



Talk on Leakage Detection and Localisation in Underground Structures: From Mobile Measurements to Permanent Integrity Control

by Ir. Khoo Chee Min

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An increasing number of underground structures in urban areas often requires deep excavations below groundwater table and therefore subjects to high technical and financial risks. The requirements for best quality and extended lifetime are very high for these types of constructions. For instance, a failure in a sealing system could cause severe damages to the construction itself as well as to neighbouring buildings. Furthermore, substantial financial losses may occur due to disruption of the building operation and expensive repair works.

On 4th April 2018, the Tunnelling and Underground Space Technical Division (TUSTD) invited Dr. Ernst D. Geutebrück of TEXPLOR Group bv, The Netherlands to give a talk on this topic, with highlight on self-developed technologies for mobile measurements and permanent integrity control for leakage detection and localisation based on his years of research and field work. The evening talk was held at Auditorium Tan Sri Prof. Chin Fung Kee, Wisma IEM with the attendance of 20 participants.

Dr. Ernst started the talk by painting a picture of potential risks, e.g. leakages in underground structures. He highlighted that leakages in sealing walls, joints and bottom seals, e.g. natural geological sealing horizons, injection bases etc., are factors, which could substantially influence the technical and financial success of a construction project. For almost all deep underground constructions, two categories of quality control of the sealing functionality in an early stage could be distinguished:

- ✓ Mobile investigation (one-time measurement), and
- ✓ Permanent integrity control.

Mobile measurements are performed if a construction needs a quality control to prove the structural integrity at a given time or if an actual problem occurs in the sealing system. Permanent integrity control devices are integrated into the construction and continuously monitor the structural tightness. The need for a permanent control could arise from economic interests, ecological requirements or legislative regulations. Those monitoring systems are used for potentially risky environments such as storage basins for hazardous liquids, waste treatment sites, or in metro stations, tunnels, below floor construction, etc.

Dr. Ernst explained the basic principle of the technology, which is to create a specific electrical signal on one side of the sealing construction. On the other side of the sealing construction, the spatial distribution of the incoming signal is observed. This incoming signal is measured by sensors, placed in a regular grid within the construction area. High amplitudes are caused by high incoming signals and thereby correlate with flow paths for liquids and thus weaknesses in the sealing construction. Figure 1 illustrates the measuring principle of a sealing construction. The recorded data is processed and displayed in a 2D top-view map of the construction site in a corresponding coordinate system localising the weak areas in the sealing system.

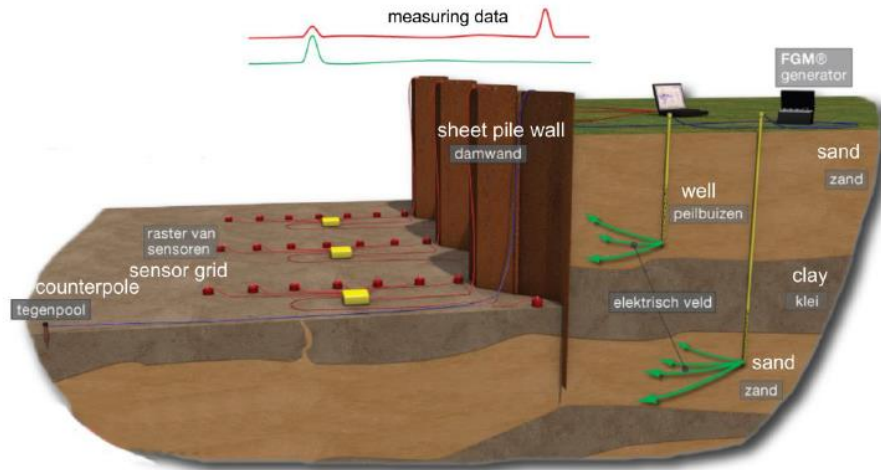


Figure 1: Measuring principle of a sealing construction

The speaker discussed the examples in leak detection works by sharing his vast experiences from the past projects over Europe, the Middle East and Asia regions, in particular in metro station constructions in Bangkok (Thailand), Paris (France) and Tianjin (China). He took few questions from the participants before the talk ended. The Immediate Past Chairman of TUSTD, Ir. Syed Rajah Hussain Shaib presented a certificate and a memento to the speaker as a token of appreciation.

