

## Application Note Xia Men Tunnel Monitoring Project

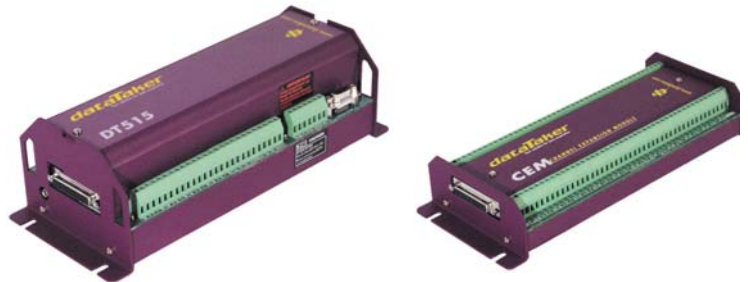
**Background:** Xia Men Tunnel is a subsea tunnel connecting Xia Men City and Xiang An in the Fujian Province of China. The tunnel is 8,695m long. The underwater length of the tunnel is 6,005m. At the deepest point the depth of the water is 70m. There are 3 tunnels, the two side tunnels are used for single direction traffic; the middle tunnel will be used for service, maintenance, emergency etc. The tunnels are designed for a maximum speed of 80km/h. The main tunnel is the longest undersea tunnel in China with a diameter of 13.5m and road width is 5m. The whole infrastructure is expected to cost is approximately 3.25 billion Yuan (USD 465 million). The project is now underway and will be complete in 2010. During the project, construction load is monitored allowing data to be collected for future projects and research.

### Customer Requirements

- 1) To monitor the changing strength of the tunnel typical structure
  - (a) Predict force state of tunnel structure in the future.
  - (b) Consequently evaluate the safety of the tunnel structure during designing benchmark period
- 2) To continuously analyze the total monitoring information
  - (a) To take effective engineering steps in advance
  - (b) Ensure safe operation
- 3) To monitor actual states of the tunnel during the construction process and for a period after completion.
- 4) Collecting information for the design and construction of an undersea tunnel project
  - (a) Accumulate experiences for later similar projects
  - (b) Supply basic monitoring information for scientific research

### Equipment

dataTaker DT515 data logger  
Channel Expansion Module  
Earthquake acceleration collection equipment  
Water level collection equipment



### Sensors

Roctest PWS wire pore water piezometer  
Roctest TPC total pressure cell  
Roctest JM-T vibrating wire jointmeter  
AGI TULIP 4-20mA single-axis tilt  
Roctest NIVOLIC WL water level indicator



### Datataker Solution

When the construction of the tunnel reached the underwater section remote monitoring is achieved. The transducers in Xiang An Tunnel long-term monitoring system includes vibrating

wire sensors, acceleration sensors, optical fiber and grating sensors, etc. The data collected will be manipulated and analyzed separately providing the clients with the information they require. As a result of environmental restrictions in the very early stage of the tunnel construction collection of the data could not be automated. The transducer cable was connected to a box in the corresponding section of the tunnel where the received data was read manually with portable frequency logger.

The monitoring of this project will indeed ensure the safety of the tunnels now and in the future. Future projects and research will also be beneficiaries of this wealth of information. Equipment and solution used in this project is provided by Datataker China Ltd.



If you need more detail please contact [joyce.reid@datataker.com.au](mailto:joyce.reid@datataker.com.au)  
Datataker Pty Ltd - 7 Seismic Court Rowville Victoria 3178 Australia  
Tel: 03 9764 8600 +61 3 9764 8600 Fax: 03 9764 8997 +61 3 9764 8997  
E-mail: [sales@datataker.com.au](mailto:sales@datataker.com.au) Web: [www.datataker.com](http://www.datataker.com)