

# CONFERENCE REPORT

# DYNAMIC EXCHANGE

The location for the Stresswave conference was well selected based on the amount of driven piling that could be seen on the drive from Kuala Lumpur International Airport to the conference venue in Petaling Jaya.

Held every four years since 1980, the main focus of the conference, organised this year by the Institution of Engineers Malaysia, has grown from dynamic pile testing to encompass both integrity and rapid load testing methods such as Statnamic.

The question that might be asked is why the conference is still needed when the use of dynamic pile analysis has been commonplace since the 1960s? Where do the challenges of the future lie?

Under the theme "The millennium challenge" some answers came from 58 technical papers and eight special lectures by authorities in industrial and academic practice.

In his keynote address George Goble, one of the pioneers of dynamic pile testing and formerly of GRL Engineers, highlighted the need for continuing development such as incorporating pile setup in analysis. He related how current dynamic pile testing practice in the US is often of poor quality, being done by operators who do not understand the tests, and followed by poor quality reporting of results.

He advised that for increased confidence in dynamic analysis where pile ultimate capacity is required, analysis must be automated and user intervention reduced. User intervention is often levelled as a criticism of dynamic pile analysis (*GE* September 2000).

Although most of the conference focused on the analysis of driven piles, attention was given to more recent developments such as integrity testing and rapid load testing.

In his special lecture on three-dimensional stress wave analysis of pile integrity tests, Professor YK Chow of the National University of Singapore described how problems can be encountered using 1D analysis where the pile head to impact hammer ratio is large. This can result in non-uniform pile head strain and 3D effects that can be interpreted as pile defects.

Report on the seventh international conference on the application of stresswave theory to piles, held in Kuala Lumpur, 9 to 11 August 2004, by Michael Brown, University of Sheffield.



Analysis also pays little regard to the presence of pile reinforcement that may become critical with the increased use of mini or micro piles.

Using 3D analysis he showed that to minimise 3D anomalies, the receiving accelerometer used during integrity testing needs to be at 40% of the pile radius for piles of 400mm to 800mm and at 50% radius for 1.6m diameter piles. Where piles are heavily reinforced, equivalent material properties based upon the "equivalent" pile section must be used in 1D analysis.

Peter Middendorp of Profound spoke about the wealth of experi-

ence in wave equation analysis using the method of characteristics. He described how various types of dynamic pile analysis methods had previously been compared such as TNOWAVE, DYNPAC and CAPWAP using the same input data.

The methods showed very similar total pile resistances but there were significant differences in the toe and skin friction load distributions. To avoid this user influence, he endorsed Goble's backing of the automatic signal matching facility.

However, Middendorp expressed reservations about a fully automated system and used "cruise control" as an analogy to how he felt automatic signal matching should be used.

The motorist starting their car and driving it to the motorway, equates to manually setting up the analysis by input of their own material properties. At that point they can switch to automatic analysis, or engage cruise control. He or she then pulls off the motorway and drives to their final destination; this translates as taking over the analysis and coming up with the final result.

The conference included several papers dealing with Statnamic pile testing including a special lecture by its inventor Patrick Bermingham.

He described research at the University of South Florida where velocity and displacement soil damping models are being developed.

This links to the work by the University of Sheffield which reported a new method for the analysis of Statnamic tests in clay soils. On the topic of damping in clays, Victor Chin, formerly of Monash University, Australia, presented a paper on results of a study into the viscous damping response of pile-clay interfaces. To undertake this work, Chin developed a high speed shear box capable of shearing rates up to 1.6m/s.

Garland Likins, president of Pile Dynamics, presented a 20 year review of correlations of CAPWAP with static load tests, based on results published in the Stresswave proceedings and industrial databases.

For 303 cases the average CAPWAP to static load test ratio for failure loads was 0.98 with a coefficient of variation of 0.169, although

Likins did comment that greater scatter was encountered in complex soils.

To improve the accuracy of prediction of the long term service load, he advised that at least six days should be allowed to elapse between installation and dynamic restrike. Richard Yu of Soil Dynamics (Malaysia) asked how valid these findings were as they were based on published conference papers where people would not wish to publish poor correlations. Yu asked that in future people should be less reluctant to publish data.

One of the most engaging special lectures was by Julian Seidel of the civil engineering Department at Monash University, who swapped the standard PowerPoint for a software based presentation around an expanding mind map that acted as an excellent summary of the conference.

Seidel posed a long list of questions and challenges for the future of the industry and the conference.

For industry there is a need for better training to avoid the misuse of dynamic testing and interpretation technology. Results of his operator certification exams showed a 19% failure rate for data acquisition and a 42% failure rate for data interpretation.

For future conferences he suggested there was a need to attract more young active researchers who could be set challenges and offered guidance by an expert panel. He also asked that industry make more money available for research and allow greater access to the wealth of accumulated field test data.

Offering an interpretation of what The millennium challenge actually meant, Seidel said better research, better professional practice, including specification and site procedures, and better training and certification.

● The 8th Stresswave conference will be held in September 2008 in Lisbon, Portugal. Contact Professor Jaime Santos (jaime@civil.ist.utl.pt).

Michael Brown is SUBR:IM Consortium manager at the groundwater protection and restoration group, department of civil and structural engineering, University of Sheffield.