The Geo Engineering Centre

Depth Beyond Knowledge™

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ABDUL CHEHAB, PHD(2008)

RESEARCH SUMMARY

NEW POLYETHYLENE MODELS TO CALCULATE CYCLIC RESPONSE

STRAIN RECOVERY MODELED DURING PULLED-IN-PLACE PIPE INSTALLATION

3D FINITE ELEMENT ANALYSIS TO CHARACTERIZE THE GROUND STIFFNESS

MODEL GIVES DISTRIBUTION OF AXIAL FORCE ALONG THE PIPE

MODEL GIVES FORCE DURING AND AFTER INSTALLATION

CONSIDERS CYCLIC AXIAL LOADS AND EFFECT OF VISCOELASTIC RECOVERY

HIGHLIGHTS

- **Analysis provides axial forces over the service life, and predicts effects of construction history**
- **Conservative value of long term axial force is half the maximum pulling force**
- **Four journal papers submitted for publication**
- **Hired by Golder Associates of Whitby, Ontario; now with NSCC Intl Ltd of Adu Dhabi, U.A.E.**

AXIAL LOAD DISTRIBUTION AND HISTORY FOR HDPE PIPES INSTALLED BY DIRECTIONAL DRILLING

During installation of a High Density Polyethylene (HDPE) pipe by horizontal directional drilling, the polymer pipe is subjected to cyclic axial stress and strain, as each drilling rod is removed from the drill string. It then experiences periods where the ends are free, then has total length that is constant over its service life (after it is fixed to appurtenances).

Abdul developed a new viscoelastic-viscoplastic constitutive model for HDPE, and developed new computational procedures to calculate axial forces during and after installation. The model accounts for the time dependent response of the HDPE, and provides the distribution of axial force along the pipe during construction and over its entire service life. The analysis provides peak axial force in-service (near the centre of the pipe), and decreases in magnitude over time. Soil stiffness is incorporated based on stiffness calculated using three dimensional finite element analysis.

Abdul inspecting a pipeline rehabilitation project in Gananoque, Ontario, an excursion organized by the Queen's University Student Chapter of NASTT, 2006.

NSERC DOCTORAL SCHOLARSHIP AND ATTENDANCE AT TRENCHLESS COLLOQUIUM IN SYDNEY, AUSTRALIA

Abdul's outstanding graduate course grades and his publication record earned him an NSERC PGSD doctoral student scholarship.

Abdul was also funded to attend the 8th International Trenchless Technology Colloquium in Sydney, Australia (2006), a meeting of trenchless researchers held every year or two preceding the international No-Dig Conference .

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