



APPLICATION SPOTLIGHT

MITE WIS™

INVOCON, INC.

19221 IH-45 South Suite 530
Conroe, TX. 77385

281-292-9903 (USA)

281-298-1717 (FAX)

www.invocon.com

Structural Monitoring in Tunnels – Invocon, Inc.

Invocon's Multiple-Input, Tiny, Enhanced Wireless Instrumentation System (MITE WIS) is currently being used to monitor repaired concrete sections of the Westerschelde Tunnel in the Netherlands. This tunnel under the Westerschelde River was opened in March of 2003 as an improvement to traffic flow over previous methods of crossing the river that were susceptible to bad weather or drawbridge delays.

The government requires strict controls over the construction and maintenance of these structures to insure that they will remain serviceable for 100 years or longer. Therefore, concrete repairs are being monitored to catch deterioration before it becomes a hazard.



Figure 1. Repaired Concrete Tunnel Section

Detecting problems in repaired sections is difficult in the tunnel because the sections are coated on the inner surface with a layer of high-temperature fireproofing.

As depicted in Figure 2, MITE WIS units are able to monitor the repair areas from underneath the fireproofing. The wireless communication capability of MITE WIS precludes the necessity for large cables to pass through the concrete. This maintains the integrity of the fireproofing by eliminating paths for heat to reach the primary tunnel wall.

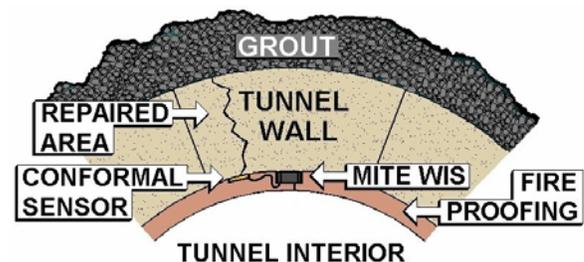


Figure 2. MITE WIS Installed in Tunnel

The MITE WIS units determine when a failure occurs by sensing strain variations across the boundaries of the concrete patches. Sampling three channels at once per minute, each unit can store up to three months of data. During monthly scheduled maintenance closures, data from the units is downloaded for post-processing. The wireless nature of the units enables the data to be gathered from difficult locations without the use of special equipment.

A significant challenge associated with instrumenting bored tunnels is the limited knowledge about their failure modes. The technology used to build these tunnels is relatively new, so they have not yet been fully characterized. The compact nature of MITE WIS enables it to be placed in practically any location throughout the tunnel. It is also flexible enough to interface to several types of sensors. These attributes provide a simple and effective means of gathering many types of data. The result will be a much more thorough tunnel characterization.

The low power, wireless nature of the MITE WIS system has significantly decreased the installation and operating difficulties for acquiring data in this application by eliminating the need for power and data cables and connectors.