

## **The Seventh International Symposium on Field Measurements in GeoMechanics (FMGM-2007) A Wrap-up**

***W. Allen Marr***

The Seventh International Symposium on Field Measurements in GeoMechanics opened with two short courses and a workshop on Sunday, October 23, 2007. Each full-day short course, one on instrumentation and the other on inclinometers, had over twenty participants. Forty-five people from more than ten countries participated in the workshop, "Innovations in Instrumentation, Installation and Data Acquisition." Workshop leader, Dr. Barry Christopher described the goal of the all-day session to provide a forum to present the latest practical instrumenta-

tion technology and an opportunity for participants to exchange ideas and to answer questions. Barry summarized the main points of the day's work as: (1) wireless technologies are the future, (2) fiber optic sensors will come to geotechnical engineering as the technologies are now well established in other fields, and (3) there is a lot of interest in a common data exchange format for instrumentation, such as the one presented by called "DIGGS" (Data Interchange for Geotechnical and Geoenvironmental Specialists). An informal sampling of participants in Sunday's activities indicated great sat-

isfaction with the day's events and encouraged more of these in the future.

### **Invited Theme Lecturers Set the Stage**

The technical program opened on Monday morning with welcomes and introductions. Jerry DiMaggio introduced the three main themes for the conference: State-of-the-Art and Future Trends, Case Studies and the Business Side of Instrumentation. Eight invited lecturers and eighteen technical sessions would focus on these themes. Jerry then invited me to deliver the keynote lecture titled "Why Monitor Per-

formance?" My key point was that effective performance monitoring can save money by helping to reduce risk. I gave an example of the Central Artery/Tunnel project where performance monitoring during construction of this \$15 billion project decreased the risk exposure from damaged property and construction delays by more than \$500 million. I argued that performance monitoring must be a part of every risk management strategy for constructed facilities. I urged the instrumentation community to more clearly define and document the purposes and benefits of instrumentation in terms that non-technical people can understand.

Monday's theme lectures highlighted geotechnical instrumentation used to provide early warnings and monitor safety of major earthworks. Elmo DiBiagio described his work to provide an early warning system to villages downstream of a massive earthen dam created by an enormous landslide. Professor Leung reviewed several major excavations made in Singapore with the aid of geotechnical monitoring systems.

Tuesday's theme lectures examined state-of-the-art monitoring technologies with applications to long term monitoring of bridges, dams, supported excavations and seabed logging for petroleum exploration. We had the opportunity to hear the latest word on bridge

performance monitoring from Ian Friedland of the U.S. Federal Highway Administration, who is helping lead the failure investigation into the collapse of the I-35 bridge in Minneapolis. Ian emphasized the growing realization that significant bridges must be monitored throughout their lives and the monitoring effort must include the substructure as well as the superstructure. James Stowell of Leica Geosystems illustrated the marriage of GPS and automated total station systems to monitor  $\Delta x$ ,  $\Delta y$ ,  $\Delta z$  movements to sub-millimeter accuracy. Richard Finno presented his team's efforts to use real-time monitoring data to update numerical predictions of future performance. Their aim is to develop ways to use measured performance from the early stages to improve the reliability of predictions of final performance. John Løvholt described a major advance achieved by geotechnical instrumentation professionals working in petroleum exploration. The success resulted from marrying high resolution geophysical surveys with advanced signal processing software to locate geological features with a high probability of containing gas.

Wednesday's theme lectures considered data evaluation and use of data to help manage risk. Giorgio Pezzetti and his associate, Alessandro Fasso, used advanced statistical methods to identify specific changes in measured perfor-

mance masked within a time stream of data with daily fluctuations from temperature. Ton Peters showed how a program of performance measurements was a key part of a major effort to minimize damage to major historic structures in Delft that might result from the cessation of deep pumping.

The theme lectures set the tone for the more specific topics and discussions that occurred in the technical sessions. A major success of the conference was that all but two of the 105 authors showed up and delivered their presentations. All papers and three of the eight theme lectures plus the keynote lecture are available on CD from ASCE as Geotechnical Special Publication 175. Electronic copies of all of the theme lectures are available online at [www.fmgm.no](http://www.fmgm.no).

#### Exhibits for What's Happening

Instrumentation manufacturers are a core component of the geotechnical instrumentation team. Thirty two of the premier suppliers of monitoring instrumentation and systems participated in the symposium. The exhibits were of outstanding quality with great graphics. The hall was packed and many people lingered well after the intended closing time to learn what's new in gadgets, exchange ideas, and catch up with old friends. My casual observations revealed a lot of emphasis on remote data logging with wireless data transmission and systems to deliver data to a personal computer quickly. Lunch and breaks were provided in the exhibit hall to encourage more interchange among symposium participants and the exhibit area was located immediately adjacent to other symposium activities. The Organizing Committee had hoped to make the exhibits and vendors an integral part of the symposium and we were successful.

#### What Did We Learn?

The Organizing Committee pulled representative participants from the symposium into a panel for the wrap-up session and asked them to comment on their take home messages from the symposium. John Zagaj of U.S. Federal Energy Regulatory Commission noted that



*Helmut Bock, from Germany, contributing to the wrap-up session.*



FMGM Attendees in Exhibit Hall.

there are many technologies in use that get customized to the application. One must know the limitations of each. He suggested there might not be enough testing of systems and software for high reliability. Art Hoffman of Gannett Flemming described the situation where lots of data exist that mean something to us but are white noise to our clients. He stressed the need for us to talk about the value of instrumentation in terms our clients can understand. He feels the future is bright in the infrastructure business for monitoring.

Elmo DiBiagio of the Norwegian Geotechnical Institute has witnessed the transition of focus from sensors to systems. He predicts future focus will be on the entire system and more automation to get meaningful data directly to the user. He also sees monitoring systems playing an important role in risk management. John Dunicliff got value from participating in the technical sessions, schmoozing with colleagues, whale watching and cheering the Red Sox to a win at Fenway Park.

Doug Baker of BC Hydro found lots of ideas from the symposium to take home and help him with his sweeping review of their dam monitoring systems. A big driver to him for more automation of instrumentation is the shortage of qualified manpower. Joel Volterra of Mueser Rutledge Consulting Engineers valued the opportunity to develop relationships within the instru-

mentation community. He lamented the difficulties convincing colleagues and clients of the value of instrumentation and appealed to the participants to provide more cases that show the direct benefits of monitoring programs.

Jerry DiMaggio of US Federal Highway Administration summed up with the view that instrumentation and monitoring have a fantastic opportunity in the infrastructure market. He urged us to broaden our language to include considerations of several high priority words prevalent in the transportation industry today: risk management, sustainability, life cycle costs and interdisciplinary communication, cooperation and coordination.

**What's Next for FMGM?**

A one-hour session at the end of Tuesday focused on the future of FMGM. Elmo DiBiagio of the Norwegian Geotechnical Institute and key participant in all past FMGM symposia reviewed the history of FMGM and the FMGM web site ([www.fmgm.no](http://www.fmgm.no)). Elmo expressed a desire to identify ways to maintain the future viability of the FMGM symposia and web site as he transitions to retirement. Dr. Joerg Gattermann of Technical University of Braunschweig, Germany, announced his willingness to organize FMGM-2011, to be held in Germany and to take over the management of the FMGM web site. This action received enthusiastic applause from those in attendance. Professor Colin Leung then suggested that we should expect to see strong interest for Asia to organize FMGM-2015. There were also suggestions that FIGES (Federation of International Geo-engineering Societies) and ISSMGE (International Society for Soil Mechanics and Geotechnical Engineering) be looked at as possible homes for FMGM going forward.

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