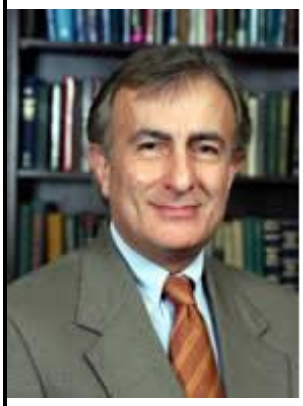
INTERNATIONAL SOCIETY FOR STRUCTURAL HEALTH MONITORING OF INTELLIGENT INFRASTRUCTURE

July 2012 ISHMII Membership Notes

President's Letter



Dear Members and Colleagues,

As we approach CSHM-4, in Berlin, Germany in November, I have asked our three Vice Presidents, Wolfgang Habel (Germany), James Brownjohn (UK) and Jinping Ou (China) to share the authorship of *Membership Note*s. They have been invited to be the Guest Editor in August, September and October, respectively. Each will offer his outlook on issues of significance to all of us as practitioners in the SHM fields. I am delighted that they will be able to do this as it allows members to get to know them better.

I also invite all of you to attend the CSHM-4 Workshop in Berlin as it is of exceptional importance to our Society. It is at this gathering that ISHMII will elect its next President.

This has been an important year for ISHMII. Our membership has jumped and we now distribute our *Membership Notes* and *The Monitor* to about 1,000 people. We weighed the growth of membership and early this year we felt it necessary for the Council to grow to reflect the balance in the organization between the founders of our field and those who follow in their footsteps as practitioners and researchers. We began by expanding the ISHMII Council and adding members who are in an earlier stage of their careers than the founders of our Society. Then, we added associate editors to the *Journal of Civil Structural Health Monitoring* and established an editorial board for *The Monitor* to encourage authors around the world to contribute to the *Journal* and *The Monitor*. In a separate article below, I am pleased to introduce the newest members of the ISHMII Council.

I would like to dedicate the July *Membership Notes* to a short report on my observations about civil structural health monitoring (CSHM) in China. I am sure that much has been written on the subject and CSHM in China is better explained by our Chinese colleagues. My observations come from a trip to Dalian University of Technology (DLUT) and to the Jiangsu Transportation Research Institute Co., LTD (JSTRI) in Nanjing. This was not merely a visit taken for the sake of wandering, but rather a planned trip that gave me the opportunity to talk with colleagues and observe first-hand as well as wonder at their accomplishments with an outsider's perspective. I thank my colleagues for their time and participation.

My trip was a part of an international project that involved the exchange of students and scholars of CSHM research between USA and China under the auspices of the National Science Foundation, Partnership for International Research and Education (PIRE) for five years. Over the life of the project, Professor Jinping Ou and his colleagues, Professors Jing Zhou and Hong Nan-Li of the Dalian University of Technology kindly hosted our students. I also had the pleasure of working with many of scholars and

faculty members from DLUT here in my laboratory at the University of Illinois at Chicago (UIC). The project has many fronts including basic research for the development of new sensors and the practical implementation of the sensors in infrastructure systems at sites in China and the USA. The primary objective of our project is to train the future practitioners, but we also share a goal of teaching them to work efficiently in international forums with colleagues of diverse cultural backgrounds, a vision conceived by the PIRE program and one that conforms to our ISHMII mission.

Professor Hong-Nan li and his students

The recent construction of many mega-span bridges has necessitated and expanded the use of monitoring of structural health as well as increased the range of products and services offered by a small number of niche structural engineering design firms in China. JSTRI is one such company. With this introduction, I like to provide you with examples of CSHM projects at DLUT and further introduce JSTRI, ISHMII's newest corporate member.

Dalian Sports Stadium under construction

One of the interesting projects undertaken by DLUT is the fiber optic instrumentation of the roof structure and supporting elements of the sports stadium in Dalian. The stadium is within the Dalian Sports Center complex. Currently under construction, it covers an area of 820,000 square meters. In addition to the sports stadium, the sports center is home to four other venues, namely the gymnasium, tennis courts, a baseball field, and a natatorium. The complex will be complete in time to host the matches of China's 12th National Games in 2013.

FBG sensors installed on the supporting elements with enlarged image (right)

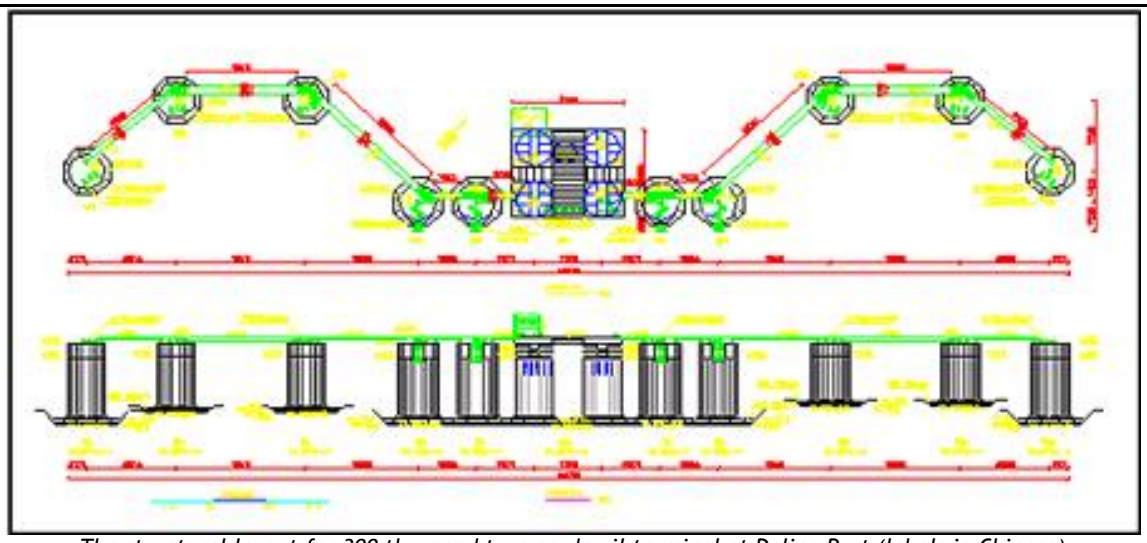
Prof. Hong-Nan Li's group placed FBG sensors in the roof's supporting structure during the construction. Their approach is to match the real-time strain and vibration data to the expected results through numerical modeling. The project is ongoing, and it is full of challenges. One of the obvious ones is that irrespective of serial multiplexing capabilities of FBG sensors, a robust sensor routing plan for the cables needs to be conceived for efficient and cost effective implementation and fault-free, long-lasting, real-time CSHM activities.

Prof. Hong-Nan li explaining the routing of the Fiber Optic sensor lead lines

This is not the only CSHM project at DLUT; many of you are familiar with the many accomplishments of Professor Jinping Ou of DLUT through his long-time work with sensors and offshore platform monitoring. I want to touch on another unique project conducted by Professor Jing Zhou's team in the Yellow Sea.

Shown here with a bridge model (left to right) are Dr. Tong Zhu, Prof. Jing Zhou and Dr. Xin Feng

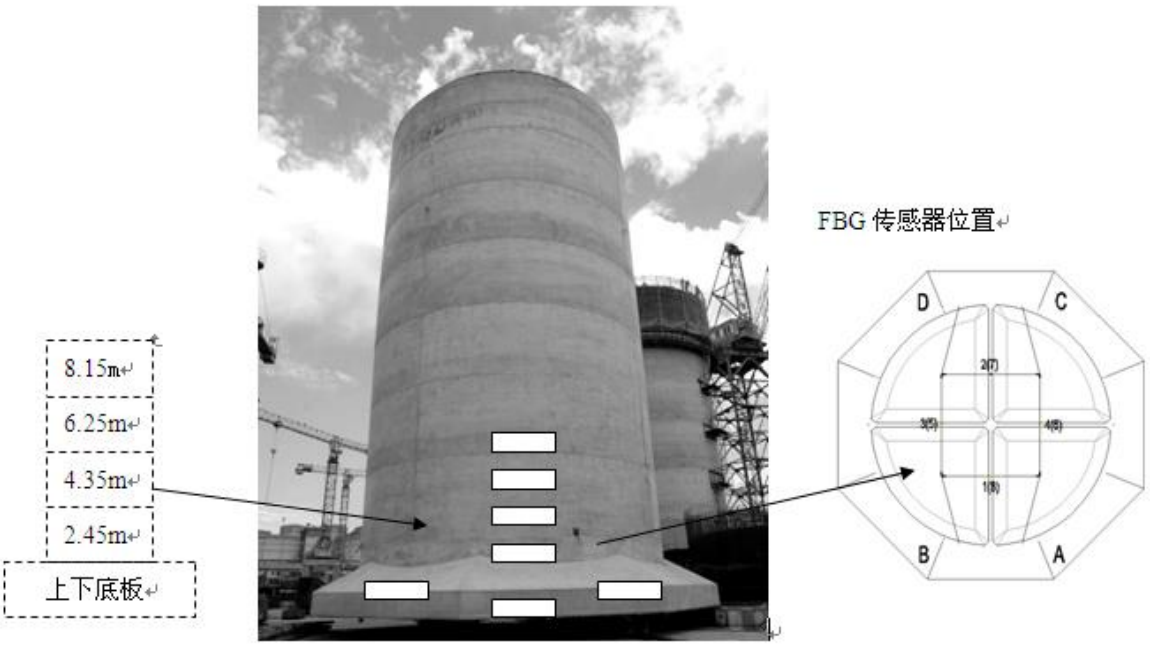
As background, Dalian is one of the primary crude oil ports in China; the annual crude oil capacity of this port is 19 million tons. Oil tanker traffic has grown in an exponential manner over the past few years, and therefore necessitated expansion of Dalian's crude oil terminal.



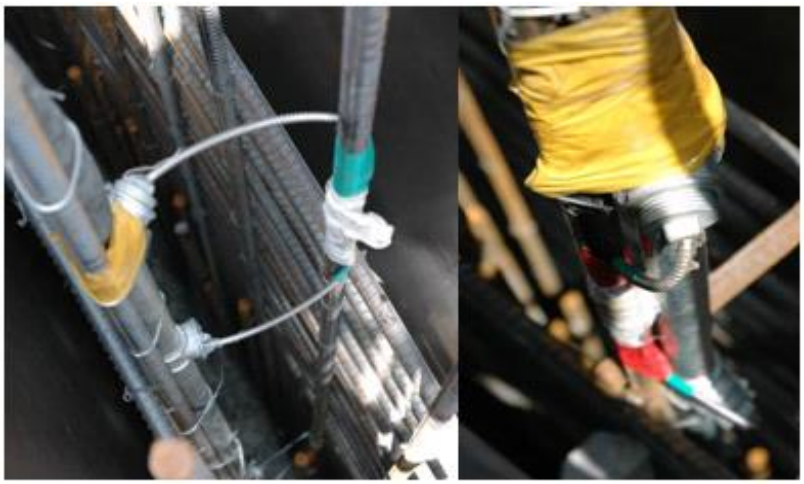
The structural layout for 300 thousand tons crude oil terminal at Dalian Port (labels in Chinese)

With the traffic, the number of accidents and damage to the terminals, especially the caissons due to tanker impact at docking rose to the levels that eventually called for monitoring of the extent of damage to the newly built terminal.

A typical caisson supporting the terminal



Sensor locations in the caisson



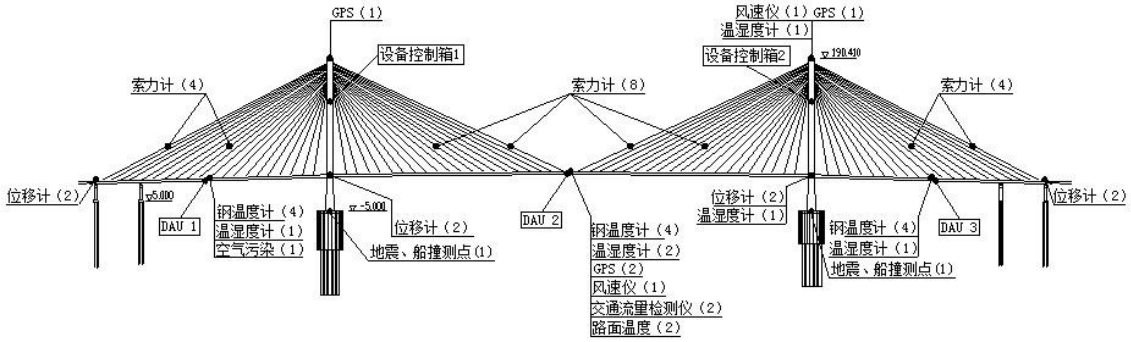
Installation and protection of FBG sensors in the caisson

Professor Zhou's group was able to install fiber optic sensors in side the concrete caissons supporting the terminals. The caissons were built and instrumented on shore and then towed to the location. In general, the caissons go as deep as 27 meters. The steel trestle shown to the right is an example of one of the terminals equipped with the real-time capability to report the tanker impacts and the full extent of damage done to its caissons.

JSTRI is a very large company. In addition to design and planning offices, it has high bay structural testing laboratories, over 4000 staff members, 400 of whom are in the bridge engineering department, and 50 staff engineers dedicated to CSHM. I had the chance to learn of some of their projects. They have designed and implemented CSHM systems for ten long span bridges, including six bridges over the Yangtze River. As part of the visit, I toured the Yangtze River Second Bridge. There, I noted the unique sensor designs at the expansion joints and visited the central monitoring station for the bridge.

Three of the larger span bridges currently being monitored by JSTRI are the Su-tong Yangtze River Highway Bridge, a1088 meter cable-stayed bridge at Jiangsu (Suzhou-Nantong), the Jiang-yin Yangtze River Highway Bridge, a 1385 meter suspension bridge located at Jiangsu (Jiangyin-Taizhou), and the north and south branches of the Runyang Yangtze River Highway Bridge at Jiangsu (Yangzhou-Zhenjiang). The north branch is a 406 meter cable-stayed bridge and the south branch is a 1490 meter suspension bridge.

The instrumentation is extensive as expected due to the size of the structures, shown below.



Nanjing Yangtze River Second Bridge instrumentation (labels in Chinese)

In most part, all of the bridges were instrumented with strain gauges, accelerometers, displacements sensors, and corrosion sensors, and temperature sensors in the structure as well as for ambient conditions, plus GPS and inclinometers. During staff presentations at JSTRI, I found out that their real time monitoring activities allowed them to provide valuable information to the bridge owners that resulted in expedited unscheduled maintenance and correction of some detailing flaws, i.e., the failure of expansion joints and locking of the supports.

I welcome JSTRI as a corporate member to ISHMII and I am looking forward in their active participation in our Society's activities.

With best wishes to all,

Farhad Ansari

RELATED NEWS

Fukushima Daichi

In the May 2012 *Membership Notes* I wrote about the nuclear disaster in the aftermath of the Tsunami in Japan. Some of you may have learned that recently a parliamentary panel in Japan blamed the disaster in parts to the government, agency regulators and the electrical power company that operates the plant. In the USA, on the other hand, the officials still cannot agree on a response to Japan's Fukushima Daichi accident. Questions have been raised as to whether the plants in USA are prepared to deal with rare but powerful natural disasters. Perhaps this is the time to re-evaluate the recurrence interval or the return

periods in design?

Industry Inspections of Pipelines and Bridges

In the US and Canada, both the pipeline and railroad industry are tasked with inspecting their own pipelines or bridges for safety concerns. I would like to mention two recent failures that bring the conversation about the lack of government oversight to the forefront and present to us the opportunity to consider how sensors and remote monitoring might change these situations.

This month, the US National Transportation Safety Board (NTSB) reported that a Canadian pipeline builder knew about but did not address cracks that resulted in the July 2010 leak of more than three million liters of oil into a creek over 17 hours before discovery and covered 56 kilometers of the Michigan's Kalamazoo River. The clean-up costs have exceeded $800 million US. Canadian environmentalists and legislators are watching plans for a $5.5-billion, 1,177-kilometre Northern Gateway pipeline constructed by the same company that will run from the oil sands to the West Coast. See the August 2011, Membership Notes for an earlier discussion of scour and pipelines.

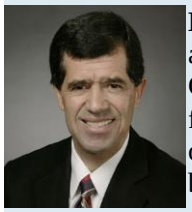
Twenty-eight cars of a freight train hauling coal derailed in suburban Chicago, IL (USA) on July 4, 2012. The railroad bridge that the train was crossing collapsed in the wreck, leading to calls for increased federal oversight of railroad bridge inspections. In this case, extreme temperature reaching 102 degrees F may have caused the tracks to warp, contributing to the derailment.

ISHMII Council Grows

With the induction of eight new members into the ISHMII Council as of July 1, 2012, the membership of ISHMII's leadership body has expanded to reflect ISHMII's demographics in a manner that is both geographic and age-based. These members include five distinguished, accomplished scholars with extensive resumes reflecting decades of experience. All participate in prominent, innovative SHM research and have a global perspective suited to work on behalf of ISHMII. Still in the early part of their careers, the younger members have also made significant contributions and represent the future of SHM and ISHMII. All have responded enthusiastically with promises to be attentive to the demands of Council membership.

We are pleased to introduce them.

As Dean and Distinguished Professor in the Faculty of Infrastructure Engineering, Dalian University of Technology (China), **Professor Hong-Nan Li** has built an extensive career that includes specialization in smart materials and structures, structural dynamics and control, and earthquake engineering and engineering vibration. He is the Vice Chairman of Advanced Materials and Structures, ASCE Aerospace Division and the Vice Chairman of China Panel of International Association for Structural Control and Monitoring. He is active in international cooperation with the United States, Japan, Australia and Korea.



Dr. Al Ghorbanpoor is the Associate Dean of Research, Professor of Civil Engineering and Director of the Structural Laboratory at the University of Wisconsin - Milwaukee, College of Engineering and Applied Science (USA). He works in the area of experimental fatigue and fracture mechanics focusing on non-destructive testing and evaluation, design of buildings and bridges, and failure investigation. Also a consulting forensic engineer, he brings an extensive portfolio of industrial experience to his academic career.

Professor Bin Shi, Nanjing University School of Earth Sciences & Engineering (China), is president of the Nanjing University High-Tech Institute and director of the Department of Geological Engineering and Geoinformatics and the Center for Engineering Monitoring with Opto-Electronic Sensing (CEMOES). His expertise is in the field of fiber optic sensors and monitoring of geo-technical materials and he has demonstrated leadership in professional societies concerned with hydrogeology, geology and geotechnology and landslides.

An expert on concrete dams and earthquake engineering, **Dr. Jing Zhou** is a Professor in the Faculty of Infrastructure Engineering, School of Civil Engineering at Dalian University of Technology (China). A prominent leader of SHM in China, he represents a significant tradition in SHM research focused on massive infrastructure. In the past 10 years, he has completed more than 50 projects in the inspections and SHM of the bridges, pipelines, dams and other structures. Dr. Zhou is the past-Dean of this School.

As a professor in the School of Civil Engineering, Dalian University of Technology (China), **Dr. Zhou Zhi** is well-recognized for contributions to the design, development and deployment of fiber optical sensors, and their implementation of these sensors into real structures. This has had a significant impact on the development of SHM and his efforts have resulted in the successful initiation and execution of China-US, China-Russia, and China-Korea collaborations in SHM. Prof. Zhou is the Chinese representative to RILEM and is part of the committee charged with the standardization of fiber optic sensors.

Dr. Branko Glisic became an Assistant Professor at Princeton University (USA) following an 8-year engineering and research career in Europe. He specializes in SHM methods for civil structures and infrastructure, data management and analysis, advanced sensing technologies, smart structures including deployable and adaptable structures, and innovative structural systems. He is an associate editor of ISHMII's electronic magazine, *The Monitor*.

Associate **Professor Frank Moon** is on the faculty of the Department of Civil, Architecture and Environmental Engineering at Drexel University (USA) and the Drexel Intelligent Infrastructure Institute. Dr. Moon is a leading member of the Long-Term Bridge Performance program in conjunction with the US Department of Transportation. He is a rising researcher in the forefront of health monitoring technology deployment and removal of implementation barriers.

Dr. Jian Zhang, a Professor at the Southeast University (China) International Institute for Urban Systems Engineering, has broad international affiliations. His work in sustainability for urban infrastructure, system identification and SHM, static and vibration field tests of large scale structures, novel information technology applications for structural engineering, and modeling for nonlinear dynamic systems and shaking table test has drawn the attention and respect of collaborators in China, Japan, USA, and Europe.

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The main markets are structural health monitoring in Civil Engineering, Energy and Aerospace Industries.

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WORKSHOPS AND CONFERENCES

SMT 2012 New York City
LaGuardia Marriott Hotel
August 21-24, 2012

SMT 2012 (Structural Materials Technology) NDT/NDE for Highways and Bridges.

SMT 2012 is co-sponsored by ISHMII. This conferences promotes the exchange of information between national and international researchers, practitioners and infrastructure owners on the application of Nondestructive Evaluation (NDE) and Nondestructive Testing (NDT) technologies for the condition assessment of highway infrastructure.

On August 24, 2012, a workshop on "Remote Sensing for Infrastructure Management" will introduce infrastructure stakeholders to remote sensing.

For more information, contact Conference Chair Dr. Sreenivas Alampalli.

Come to CSHM-4

Berlin

November 6-8, 2012

SHM Systems Supporting Extension of the Structure's Service Life

Visit the CSHM-4 Web Site

CSHM-4 is an official Workshop of ISHMII. Members may register at a reduced price.

Conservation of Heritage Structures

The Proceedings of CSHM-3 are now available in the Knowledge & Education Center at ISHMII.org

SMT 2012 Program On-Line Registration

OSMG 2012
Nanjing University, China
October 2012

4th OSMG-2012: International Forum on Opto-electronic Sensor-based Monitoring in Geo-engineering.

CALL for Papers: Deadline is July 1, 2012

OSMG 2012 On-Line Registration

PLSE 2012

PLSE 2012 Hong Kong
December 5-7, 2012

First International Conference on Performance-based and Life-cycle Structural Engineering (**PLSE 2012**).

PLSE 2012 On-Line Registration

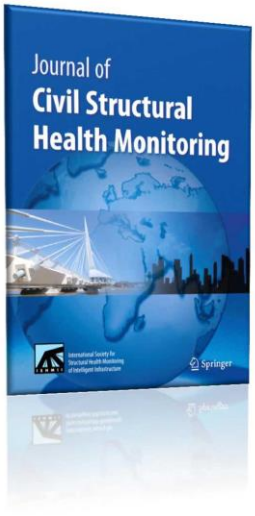
MODERN
Monitoring Developments for Safe Repository Operation and Staged Closure

MoDeRn International Conference and Workshop, Luxembourg
March 19-21, 2013

The MoDeRn Project announces the International Conference and Workshop - Monitoring in Geological Disposal of Radioactive Waste.

Abstracts for Papers now being considered.

SMAR 2013



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This is a reminder that in these times of heightened internet security you may need

Istanbul, Turkey
September 9-11, 2013

Second Conference on Smart Monitoring, Assessment and Rehabilitation of Civil Structures.

SHMII-6 Hong Kong December 2013

ISHMII invites you to attend the 6th International Conference on Structural Health Monitoring of Intelligent Infrastructure, SHMII-6.

SHMII-6 2013 is organized by the Department of Civil and Structural Engineering, The Hong Kong Polytechnic University.
Details are available at shmii6.2013@polyu.edu.hk.

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New preferred email address? Please let us know that, too.

CREDITS AND APPRECIATION

Photographs by Farhad Ansari and colleagues at the various sites with this exception:

Photograph of the steel trestle concrete infilled arches of the Dalian port is found at http://english.runsky.com/2011-10/13/content_4050082.htm

Article on the NTSB report about the 2010 oil leak is found at **http://www.cbc.ca/news/world/story/2012/07/10/enbridge-oil-spill-michigan.html**

Article on and photograph of the July 2012 derailment is found at http://chicago.cbslocal.com/2012/07/09/cleanup-of-fatal-glenview-train-wreck-resumes/