

A successful technical site visit to Trunk Road T2 was organized on September 16, 2023, by the Association of Geotechnical & Geoenvironmental Specialists (Hong Kong) (AGS).

The visit commenced with a concise presentation focusing on the 3.1 km long sub-sea tunnel constructed using a mix shield slurry type tunnel boring machine (TBM). The first presenter provided an overview of the TBM components, including the 14m diameter cutterhead, shield, and gantry. One notable highlight that impressed me was the "Humanized design adopted on the mature TBM technology," specifically the accessible cutterhead design. This design eliminates the need for workers to be exposed to a pressurized environment when changing new cutter discs, which was a common practice in previous TBM constructions. Instead, workers can easily access the cutterhead under atmospheric pressure, effectively improving their safety.

Another presenter introduced various innovative solutions for effective monitoring, such as Distributed Fibre Optic Sensing (DFOS), Handheld LiDAR Scanning (LiDAR), Global Navigation Satellite System (GNSS), Interferometric Synthetic Aperture Radar (InSAR), and AI-Supported Tunnel Inspection Drone (AI Drone). I was deeply impressed by these emerging technologies in the construction industry. For instance, DFOS with different fibre optics layouts was used to monitor the in-situ strain behavior of significant structural elements, such as the launching shaft. This technology provides more accurate measurements compared to traditional monitoring techniques like manual measurements with tilting markers. Depending on the cost and maturity of the technology, DFOS could be further adopted in Hong Kong for construction monitoring and post-construction surveillance, ensuring the long-term structural integrity of building projects.

After the presentation, we were given access to the TBM tunnel for a close-up observation of the gantry and shield. As a first-time visitor to a TBM tunnel, I initially had the misconception that the inner part of the tunnel would be similar to a drill and blast tunnel, with air and noise pollution. However, I was pleasantly surprised to find that the site clearance and logistics management exceeded my expectations. The air circulation system effectively improved the air quality, and the AI Drone assisted in monitoring segments and joints for any concrete spalling or water leakage, reducing the need for cherry pickers and manual checks. This optimization of resources also freed up space for logistics delivery. Additionally, the use of a rotary platform for light goods vehicles helped minimize traffic congestion inside the TBM tunnel.

In conclusion, I express my gratitude to AGS for organizing this valuable opportunity for members to have a close-up observation of the TBM. Personally, I eagerly anticipate the new era where innovative technologies are widely adopted in the local construction industry, further enhancing efficiency and safety.