

ICPTT 2009

ADVANCES AND EXPERIENCES WITH PIPELINES AND TRENCHLESS TECHNOLOGY FOR WATER, SEWER, GAS, AND OIL APPLICATIONS

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON
PIPELINES AND TRENCHLESS TECHNOLOGY 2009

October 18–21, 2009
Shanghai, China

ORGANIZED AND CO-SPONSORED BY
The Pipeline Division of the American Society of Civil Engineers (ASCE)
China-U.S. Joint Center for Trenchless R&D at CUG
China Society for Trenchless Technology (CSTT)
Center for Underground Infrastructure Research and Education (CUIRE)

EDITED BY
Mohammad Najafi
Baosong Ma

ASCE *American Society
of Civil Engineers*

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RESTON, VIRGINIA 20191-4400

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Foreword

This International Conference on Pipelines and Trenchless Technology (ICPTT) was held on October 18-21, 2009, in Shanghai, China, and was organized by the China-U.S. Joint Center for Trenchless Research & Development (CTRD) at the China University of Geosciences-Wuhan and the Center for Underground Infrastructure Research and Education (CUIRE) at The University of Texas at Arlington. The conference was co-sponsored by the Pipeline Division of the American Society of Civil Engineers (ASCE) and the China Society for Trenchless Technology (CSTT). Other co-sponsors of the conference were:

- ◆ The U.S. National Science Foundation (NSF)
 - ◆ China Association for Science and Technology
 - ◆ The Ministry of Land and Resources P.R.C.
 - ◆ Geological Society of China
 - ◆ China University of Geosciences (Wuhan)
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-

The conference received 347 abstract submissions, in which 227 excellent papers were finally published in these *proceedings* and presented at the conference. The success of this conference is a result of the volunteer efforts of a large number of dedicated professionals including authors, reviewers, session moderators, sponsors and members of the Conference Steering Committee. All papers were peer reviewed by at least one reviewer and are eligible for discussion at the *ASCE Journal of Pipeline Systems – Engineering and Practice* and are also eligible for ASCE Awards. The high quality of papers presented is due to obvious efforts of the **Authors**, who contributed results of their many years of experience and studies. We were privileged

to have the opportunity to work with an enthusiastic group of pipeline professionals including **Authors, Session Moderators, and Reviewers** who provided a great service to our profession.

The dedication and hard work of ASCE staff, especially Verna Jameson, Administrator, Technical Activities, John Segna, Director, Technical Activities Department, and Donna Dickert, Production Coordinator, Books & Reprints, are greatly appreciated.

Special thanks go to all the conference sponsors, exhibitors as well as the College of Engineering, China University of Geosciences-Wuhan, China Society for Trenchless Technology, for providing the necessary resources and support towards this conference. In particular, we wish to acknowledge and appreciate the efforts of Shaoxiong Wang, Peng Guo, Yaozu Kong and others from Wuhan UnderNet Trenchless Technology Company for collecting the papers and Kosha Vinodbhai Shah, a graduate research assistant with CUIRE at The University of Texas at Arlington, and graduate research assistants (Benke Shao, Hua Shen, Pinghe Sun, Lianghui Wu, Biao Shu, Yehai Zhao, Ningning Chen, Zhengjun Bu and Haitao Lan) from the College of Engineering, China University of Geosciences-Wuhan, for formatting the papers in accordance with ASCE guidelines.

On the behalf of the International Conference on Pipelines and Trenchless Technology (ICPTT 2009) Conference Committee,

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Contents

Integrated Asset Management

A System for Rehabilitation Planning of Infrastructure Projects	1
Yoojung Yoon, Wonjin (JB) Kang, and Makarand Hastak	
Analytic Mode for Predicting the Failure Risk of Pipeline System	17
Cong Zeng and Baosong Ma	
Evaluation of Non-Destructive Methods for Condition Assessment of Culverts and Their Embedment	28
Chenguang Yang and Erez Allouche	
Integrity Management System Model Design and Development for New Oil and Gas Long-Distance Pipeline	39
Xingyu Peng, Zhang Peng, and Risheng Song	
The Remaining Life Prediction of Buried Pipeline Based on the Maximum Extreme Value Distribution	50
Kejiang Han, Jian Shuai, and Zhongliang Jiao	
Integrity Assessment and Management of a Long-Distance Pipeline in China	59
Jian Shuai and Xiao-lin Wang	

Condition Assessment

Best Practices in the Condition Assessment of Water Transmission Mains	66
Xiangjie Kong and Brian Mergelas	
Dynamic Testing Analysis and Treatment of Suspended Pipelines through the Lower Yellow River	74
Tongtao Wang, Xiangzhen Yan, Xiujuan Yang, Jianjun Wang, and Qingzhi Yan	
Energy Loss Analysis and Conservation Potential Prediction for the Pipelines Network of Oil and Gas Gathering and Transferring System	84
Qinglin Cheng, Hailian Zhou, and Tao Yu	
Hyperbaric Welding Maintenance Techniques of Subsea Pipeline	94
Long Xue, Tao Lv, Yong Zou, Zunguang Guo, and Lili Xu	
Longitudinal Condition Assessment of Exposed Pipelines Encased in Concrete Box in a Riverbed	102
Jong Hwa Won, Moon Kyum Kim, Young-Ho Woo, Tae Min Kim, and Won Joon Lee	
Modified Methods on Testing Roughness Coefficient of Water Pipes in Urban Water Distribution Network	114
Shihu Shu, Lanying Kang, Ming Zhao, Jingyang Yu, Hongbin Zhao, and Kun Yang	

The Estimation to the Service Life of Casing in Salt Formation	124
Zhonghui Li, Yishan Lou, Liang Zhu, Zheng Tian, and Yunchuan Lei	

Leak Detection and Monitoring

A New Approach to Solve the Problem of Pipeline Plugging by Gas Hydrates during Oil Production	136
Qi Song, Shuli Wang, Zhi Zheng, and Huijun Yu	
Application of Oil Pipeline Leakage Detection and Location System Based on Negative Pressure Wave Theory	148
Enbin Liu, Changjun Li, Shanbi Peng, and Jiangang Sun	
Application Research of the Correlation Detection in Ship Pipeline Leakage Detecting	156
Zhongbo Peng and Lin Yang	
Case Study of Urban Water Distribution Networks Districting Management Based on Water Leakage Control	164
Shan Wu, Xiaohong Li, Shiwen Tang, Yuwen Zhou, and Kegong Diao	
Detection of Small Leakage of Long Distance Natural Gas Transporting Pipeline Based on Airborne Laser Equipment	176
Ke Li and Zhenlin Li	
Fast Leak Detection and Location of Water Pipelines Based Using Orthogonal Wavelet Transform	186
Seyed Masoud Taghvaei	
Feasibility Study on Pipeline Leakage Detection under Pressure Testing Using Numerical Inversion Technology	193
San He, Yongli Zou, Zongming Yuan, and Maoze Jiang	
Infrared Temperature Measurement and Simulation of Temperature Field on Buried Pipeline Leakage	203
Guozhong Wu, Fenfen Song, and Dong Li	
Pre-Study of Leaking Fault of the Oil Pipelines in Maowusu Desert Areas	210
Ruihua Yuan	
Study on Real-Time Detection of Pipe Bursts with Simulation and Management System on Water Distribution Networks	217
Hui Zhang, Tinglin Huang, Meihua Cao, and Wenjie He	

Pipeline Inspection

Gas Transmission Pipeline Defect Detection Based on New Intense Magnetic Memory I LI Tool	224
Lan Zhang, Laibin Zhang, Jianchun Fan, Dong Wen, and Yunhang Jia	

Multi-Layers Wavelet Kohonen Neural Network Model for Underground Pipeline Coating Detection with Galvanostatic Transient Technique	230
Zhiming Gao and Shizhe Song	
Recognition of Environment for Navigation of Gas Pipeline Inspection Robot Based on Monocular Vision System	240
Y. W. Zhang and G. Z. Yan	
Research about Magnetic Pulse Detection Method of Annulus Multi-String Damage	252
Rui Deng and Fanshun Meng	
Scheme and Key Technology Research of Internal Defects Positioning of Oil and Gas Pipelines	261
Zegen Wang, Jinzhu Wang, Linlin Duan, Dongliang Zhang, and Long Xiao	
Study on Comparison and Selection and Application of Pig in Long Distance Pipeline	272
Guofeng Du, Bijun Sun, and Yan Zhao	
Study on the Unstable Geological Factors of Oil Gas Submarine Pipeline in Shallow Sea Shelf Area	281
Yongchen Xu, Jianzheng Wu, Longhai Zhu, and Nan Wang	
The Exploitation and Application of a Pipe Track Detector in HDD	296
Pinghe Sun and Xiaoming Wu	
Three-Dimensional Detection of Space Trajectory in Flexible Pipe by Trenchless Technology	304
Yule Hu, Xiaoming Wu, Yang Xia, Jian Xu, Shouzhi Chen, and Genlan Chen	

Pipeline Planning

Application of Fuzzy Neural Network in Optimal Design of Methane Drainage Pipeline System in Coal Mine	311
Kaiqing Li	
Design and Implementation of Optimizing Operation System of Sulige Gas Field Pipeline Network	317
Wu Liu, Yuan Xu, Yi Liu, Denghai Wang, and Guang Yang	
Dynamic Response of Underground Pipeline to Incident Body Waves	325
L. F. Jiang, S. X. Chen, and X. C. Xu	
Establishing a Pathway for Achieving Water Utility Infrastructure Management Excellence	335
Tom Iseley and Olga Lucia Vargas-Lamanna	
Multi-Objective Parameters Optimization Design of Oil-Gas Gathering and Transportation Pipe Network	350