Presentation of MTM Inspection Technology at Gas/Electric Partnership Workshop

- Pipeline Inspection
- Pipe Locators
- Diagnostic Equipment
- Corrosion and Ecological Monitoring

Houston, TX February 09, 2007
MTM INTRODUCTION

What is MTM (Magnetic Tomography Method)?

- Innovative non-intrusive, non-contact method of inspection for pipelines constructed with ferrous materials
- Provides 100% inspection of pipeline material
- In commercial use from 2001 (over 6200 inspected miles)
MTM INTRODUCTION (cont.)

- **MTM Fundamentals:**
  - Identifies and analyzes magnetic field anomalies in areas with stress concentrators due to:
    - Defects or changes in structural conditions
    - Excessive mechanical stress
    - Combination of the above

- **Intents of MTM:**
  - To define locations of pipeline material anomalies
  - To predict the cause of anomalies and forecast the need for follow-up actions
  - To evaluate corrosion situation
MTM DISTINCTIONS

- Does not require any contact w/inspected pipe
- Does not introduce any external signal
- Different approach in achieving the goals of pipeline inspection:
  - Non-parametrical (Rating of anomalies by a risk factor)
  - Direct measurement of amplitudes in stress levels
MTM ADVANTAGES

- **Does not require:**
  - Advance preparation other than clear walking path
  - Changes in operating conditions

- **Suitable for any pipeline regardless:**
  - Type of construction (elbows used, coating, CP)
  - Type of medium transported
  - Presence of flow

- **Does not magnetize the pipe**
- **Reveals wide group of anomalies**
- **Efficient means of follow-up monitoring**
Identifies the following Groups of anomalies:

- Metal Loss
- Crack-like Defects
- Geometry Changes (loss of stability)
- Discontinuity
- Weld Anomalies
- Stress-strained Condition
- Other Anomalies (features, mechanical damage)

Supplemental Data:

- Corrosion Prediction
# MTM Commercial Experiences

<table>
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<tr>
<th>Country</th>
<th>Service</th>
<th>Pipe Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUSSIA</td>
<td>Gas pipelines, CS’s</td>
<td>4” to 56”</td>
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<tr>
<td>UZBEKISTAN</td>
<td>Gas pipelines</td>
<td>28” to 56”</td>
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<tr>
<td>MOLDOVA</td>
<td>Gas pipelines</td>
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<td>BYELORUSSIA</td>
<td>Underwater crossings</td>
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<td>ARGENTINA</td>
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<tr>
<td>MEXICO</td>
<td>Oil pipeline</td>
<td>20”</td>
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<td>UK</td>
<td>Water pipeline</td>
<td>14”</td>
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<tr>
<td>CROATIA</td>
<td>Gas pipeline</td>
<td>20”</td>
</tr>
</tbody>
</table>

**To date: ~ 6,200 miles inspected total**
MTM FINDINGS

– Geometry Changes:
MTM FINDINGS (cont.)

– Stress-Deformed Condition

Ravine’s slope

Soil pressure

Wash out under the gas pipeline w/total length of 120 feet
MTM FINDINGS (cont.)

– Metal Loss
MTM FINDINGS (cont.)

– Metal Loss
MTM SPECIFICATIONS

- Linear Accuracy: ± 5 feet
- Angular Accuracy: ± 45 Deg
- Max Data Recording Speed: 16 feet/sec
- Min Crack-like defect (length × opening), inches: 3/8”x 0.012”
- Does not reveal anomalies without stress concentrators:
  - wall loss under 5 % and over 95 %
  - artificial defects
  - pitting corrosion w/dia under 1/8 in.
MTM SPECIFICATIONS (cont.)

- Maximum distance from the scanner to inspected pipeline: 15 pipe diameters
- Maximum wall thickness: no limits
Questions?