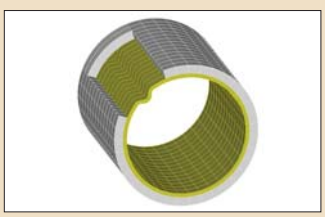
Trenchless Technology Center Newsletter
MARCH 2005

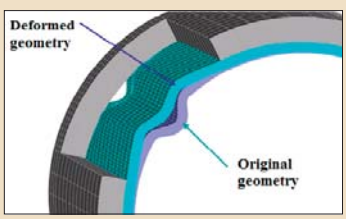
Impact of Longitudinal Folds on Pressure Rating of CIPP Liners

The effect of longitudinal folds in fiberglass-reinforced CIPP liners resulting from the oversizing of the liner in fully deteriorated cast-iron water distribution pipes has been studied over the past 12 months at the Trenchless Technology Center. The study involved an extensive numerical modeling using 3-D finite element (FE) models (Figure 1).

The numerical models have been verified by comparing their predictions with measurements taken during pressure tests on specimens exhumed from a recently rehabilitated 70-year-old cast-iron pipe. Predictions from the FE model were also compared with results given by the analytical solution presented in ASTM F 2207-02. The predictions from the FE models were found to be in close agreement with both the experimentally measured values and the values given by ASTM's analytical solution.

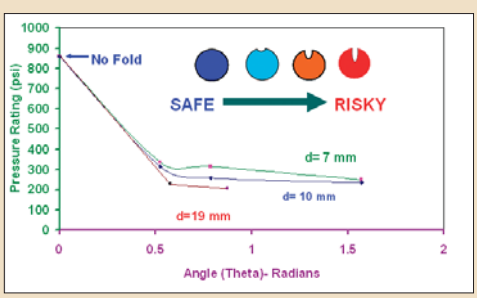


(Figure 1) 3-D FE model of a fully deteriorated lined cast-iron pipe.



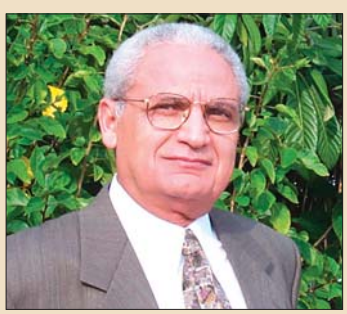
(Figure 2) Initial and final geometries of a longitudinal fold in a GRF CIPP liner subjected to internal pressure.

Following verification of the model, a parametric study was conducted to perform an extensive sensitivity analysis to evaluate the stress concentration in the fold as a function of the fold geometry and the applied internal pressure (Figure 2). It was determined that, in cases when the location of the longitudinal fold coincides with a gap in the wall of the host pipe, a significant reduction in the pressure rating of the liner (up to three fold) can occur due to significant strain concentrations in the fold's region. Sample results for one gap geometry are shown in Figure 3.



(Figure 3) Pressure rating of CIPP liner bridging a gap in the host pipe as a function of the geometry and size of the longitudinal fold.

Based on the analysis, a guideline concerning the maximum allowable over sizing ratio of the virgin liners was proposed. This provides an empirical expression that corrects the pressure rating predicted by ASTM F 2207-02 to account for geometrical imperfections in the form of longitudinal folds as a function of the size of the gap in the host pipe and the over-sizing of the virgin liner. For more information, contract Dr. Allouche or Arun Prakash at (318) 257-4072 or E-mail *allouche@latech.edu.*



Barsoom becomes director of TTC Municipal Forum program.

Joe Barsoom, who retired at the end of January after 35 years of service to the City and County of Denver, has been named director of the Trenchless Technology Center's Municipal Forum program. Barsoom, who served as the director of engineering for wastewater management in Denver, is registered professional engineer and land surveyor and has a master's degree in civil engineering from the University of Colorado.

Among his many accomplishments and awards, he is the chairman of ASTM F17 Committee and the founder and past chairman of F17-67 Trenchless Technology Subcommittee. Barsoom is chairman of the TTC Industry Advisory Board and was the *Trenchless Technology* Person of the Year in 2000. He is a recipient of the ASTM Award of Merit, which is the highest society award granted to an individual member.

Because of his long experience in municipal trenchless applications and his long ties to the TTC, Barsoom was a natural fit to take over the management of the TTC's municipal forum program. The regional forum program has continued to grow and provide a unique means for public works personnel to share their experiences with the successful and not so successful use of trenchless technology and to learn collectively about the various trenchless techniques. However, the growth of the program, the cost and time required to organize and travel to the meetings and the increase in the overall TTC research program has

stretched the center's ability to give each forum the attention that it has deserved.

Barsoom started in his new role Feb. 1 and he will be working part-time, based at his home in Denver. He will be responsible for the organization and development of both existing and new municipal forums together with the financial management of the forum program as a whole. The TTC charges municipal participants only a nominal fee of $20 for the one-day sessions, which include lunch and refreshments and looks to industry sponsorship of presentations and the forum organization to make the program break even.

Industry participants attend only in the morning session of each forum leaving the public works participants to freely discuss issues in the afternoon session.

The currently planned forum program for the first half of 2005 includes forums in the following locations:

March 9 – Thornton, Colo.
March 10 – Tacoma, Wash.
April 29 – Orlando, Fla.
May 10 – Los Angeles
May 12 – Ruston, La.
May 17 - Cincinnati
May 18 - Atlanta
June 9 – Austin, Texas

If you are a public works employee interested in attending a nearby forum or a company interesting in presenting at a forum or if you wish to help create a new forum in your area, please contact Joe Barsoom at *jbarsoom@comcast.net* or Jadranka Simicevic at the TTC at *jadranka@latech.edu*.

LMK Enterprises, O'Donnell Associates Join IAB

Continuing the strong growth of the TTC Industry Advisory Board, TTC is pleased to welcome Larry Kiest, president and CEO of LMK Enterprises Inc., as an industry member and Hugh O'Donnell of O'Donnell Associates as a consultant member.

LMK Enterprises was founded in 1993 by Kiest and for more than a decade has produced trenchless solutions focused on the rehabilitation of sewer laterals. LMK offers a one-piece lateral lining system and mainline joint seal that is launched from the mainline. You can learn more about the system and company activities at the LMK Web site (*www.performanceliner.com*).

O'Donnell is a 1963 B.S. graduate and 1965 M.S. graduate of civil engineering from Louisiana Tech University who is one of the pioneers in the development of the HDD industry. He is a recipient of the Louisiana Tech University Distinguished Civil Engineering Alumnus award in 1991 and currently works in his own consulting firm, O'Donnell Associates. O'Donnell was also one of the founding participants in the TTC Industry Advisory Board when he was with Spie Horizontal Drilling Inc. It is very good to welcome him back.

Sterling Receives Louisiana Engineering Foundation Award

TTC director Ray Sterling received the Faculty Professionalism Award for 2005 from the Louisiana Engineering Foundation at the annual meeting of the Louisiana Engineering Society in New Orleans in February. This award is given annually to an engineering faculty member in each of the Louisiana universities with accredited engineering degree programs.

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Trenchless Technology Center

Louisiana Tech University
Director: Dr. Ray Sterling

Secretary:
Carol Hilton

Mailing address:
P.O. Box 10348
Ruston, LA 71272-0046 USA

Phone: (318) 257-4072
Toll Free: (800) 626-8659
Fax: (318) 257-2777

E-mail: ttc@engr.latech.edu

Web site for TTC:
http://www.ttc.latech.edu

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