HDPE PIPELINE INSPECTION PRESENTATION
Conventional and Advanced NDT and Inspection Services

Oil and Gas, Refinery, Petrochemical, Heavy Industry, Mining and Power Plant

Over 400 personnel including more than 300 inspectors

Thailand headquarters with International expertise since 1979
Presentation Overview

HDPE used as Tailings Lines for mining
• Erosion in HDPE lines
• Dacon’s involvement
• HDPE Pipe Development

ILI Recovery at Sea

Inspection Accuracy
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• Inspection Report for H4 Hybrid
HDPE
USE AS TAILINGS LINES FOR MINING
Erosion in HDPE Pipes

Since mines started using HDPE lines for Tailings transport, erosion in the bottom of these lines have been an issue.

A leak was found in 2005 and a program to inspect and verify the pipe condition before it becomes critical has since been in place.
Dacon Inspection Services first started testing Intelligent Pigging for HDPE pipes in 2001 and conducted the first commercial inspections in 2004. More than 150 hundred commercial inspection runs in large diameter HDPE pipelines has been completed by end of 2009.

The technology Dacon utilizes has been specially developed for HDPE and plastics material and provide unequaled accuracy and inspection coverage.

This enables HDPE Pipeline owners to accurately verify the condition of any line in regard to remaining wall thickness, damages and integrity of the pipeline. Thus enabling full Fitness For Service (FFS) and integrity studies of these lines.
HDPE Pipe Development

- Until 2006 Tailings Lines were 46.5” 85 mm HDPE
- From 2006 Tailings Lines were 48.0” 110 mm HDPE

<table>
<thead>
<tr>
<th>Year</th>
<th>Erosion groove width</th>
<th>Approx. erosion rate</th>
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<tbody>
<tr>
<td>2005 - 2006</td>
<td>25 - 40 cm</td>
<td>3 mm/month</td>
</tr>
<tr>
<td>2006 - 2007</td>
<td>20 - 30 cm</td>
<td>5 mm/month</td>
</tr>
<tr>
<td>2008</td>
<td>10 - 25 cm</td>
<td>11 mm/month</td>
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Above values are approximate values based on multiple inspections and worst location.
INSPECTION ACCURACY
Inspection Accuracy

Based on what was learnt from the correlation between actual thickness and ILI data interpreted thickness, it is clear that the thickness accuracy is quite close to real world thickness. Some variations will always be encountered due to the physical configurations and/or damage/disfiguration to the pipe. The worst case variation in Line “A” using the highest and lowest differentiation that was indicated in the above table will set a margin of error at: ± 4 mm.
Data Comparison vs. Actual Condition

Normally 3 ILI tools is used for each inspection, each of these generating over 80 million thickness measurements.

These measurements are plotted in both 2D and 3D.

Every one meter of pipe typically gets approx. 25 000 measurements.

Since 2007 a new inspection and analyzing software was introduced to ease the post inspection verification.
Inaccuracy Contributors

There are several factors that contribute to making the data less compatible, these include:

- Due to the curvature of the groove internally, most measurements have to be taken from the outside using PTNNT’s hand.
- Externally on the 10 sample joints there are quite severe scraping marks which also prevent measurements in many locations.
- The thinnest location in most joints is exactly at the joint. However, due to the external pipe overlap at the joint, combined with toe-in creep, measurements cannot always be made at the absolute thinnest point.

**Left side:**
Illustration of the toe-in creep seen externally at a Joint 1. Red line indicates the straight line.

**Left side:**
Internal joint, deflection of angles caused by erosion, exactly at joint itself.
Remaining Thickness for H3

Average thickness from ILI 1, 2 & 3. Thickness in mm, distance in meter.

Individual ILI data overlaid. Thickness in mm, distance in meter.
Inspection Report for H3

Typical joint C Scan

Joint 65 C Scan
Inspection Report for H3

Typical B Scan of nominal groove.

Typical B Scan secondary erosion
• Note: The first part of the graph is for the new line and the thickness is here 100% (not yet used).

• The second half is the old process line (36 PE001H3) with erosion groove. The spikes coming down from the general graph is each joint, which typically are 10-20 mm thinner then the adjoining part.
The general erosion groove in the offshore section of the pipe varies in depth between 55 to 70 mm remaining wall thickness and is 250 –300 mm wide and runs the entire length of the old pipe.

- Each 15 meter section of pipe typically appears to have 2 “extrusion marks” approx. 90 apart. These marks are typically 250 mm (10”) wide each and are easily seen in each pipe as back wall loss. There are slight offsets at each joint.
Inspection Report for H4 Hybrid

**Typical B Scan** (pipe cross section) with no erosion groove

**Typical B Scan** with erosion groove
ILI RECOVERY
AT SEA
ILI Recovery at Sea

Current Method for ILI recovery at sea:
Diver jumps into the sea to attach hoisting slings around the ILI. The ILI is then hoisted onto boat deck.
How Can We Help?

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Thank You