

TALK ON REAL TIME MONITORING ON MRT TUNNELS

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The above talk on Real Time Monitoring of MRT Tunnels using remote wireless systems was organised by the Tunnelling and Underground Space Technical Division on 13 October 2003. The subject of the monitoring of tunnels either during construction or service is becoming an important part of tunnelling activities.

The talk was delivered by Dr G.H. Tan on behalf of a consortium of companies consisting of SysEng (S) Pte. Ltd., Wisescan Engineering Pte. Ltd., Siber Hagner Southeast Asia Pte. Ltd. and GeoEng Consultants. In spite of its very specialised subject matter and with only two weeks' notice, the talk was well attended by about 20 participants. There was an active and lively discussion following the presentation and the talk ended at 7.00 p.m.

This is state-of-the-art tunnel monitoring work. For the benefit of those who were unable to attend, the following is a summary of the talk.

In cities with operating tunnel networks, the construction works near these tunnels require continuous real-time tunnel monitoring systems. These systems provide important data immediately for decision making, and help send out alerts if tunnel movements exceed the allowable design limits. A fully-automated measuring system with a real-time data communication system will provide immediate reliable information to the relevant contractors, consultants and authorities simultaneously. However in many cases, these automatically measured data are stored in the on-site system. The data is retrieved manually at night when the trains are not operating. Alternatively, they can also be manually retrieved via wireless methods from the sites. As the measured data is retrieved and analysed manually, human errors and time delays do occur. Hence, this crucial information can be up to 24 hours late and precious time can be lost if movements deviate from their allowable limits.

New innovative technologies of smart Remote Terminal Units (RTUs), wireless communications and mobile phone Short Message Service (SMS) alerts are introduced to the automated tunnel monitoring system. With these enhancements, the measured data is automatically analysed by the right people and SMS alerts can be sent to the responsible personnel for corrective actions. As tunnelling works 24 hours a day and 7 days a week, any monitoring required has to follow the same tunnelling effort to avoid expensive construction delays.

The system consists of a state-of-the-art Leica Total Station which consist of contactless and wireless instruments capable of measuring X, Y and Z displacements, a Smart RTU, a GSM modem, and an

automatic computer system which receives the measured data. Measured data is automatically analysed, results are automatically e-mailed via the Internet to users, and SMS alerts are automatically sent to users when the movements exceed limits. This design is a fully automatic information push system from the remote site to the users to achieve the fastest information flow for time critical monitoring.

This system is fully automated and has been proven to be reliable. It is being used in most tunnel monitoring contracts in Singapore. ■