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HONGWEI XIA, PHD (2008)

MUD LOSS DURING DIRECTIONAL DRILLING

RESEARCH SUMMARY

HYDRAULIC FRACTURE EXPERIMENTS WITH DAVID ELWOOD (MSC, 2008)

FINITE ELEMENT ANALYSIS USING ABAQUS TO INTERPRET EXPERIMENTS

NEW CLOSED FORM SOLUTION TO PREVENT BLOWOUT IN CLAY

IMPROVED SOLUTION TO PREVENT BLOWOUT IN SAND

2D AND 3D CALCULATIONS FOR PILOT HOLE DRILLING AND PULLBACK

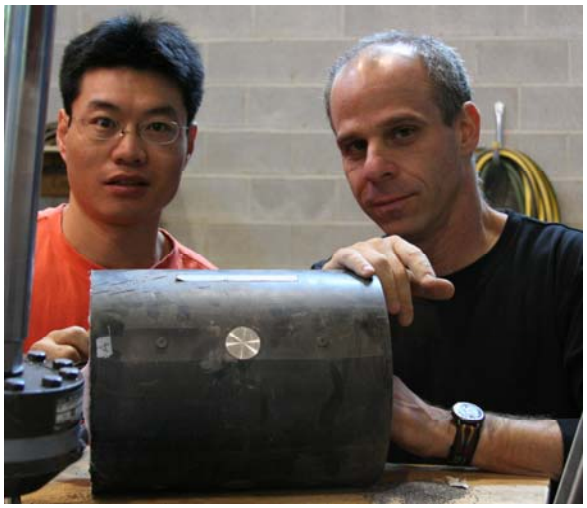
MEASUREMENTS OF CONSTRUCTION EFFECTS ON HDPE PIPES

HIGHLIGHTS

- **5 publications to date including 2 Journal papers.**
- **Runner up in NASTT graduate student poster competition, No-Dig conference, San Diego, 2007**
- **Commenced position with EBA Engineering (Edmonton, AB) in January, 2009**

Horizontal directional drilling creates a route for a new pipe, stabilizes the cavity using drilling mud, enlarges it using reaming, then pulls a new pipe into place. Project success depends on avoiding mud loss during drilling from ground fracture ('fract-out') and blowout (unconfined plastic flow).

Hongwei Xia has used two and three dimensional finite element analysis to produce solutions for mud pressure limits during pilot hole drilling and pull-back, considering mud loss in both clays and sands. His work explains the importance of the initial stresses in the ground (in particular, the ratio of lateral to vertical ground stresses) and the relative importance of fracture and blowout. Experiments conducted in collaboration with David Elwood (MSc, 2008) provide the first measurements of limiting mud pressures in sands, demonstrate the effectiveness of Hongwei's new solutions for maximum mud pressure, and confirm the inadequacy of past practice.



Hongwei (left) with Dr Mark Talesnick of Technion, Israel during Dr Talesnick's visit in 2006.

EARTH PRESSURES ON PLAIN HDPE PIPES

Dr Mark Talesnick of Technion in Haifa, Israel visited in the summer of 2006 to assist with the use of his novel contact pressure sensors in projects involving buried flexible structures. These sensors use active control of air pressures to balance contact pressures from the surrounding ground, so avoid arching (conventional sensors deform under load, and deformations influence earth pressures reaching the sensor). Measurements quantify the effect of compaction on soil pressure distributions on buried pipes. The work is under review for Geotechnique.

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