



Case Study - Bridges

Highway Bridge SHM, M56 Motorway

Cheshire, UK, 2007-2008





Aim	Monitoring of strain, displacement and temperature on a post-tensioned concrete bridge constructed in the late 1960s. The bridge forms part of the UK's motorway network and carries slip road traffic at a busy intersection. The sensor system is being used to monitor the behavior of the bridge following recent remedial works.
Location	M56 Motorway, Cheshire, UK
System Integrator	Smart Fibres Ltd
End Customer	TRL Ltd
Date	2007-2008
Instrumentation	(1) Micron Optics, sm130 Optical Sensing Interrogator (Smart Fibres, 16-channel W5 system) (1) Micron Optics, sm041-416 Channel Multiplexor. Used for both static and dynamic monitoring.
Sensors	SmartPatch, SmartBridge, SmartTemp
Software	Smart Fibres' Smartsoft and Custom web based interface.
FBG Technology Benefit	High Multiplexing capability long-term stability



sm130, Micron Optics Optical Sensing Interrogator



Smart Fibres, SmartPatch



Smart Fibres, SmartBridge



Smart Fibres, SmartTemp



View of bridge from the M56 motorway.



Installation of sensors on the bridge deck.



Close up of deck displacement sensors.

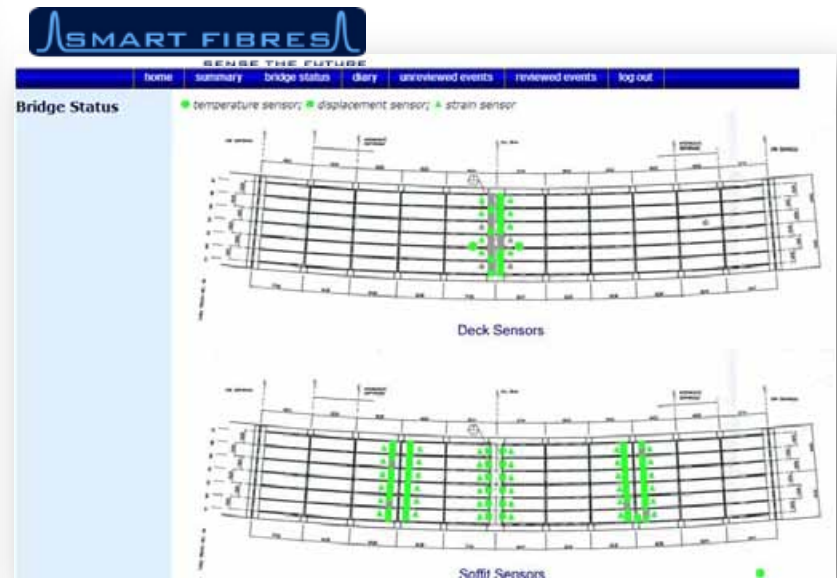
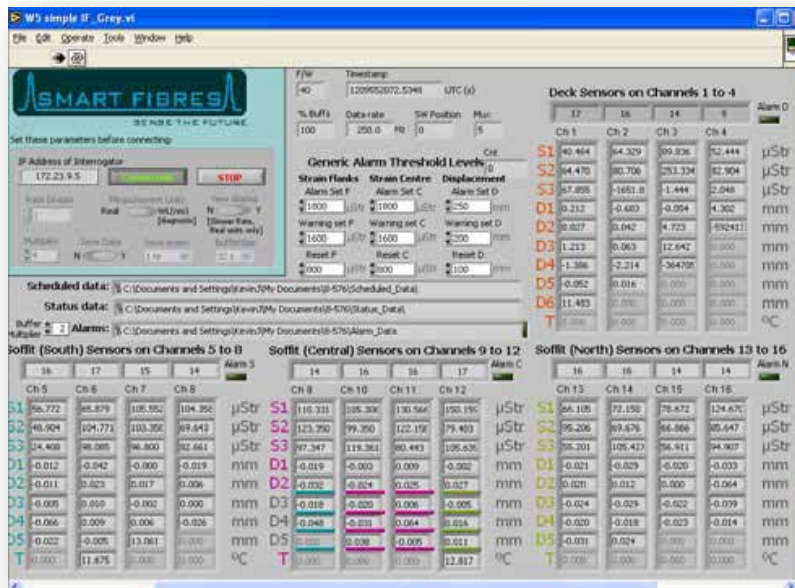


Soffit sensors installed.





Data available from site computer using SmartSoft suite of LabVIEW.





- Results
 - § The bridge is to be continuously monitored for a multi-year period using a network of 84 displacement sensors, 48 strain sensors, and several temperature sensors. Sensors were fixed both to the bridge deck and soffit. The sensors on the bridge deck were fixed in place, prior to the road surface being re-laid.
 - § Data is transmitted via a DSL connection to a remote website enabling the client to remotely monitor the status of the sensor network at any time. In its normal mode of operation the system monitors the quasi-static state of the bridge and uploads sensor data to the website at preset intervals throughout the day. The system is also able to automatically capture dynamic data at a rate of 250 Hz should pre-set trigger levels be exceeded.
 - § The long-term load trend analysis, and periodic dynamic load tests from the system will be compared with results obtained from a third-party Acoustic Monitoring System also installed on the bridge.

- Acknowledgements
 - § TRL Ltd
 - § Smartfibres Ltd.
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 - § Micron Optics, Inc.
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