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SIMoNET Structural Integrity Monitoring Network

Report on 19th SIMoNET Meeting
"SIM for Offshore and Infrastructure"

Held at UCL on April 22nd 2009

Introduction

Dr. Paul Fromme introduced the seminar and welcomed those attending. Brief details of the presentations are given below.

1. Offshore On-Line Monitoring for Structural Integrity

Ray McGlynn
Fugro Structural Monitoring

It was explained that On Line Monitoring (OLM) is not a new concept and has been used in the North Sea Oil & Gas Industry for over twenty years now. However as assets continue to mature world-wide, and operators' increasingly extend the life expectancy of these aging structures, in an attempt to maximise the profits from their dwindling fields, a greater awareness of the usefulness of OLM is emerging within the industry.

Fugro Structural Monitoring (FSM) has been at the forefront of this technology for nearly thirty years and has seen the changing attitude of industry, as improvements in sensor technology and data acquisition software, has allowed FSM to now offer industry a much simpler system, without any reduction in accuracy and capability.

The talk included some of FSM's more recent experiences and covered:

- Quick Overview of Principals of OLM.
- Regional 'drivers' for OLM use.
- Changing attitude of authorities and operators.
- Recent Case Studies of Use.

2. Ship Structure Monitoring using Guided Ultrasonics

Paul Fromme
Department of Mechanical Engineering, UCL

Many technical structures contain large plate-like components, which can suffer from severe corrosion and the development of fatigue damage during their service life. Permanent monitoring of such structures can be achieved using guided ultrasonic waves, which can propagate over large distances and allow for efficient nondestructive testing of such structures with limited access. Damage often occurs at or close to structural features, e.g., stiffeners welded to the hull plates of a ship. The sensitivity for damage detection close to structural features has been investigated by studying the combined interaction of the guided ultrasonic wave with defects and structural features.

3. Aerospace and Defence Knowledge Transfer Network

Sameer Savani
Operations Manager, Aerospace & Defence KTN

It was explained that Knowledge Transfer Networks are funded by the Technology Strategy Board (TSB) (a non-departmental public body sponsored by the Department for Innovation, University and Skills). They are a critical enabler in delivering the TSB's Connect and Catalyse Strategy. The Aerosapce and Defence KTN is a single overarching network across Government, Business and Academia in the UK to transfer knowledge with respect to Innovation and Technology within the aerospace and defence sectors. The KTN's broad objectives are:

- Delivering improved industrial performance through innovation and collaboration
- Making the UK more globally competitive for investment in research and technology
- Facilitating innovation and knowledge transfer across civil and defence sectors
- Improving coherency and effectiveness of industry in science, technology and innovation towards government

The KTN is the custodian of the National Aerospace Technology Strategy (NATS), an output of the Aerospace Innovation and Growth Team initiative between Industry, Academia and Government. The KTN leads processes to ensure currency, relevance and inclusivity of NATS. These processes distil into a set of detailed technology road maps, which are recognised and accepted by Ministers in both BERR and DIUS. The road maps inform the TSB and other agencies of the UK's R&T priorities within the sector.

4. SIMoNET Network

Paul Fromme, Department of Mechanical Engineering, UCL
and
John Sharp, School of Applied Science, Cranfield University

A brief review of the history of the SIMoNET network was given. It started in 1998 with funding from the Engineering & Physical Science Research Council, became funded by industry and government in phases 2 and 3. It was noted that Phase 3 was due to finish next year and extending the network into a phase 4 needed to be considered. Those attending were invited to provide views and comments which the committee would take into account at their next meeting.

5. Development of optical fibre sensors for structural health monitoring

Tong Sun
Professor of Sensor Engineering, City University London

The presentation reviewed the research activities undertaken in relation to the structural health monitoring in the Optical Fibre Sensor Research Group at City University London. The group has successfully developed a range of optical fibre sensors, which include distributed strain/temperature sensors, humidity sensors, pH sensors and chloride sensors, designed specifically to meet the measurement requirements arising from concrete structures.

6. Monitoring structures with non-contact optical techniques

Stuart Robson
Civil, Environmental and Geomatic Engineering, UCL

The presentation described non-contact optical techniques which have been used to measure and monitor structures for a number of years, both in laboratory and outdoor environments. It gave an outline of the available techniques and technologies and then focussed on several application examples to illustrate what could be achieved in practice. Examples were primarily drawn from civil and aeronautical engineering, but it was noted that the generic processes and tools required to solve problems in other domains were similar.

7. Fibre Optic Sensors – Research at Queens University Belfast and Commercial Aspects

Simon Grattan & Susan Taylor
Queens University Belfast & Sengenia Ltd

The presentation described a number of applications using fibre optical sensors to measure humidity and chloride in concrete. These included concrete blocks at different tide levels in Belfast Lock. A patented arch bridge system, based on pre-cast concrete methods was described, following from several years of research at QUB, together with development work with Macrete. A load tests on a bridge was described. A glass fibre reinforced reinforcement bar was also to be tested as part of a bridge.

It was also explained that Sengenia was a spin-out company from QUB, seeking to provide sensing and monitoring expertise specifically to the civil engineering sector. The presentation covered some of the business activities of Sengenia, discussing their novel fibre optic sensors, as well as details on the range of other applications that could benefit from this technology.

Conclusion

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