.4 km (78.8% of which are tunnels and bridges)
- **Longest tunnel:** Yemajian No. I (6.56 km long)
- **Excavation method:** Drill and blast
- **Contractor:** Zhejiang Jiaotong Engineering Group
- **Investment:** 6.7 billion Chinese Yuan / 8.6 billion Euro

Duration

- 2018 - 2021

Tasks

- Profile quality control
- Volume calculation of 2nd lining
- Thickness detection of lining

Building China's JingWen Expressway Project using Amberg Tunnel Office Software and Topcon's GTL-1000 scanner

The construction of the JingWen Expressway is considered an essential transport infrastructure investment for China's Zhejiang province. Located in the southwest of the province, the project is the most ambitious and complex expressway construction project undertaken in the region to date.

The JingWen Expressway is being constructed by Zhejiang Jiaotong Engineering Group. The project faces many challenges: complex geological conditions, challenging terrain, scenic view considerations, and environmental protection to name a few. Construction of the project can be divided into three distinct stages: the excavation stage, the initial support stage, and the inner-lining stage. Each stage requires precise measurement tasks to be carried out, such as over- and under-excavation measurement, the guidance and placement of support structures, volume calculations, concrete consumption estimates, and layer thickness measurement of the inner lining. Amberg Tunnel Office Software is specifically designed to support these, and many more, tunnel specific tasks and workflows. The complete solution helps tunnelling contractors meet the required level of quality, safety, and efficiency of the construction project.

3D Tunnel Design Definition

Amberg Tunnel is a fully featured authoring software for designing tunnel geometry in 3D. The authoring tools include horizontal and vertical alignment creation, theoretical profile creation, theoretical section definition, and transverse slope creation.



“Under the very intense work pressure, this system has indeed improved our measurement efficiency and reduced the labor volume of our field and office work.”

Guo MengYuan
Survey Engineer
Head of Tunnel Survey Division
Zhejiang Jiaotong Engineering Group

Challenges

- Extremely challenging terrain conditions
- Strict environmental protection and conservation requirements
- Tight construction completion deadline

Products Used

- Amberg Tunnel
- TOPCON GTL-I 000 Scanner

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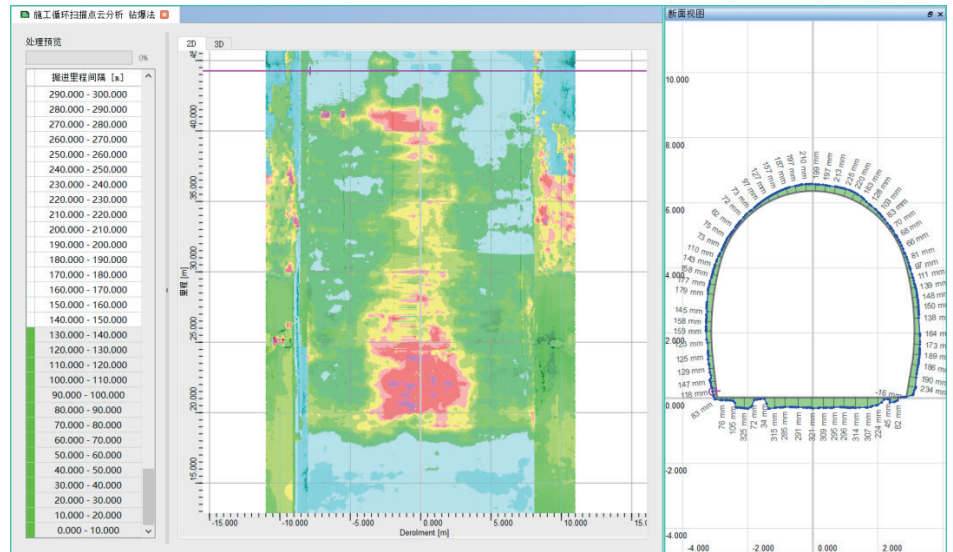
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Field data acquisition

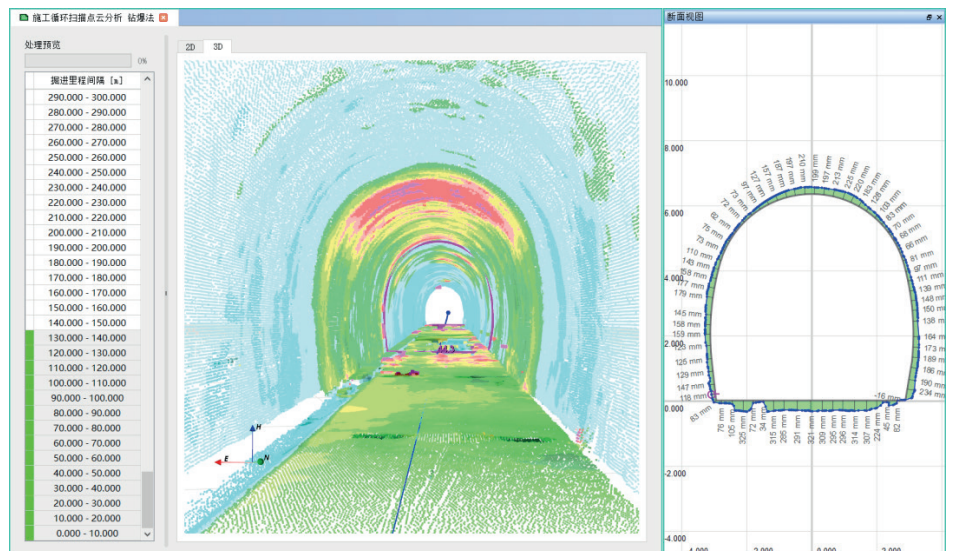
A wide range of industry-standard data formats are supported in Amberg Tunnel, resulting in a seamless and flexible field to finish workflow. For this project, Amberg Tunnel is being used to consume, edit, and analyse point clouds captured from a Topcon GTL-I000 scanner. Once the point clouds are imported into Amberg Tunnel, they can be quickly and easily filtered to remove noise using the inbuilt point cloud editor tools. From this point, the point cloud data is ready for analysis.

Data Processing & Results

Several point cloud analyses are available in Amberg Tunnel, depending on the desired reporting output for the contractor or project owner. Once an analysis is initially defined in Amberg Tunnel, any subsequent point cloud imports will automatically produce analysed results. This has proved to be a significant time-saver for the tunnelling crew. For this project, the construction team configured Amberg Tunnel to automatically produce measured profiles, over- and under-break analysis, volume calculations, lining thickness analysis, and clearance analysis.



2D view heat-map of tunnel over/under excavation deviation



3D view of tunnel over/under excavation analysis

Conclusion

Amberg Tunnel Office Software and the Topcon GTL-I 000 is a comprehensive and powerful tunnel survey solution. The high-fidelity point clouds from the scanner can be quick and easily converted into final deliverables thanks to Amberg Tunnel's powerful point cloud editing and advanced analysis capabilities. Zhejiang Jiaotong Engineering Group relies on Amberg Tunnel for all construction stages of the impressive and challenging JingWen Expressway project.

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