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SIMoNET Structural Integrity Monitoring Network

Report on 18th SIMoNET Meeting “SIM for Offshore and Infrastructure”

Held at UCL on Nov. 5th 2008

Introduction

Dr. Paul Fromme introduced the seminar, welcoming those attending and briefly describing the background to the SIMoNET network. Brief details of the presentations are given below.

1. UK Forum for Engineering Structural Integrity Support

*Poul Gosney
FESI*

It was explained that FESI facilitates the dissemination of current developments in Best Practice for Engineering Structural Integrity between professional specialists in industry, business and academic communities, by providing Continuing Professional Development through Knowledge Transfer from seminars and workshops, international conferences, collaboration with National and International Organisations, representation on the Council of ESIS (European Structural Integrity Society) and the International Bulletin on Structural Integrity. The aim of ESIS is to continuously develop a knowledge base relating to all aspects of Structural Integrity with the objective of improving the safety and performance of engineering structures, components, systems and their associated materials. It holds regular International Conferences and Seminars. It also has a number of Technical Committees.

2. TSC StressProbe on gas pipelines

*Sylvain Cornu
TSC Inspection Systems*

It was explained that the objective of this project was to assess the capabilities of TSC's StressProbe technology in determining the loading in gas pipelines under a range of loading conditions. It is considered possible that the StressProbe technology could be applied both internally (from pig) and externally (during a dig). Pipelines are made from steel plate rolled up to give seam-welded pipe or from steel plate wound to give spirally welded pipe. In both cases the as-delivered pipe would have residual stresses but, given the nature of pipeline loading in service, these often disappear quickly. In service the applied loading and manufacturing process will give rise to several types of stress. These include residual stress, pipe distortion stress (PDS) and pressure tension stress (PTS). StressProbe will measure all of these stresses and often it is valuable to decouple the measurements to give an indication of the magnitude of both PDS and PTS. In order to do this it is necessary to measure the stress distribution around the pipe, identify the likely PDS and decouple this from the total stress so that the PTS can be identified.

Different trials to demonstrate this concept were done by TSC, including:

- test conducted at C-FER Technologies
- measurements at big Knife creek
- measurements on a pig trap
- trial in geologically active region involving measurements on two gas transmission pipelines

3. Review and appraisal of current structural integrity monitoring methods in the offshore industry

Philip May
Principal Engineer, Oil & Gas, ATKINS

Structural integrity monitoring is playing an increasingly important role in the justification of continued safe operation of aging offshore structures. The UK Health and Safety Executive recently commissioned a study to review and appraise current structural integrity monitoring methods in the offshore industry. This presentation summarises the findings of this review prior to publication of the HSE report.

4. Offshore Asset Key Performance Indicators

John Sharp
Cranfield University

Development of Key Performance Indicators (KPIs) has many benefits, particularly as a means of measuring the management of structural integrity in offshore installations. A number of quantifiable indicators have been proposed related to offshore hazards. These were described, together with examples of acceptance criteria. It was pointed out that it has proved difficult to propose quantifiable KPIs for all the main hazards e.g. foundation failure. It was explained that structural integrity monitoring has a role in developing KPIs, and some examples were provided. The use of KPIs to demonstrate life extension of ageing structures was also addressed.

5. Infrastructure monitoring recommendations

Philip Charles
Project Manager, CIRIA

This presentation provided an overview of the challenges facing asset managers in maintaining the in-service condition of ageing civil infrastructure assets and the requirements for the use structural monitoring techniques. This overview drew upon the extensive guidance produced by CIRIA in collaboration with industry practitioners over a number of years, which has led to the development of authoritative guidance on embankments, cuttings, embedded retaining walls, masonry arch bridges and iron & steel bridges. It was explained that this suite will shortly be expanded to include guidance on drystone retaining walls, tunnels as well as an overarching asset management guide.

6. Corrosion detection

Peter Haycock
SciSite

Electromagnetic means can be used as an NDE method to detect corrosion on reinforcing bars. Low frequency probes provide relatively simple data, but large data sets are required which often need computational intelligence techniques to extract useful information and, in complex structures, this could be enhanced by recourse to an expert system. A major advantage of a low frequency system is that it is not affected by the moisture content of the concrete. Microwave based methods can provide a more definitive signal with less interpretation involved, but the data in itself is more complicated and the equipment required is both more costly and less manoeuvrable; there are also issues with regard to penetration through wet concrete. Both techniques can be used as survey tools, but could also be embedded in new structures to provide a means of monitoring structural health.

7. Remote monitoring of infrastructure

Graeme Phipps
SP Property Services

SP Property Services is one of the largest independent suppliers of crack and level monitoring services in the UK. It is the market leader in the insurance sector and combines innovation with expertise – offering the latest sensory technology via a national network of monitoring technicians, engineers and surveyors. Working faster and smarter has always been the ethos for SP - it is at the forefront of latest developments in site investigation, testing and monitoring and is delighted to sponsor the Technical Updates workshops at this year's Subsidence Expo. SP's latest innovation (using Box architecture with Wireless Sensor Network technology) is remote data loggers which monitor the movement of any building or structure, accurate to 0.05 mm (50 microns). It was noted that SP believes it can cut down a typical claim cycle by 4 months, which in turn will reduce claims costs and handling times. The presentation covered:

- Introduction and overview of the crack and tilt sensor technology
- How it works
- Applications
- Comparisons with traditional methods
- Benefits and Stakeholder involvement (BRE / BGS / ASELB etc)

8. Laser-based NDT of civil engineering structures

Leon Lobo
Laser Optical Engineering Ltd., Loughborough University

Laser shearography is a non-contact interferometric technique used to measure the wholefield strain in a structure. Non-destructive testing of civil engineering structures using laser shearography not only provides the user with a defect detection solution but allows structural lifetime to be assessed. The wholefield strain within the structure can be measured and compared with finite element models enabling a feedback mechanism into the design process.

Conclusion

Professor Sharp closed the seminar, thanking those who had presented and those attending and reminded attendees of the next SIMoNET seminar in the spring.