The ultimate guide to UNPIGGGABLE PIPELINES
Contents

Editor's letter 3
What is an unpiggable pipeline? 4
Why is it important that pipelines are maintained? 5
Tool matrix 6
Case study 1: extending the lifespan of unpiggable pipelines 8
Case study 2: in-line inspection in a low flow/low pressure situation 10
Company profiles 12
Frequently Asked Questions 14
Checklist for unpiggable tools 15
About the publishers 16
At the 2013 Unpiggable Pipeline Solutions Forum, recently held in Houston, semantics had a surprising relevance as the debate moved towards dropping the word ‘unpiggable’, and replacing it with ‘challenging’, ‘difficult-to-inspect’, ‘not-easily-piggable’, and similar epithets. Those who might be considered the traditionalists won the day, however, and the consensus view supported continued use of the original adjective.

While this might seem a trivial issue, the fact that there was any sort of debate about how to describe such pipelines is significant, as it demonstrates how far the inspection industry has moved in recent years. With internal-inspection technologies ranging from free-swimming tools, tethered tools, and robotic tools, to a number of external-inspection solutions, the inspection industry has at least 16 separate techniques available to suit both onshore and offshore applications, as can be seen summarised in this e-guide. Using one or more of these options means that almost all pipelines previously considered as unpiggable can be inspected with a degree of accuracy commensurate with that of piggable lines.

Most of the difficulties posed by imprecise geometry have been resolved, or at least are well-known enough to be soluble, as a consequence of the enormous efforts that many pipeline operators have made to remove obstructions, smooth-out awkward bends, and replace heavy-wall valves. Quantifying the lengths of unpiggable versus piggable pipelines is currently not possible; however, a recent survey presented by the Interstate Natural Gas Association of America (INGAA) shows that the proportion of its members’ pipelines that are piggable has increased from 20 per cent in 2002 to 64 per cent in 2012, which gives a concrete indication of how much effort has been expended.

In the recent past, unpiggability was ascribed to pipelines with geometry issues such as tight bends, mitred bends, or varying diameters, or pipelines who’s location made them inaccessible, such as those at river and road crossings. While these types of problem no longer cause the same levels of concern that they did only a few years ago, other issues – which may be considered to be more ‘advanced’ – are coming to the fore, which present a different, non-geometric, type of challenge. These include flow (too much, or not enough, or even zero), the inability to take a line out of service, no launch or receive facilities, and lack of knowledge about the line’s condition (not to mention where it is actually located). Quite often lines that are challenging in this regard are short and of small diameter – maybe infield or gathering – although this does not detract from their importance and the need to ensure their integrity. In the past, such lines may have fallen outside the scope of government regulations, although in a number of jurisdictions this also is changing.

The dream is for a tool that can enter into a previously-unpigged line and fully inspect it to the same standard as a piggable line, despite the fact that the line has not been cleaned and its geometry is unknown. This is certainly only a pipe-dream at present; however, as the spotlight of risk-reduction, zero tolerance of leakage, and maintenance of total integrity, focuses more directly on unpiggable pipelines, the inspection industry – as represented by the companies reviewed in this guide – will undoubtedly respond and, through investment and lateral thinking, develop solutions that really will remove ‘unpiggable’ from the lexicon.

Kind regards,

John Tiratsoo
Editor-in-Chief
What is an unpiggable pipeline?

The term ‘unpiggable,’ while having no universally accepted definition, best describes pipelines that are difficult to inspect internally with conventional in-line tools such as smart pigs. There are a number of ways in which a pipeline is characterised as difficult to inspect. These are described below.

Small diameters
The size, or diameter, of the pipe can be restrictive to pigging tools, since most pigs are designed to travel through larger-diameter pipelines (12 inches and above). Some companies now offer pigs specifically for smaller diameters, and this has expanded the inspection options for pipeline operators.

Other physical characteristics that pose challenges to pigging:
- Multi-diameters
- Small diameters with tight bends
- Fabricated (‘mitre’) bends
- Thick- or thin-walled pipe
- Repair sections in a different size
- Over- or under-sized valves.

Bends and connections
Bends and connections can cause a pig to get ‘stuck’. Examples of problematic bends/connections include:
- Back-to-back bends
- Unbarred tees
- Y connections
- Short-radius or mitred bends
- Deadlegs, crossovers, and laterals.

Recently, pigs have been developed with more agility to help them pilot their way through these configurations.

Flow and access
The flow within a pipeline affects pigging, as without sufficient product flow a pig is more likely to stall or become stuck. The internal cleanliness of the pipe can also cause problems with movement inside the pipe. Companies have developed processes to help with these issues, such as pigs that physically clean the pipe, or chemicals or gels that can be pumped through the pipe for the same purpose.

Below are examples of pipelines with flow or access restrictions:
- Difficulties of access (such as offshore platforms, subsea)
- Low or no flow
- Cleanliness of the pipe
- Pipeline without a pig launcher or receiver.

There must also be sufficient access facilities at each end of a pipeline section in order to launch pigs into the line and retrieve them following a cleaning or inspection run.

Older pipelines
Other restrictions on pipelines are related to how the pipeline was constructed, especially in older, longer pipes. There has been some research and development devoted to enabling pigs to travel longer distances and navigate through some of the restrictions listed below:
- Cased road or river crossings
- Bore restrictions
- Steep and vertical sections
- Installations such as plug valves, dead ends, offtakes, etc.
In-line inspection (ILI), such as pigging, is an important process to maintain the integrity of a pipeline. ILI tools are used to survey the pipeline and assess failure risks such as corrosion, blockages or leaks. These inspections can also help uncover important information about the pipeline and fill ‘gaps’ of knowledge.

The impacts of pipelines that are not inspected can lead to a number of problematic scenarios including pipeline failure. With proper and scheduled maintenance of pipelines you decrease the chances of the pipeline failing. While some cases of pipeline failure are more extreme than others – for example the fatal San Bruno incident – it is still important that they do not fail at all if possible.

As mentioned in the Editor’s welcome, there has been discussion that pipelines aren’t ‘unpiggable’ and more ‘difficult-to-inspect’ so operators can no longer use it as an excuse to not pig their pipelines.

In the March 2013 edition of Pipelines International P-PIC Chairman Dr Keith Leewis explains that since the US San Bruno incident, the public and regulators have questioned the completeness, comprehensiveness, and validation of some of the original pipeline mill and construction records, especially in high-consequence areas (HCAs). In some cases where records are incomplete, owners and operators have been required to complete a number of sampling excavations and inspect the exposed pipe in the bell hole.

The mill and construction records are needed to determine where residual threats exist and if there is a possibility of interactive threats if deterioration mechanisms may be active.

In addition, the validity of the original construction hydrotest records that established the maximum allowable operating pressure (MAOP) for pipelines in HCAs came into question. ILI is looked upon as a technical solution to validate questionable pressure-test documentation. The industry has started a research and development (R&D) programme to show that off-the-shelf ILI tools will be able to complete or validate these record gaps.

A magnetic-flux leakage (MFL) inspection could be sufficient to find those extra-large mill defects that would be expected to fail a pressure test at 125 per cent MAOP. The alternative is to conduct a hydrotest to 125 per cent MAOP when any of the original records are found to be questionable.

This R&D programme will use free-swimming tools and is expected to be validated by in-the-ditch inspections followed by some hydrotests. Note that these successes translate directly to unpiggable segments to be used wherever mill and construction records are in question.

The contents of this guide will help validate these efforts and identify ways in which companies are able to overcome obstacles for their ILI programmes.

The impacts of pipelines that are not inspected can lead to a number of problematic scenarios including pipeline failure. With proper and scheduled maintenance of pipelines you decrease the chances of the pipeline failing.
Service providers with abilities to examine pipelines that cannot utilise traditional ILI technology (in market & shown with current capabilities)

<table>
<thead>
<tr>
<th>Service Provider</th>
<th>Motive Power</th>
<th>Manufacturing Capability: Pipeline Diameter (in)</th>
<th>Sensor Technologies that can be adapted to Platform</th>
<th>Remote Field Eddy Current</th>
<th>Ultrasonic</th>
<th>Electromagnetic Acoustic Transmitter</th>
<th>Caliper</th>
<th>Line Stays In-Service</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tethered Cable/Rod</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Hak Industrial</td>
<td>Cable</td>
<td>Smallest: 4</td>
<td>Largest: 60</td>
<td>Axial Magnetic Flux Leakage (MFL)</td>
<td>Liquid Only</td>
<td>UT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oceaneering Pipetech</td>
<td>Cable</td>
<td>Smallest: 6</td>
<td>Largest: 52</td>
<td>Transverse Circumferential / Helical MFL</td>
<td>Liquid Only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appius RTD</td>
<td>Cable</td>
<td>Smallest: 4</td>
<td>Largest: 60</td>
<td></td>
<td>Liquid Only</td>
<td>14&quot; - 32&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BJ-Baker/Hughes</td>
<td>Cable</td>
<td>Smallest: 3</td>
<td>Largest: 32</td>
<td></td>
<td>Gas Only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CUDD Energy Services</td>
<td>Cable</td>
<td>Smallest: 6</td>
<td>Largest: 30</td>
<td></td>
<td>SLOFEC</td>
<td>Liquid Only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drakont</td>
<td>Cable</td>
<td>Smallest: 36</td>
<td>Largest: 59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GE</td>
<td>Cable (conv tools)</td>
<td>Smallest: 6</td>
<td>Largest: 30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KTN AG Norway</td>
<td>Cable</td>
<td>Smallest: 4</td>
<td>Largest: 48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NLINE Devices / Mears</td>
<td>Cable</td>
<td>Smallest: 3</td>
<td>Largest: 12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innspection</td>
<td>Cable</td>
<td>Smallest: 6</td>
<td>Largest: 36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kosen</td>
<td>Cable</td>
<td>Smallest: 3</td>
<td>Largest: 64</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kusnet technologies</td>
<td>Cable</td>
<td>Smallest: 2</td>
<td>Largest: 12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TD Williamson</td>
<td>Cable</td>
<td>Smallest: 4</td>
<td>Largest: 12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weakenford Pipeline</td>
<td>Cable</td>
<td>Smallest: 6</td>
<td>Largest: 56</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bi-Directional</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3P services</td>
<td>Pump-in/Pump-out</td>
<td>Smallest: 3</td>
<td>Largest: 42</td>
<td></td>
<td>Liquid Only</td>
<td>Liquid Only</td>
<td>UT</td>
<td></td>
</tr>
<tr>
<td>A. Hak Industrial</td>
<td>Pump-in/Pump-out</td>
<td>Smallest: 4</td>
<td>Largest: 60</td>
<td></td>
<td>Liquid Only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oceaneering Pipetech</td>
<td>Pump-in/Pump-out</td>
<td>Smallest: 3</td>
<td>Largest: 32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BJ-Baker/Hughes</td>
<td>Bi-Directional</td>
<td>Smallest: 3</td>
<td>Largest: 32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Half Wave</td>
<td>Bi-Directional</td>
<td>Smallest: 16</td>
<td>Largest: 36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRobotics</td>
<td>Pump-in/Pump-out</td>
<td>Smallest: 5</td>
<td>Largest: 36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oceaneering Pipetech</td>
<td>Bi-Directional</td>
<td>Smallest: 6</td>
<td>Largest: 56</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quest integrity</td>
<td>Bi-Directional</td>
<td>Smallest: 3</td>
<td>Largest: 24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kosen</td>
<td>Bi-Directional</td>
<td>Smallest: 6</td>
<td>Largest: 42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TD Williamson</td>
<td>Pump-in/Pump-out</td>
<td>Smallest: 6</td>
<td>Largest: 32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Robotic/Tractor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oceaneering Pipetech</td>
<td>Motorized</td>
<td>Smallest: 6</td>
<td>Largest: 52</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diakont</td>
<td>Motorized</td>
<td>Smallest: 16</td>
<td>Largest: 59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GE-PII &quot;UT Surveyor&quot;</td>
<td>Motorized</td>
<td>Smallest: 6</td>
<td>Largest: 12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tool matrix provided by Keith Leewis in co-ordination with AGA and INGAA.
<table>
<thead>
<tr>
<th>Service Provider</th>
<th>Motive Power</th>
<th>Manufacturing Capability - Pipeline Diameter (in)</th>
<th>Sensor Technologies that can be adapted to Platform</th>
<th>Remote Field Eddy Current</th>
<th>Ultrasound</th>
<th>Electromagnetic Acoustic Transmitter</th>
<th>Caliper</th>
<th>Line Stays In-Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>GE - PII &quot;SLOFEC Surveyer&quot;</td>
<td>Motorized</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsea Integrity Group &quot;Pipecrawler&quot;</td>
<td>Brush Driver</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipetel (NYSearch)</td>
<td>Motorized</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote Inspection Technologies</td>
<td>Motorized</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rosen</td>
<td>Motorized</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>External Robotic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipeway</td>
<td>Motorized</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rosen</td>
<td>Motorized</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPECTRUM</td>
<td>Motorized</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applux RTD</td>
<td>ROV</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inospection</td>
<td>ROV &amp; Crawler</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trill Undersea</td>
<td>ROV</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oceanering</td>
<td>ROV</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipetech (AG&amp;G)</td>
<td>ROV</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote Inspection Technologies</td>
<td>ROV &amp; Crawler</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seabotix</td>
<td>ROV</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SONOMATIC</td>
<td>ROV</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsea Integrity Group</td>
<td>ROV/Permanent/ Diver</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

continued »
Although installations and systems might have been designed for a certain lifespan, it is worthwhile to study the feasibility of extending the operational life of pipeline systems. Increases in regulations require full accountability for pipeline system integrity.

As an oil terminal reached the end of its designed lifespan, A.Hak Industrial Services was contracted to provide insight into the integrity of the underground connecting pipeline infrastructure, which was 24 inch, 28 inch and 20 inch in diameter – without shutting down the tankfarm operations.

Since the connecting pipework was not designed to allow pigging, a non-piggable approach was selected to allow the pipelines to be inspected and consequently recertified. Together with the client, an integrity plan was developed that combined hydrostatic testing, mechanical cleaning, in-line ultrasonic inspection and defect validation. This process was performed periodically so that corrosion growth could be monitored. The result was a package that assured the integrity of the system and allowed the tankfarm to remain operational for the years to come, with minimum impact on its ongoing operations.

Case study 1
Extended lifespan – A.Hak
continued on next page »
Together with the client, an integrity plan was developed that combined hydrostatic testing, mechanical cleaning, in-line ultrasonic inspection and defect validation. This process was preformed periodically so that corrosion growth could be monitored.
The ultimate guide to unpiggable pipelines

The Access challenge

Access Midstream Partners, L.P. (ACMP) is a growth-oriented midstream natural gas services provider with operations focused on owning, operating, developing and acquiring midstream energy assets in the United States.

Access’ ILI programme is currently focused on its Barnett shale assets, which are nearby a population center. None of the lines included in the programme are subject to Subpart O and all of the assessments are done as part of an asset integrity management programme. The programme is modelled after a traditional integrity management programme, with baseline assessments/reassessment interval/risk assessment/etc., but the programme is purely voluntary. To date over 100 assessments have been performed in the Barnett with 20,000 features identified and 6,000 features repaired.

The difficulty of inspecting the pipelines in Barnett is high due to the low operating pressure and low flow rates of the pipelines. While many of the larger pipelines (16 inch and greater) can be inspected with traditional ILI tools, the smaller lines require a unique solution. Access considers these smaller diameter pipelines (12 inch and less) to be unpiggable by traditional ILI tools even though facilities for running the tools are available. Access considers two types of piggability; asset piggability (are facilities present?) and operational piggability (are the operating variables sufficient for ILI?). It is thought that of the 1,287.5 km of pipe in Barnett, 75 per cent is unpiggable by traditional techniques.

Access views the programme as a unique method for assessing what it sees as the four greatest threats to their pipeline’s integrity; internal corrosion, external corrosion, third-party damage, and construction-related defects. Construction-related defects are considered to be a threat for Access because of the relatively young age of its asset base (two to six years in Barnett), and the large amount of construction that Access undertakes each year. ILI, as a survey method, can provide a low-cost alternative, as compared to individual survey techniques, to address each of these threats.

Access has found success in the programme by identifying areas that are experiencing internal corrosion and using this as an early warning for assessing other mitigation techniques efficiency and making changes as necessary. External corrosion and dent defects have also been identified and mitigated, but the focus of the programme is judging mitigation effectiveness rather than finding specific defects.

The main challenge is the inspection of 8–12 inch pipelines with a field pressure of around 150 psi.

The pipelines are typically short, 4 km average, have bends of 3D or larger and are typically less than ten years old.

If pipeline inspections were to be performed in the past, Access was forced to increase the pressure in the line to up to 300 psi by using techniques that heavily affecting their operations and were performed at a significant cost. Even at 300 psi the results were often strongly restricted with respect to corrosion feature detection and sizing capabilities, as there was insufficient control of the tool behaviour.

Various alternatives such as deploying mobile tanks and compressors to boost the gas have been assessed but ideally high-quality inspection data would be gathered without such temporarily increased gas pressure.

Case study 2

The challenges of a low flow/low pressure in-line inspection tool programme

by Matt Hastings, Access Midstream Partners & Tom Steinvooorte, ROSEN

(Access Midstream Partners and ROSEN USA discuss the joint development of an ILI tool for challenging pipeline segments.)

Access’ ILI programme is currently focused on its Barnett shale assets, which are nearby a population center. None of the lines included in the programme are subject to Subpart O and all of the assessments are done as part of an asset integrity management programme.

Making changes as necessary. External corrosion and dent defects have also been identified and mitigated, but the focus of the programme is judging mitigation effectiveness rather than finding specific defects.

The main challenge is the inspection of 8–12 inch pipelines with a field pressure of around 150 psi.

The pipelines are typically short, 4 km average, have bends of 3D or larger and are typically less than ten years old.

If pipeline inspections were to be performed in the past, Access was forced to increase the pressure in the line to up to 300 psi by using techniques that heavily affecting their operations and were performed at a significant cost. Even at 300 psi the results were often strongly restricted with respect to corrosion feature detection and sizing capabilities, as there was insufficient control of the tool behaviour.

Various alternatives such as deploying mobile tanks and compressors to boost the gas have been assessed but ideally high-quality inspection data would be gathered without such temporarily increased gas pressure.

continued on next page »
The solution

Rosen’s key for low-friction is the optimisation of the magnetiser. While the brushes serve a valuable purpose they also increase the friction between the pipe wall and the inspection tool. To reduce this drag effect in low-pressure pipelines, a special friction reducing magnetizer was developed.

An optimised cup design is equally important to further reducing the friction. Extensive testing resulted in selecting an optimum solution combining low friction with excellent sealing capabilities.

Using high power batteries, state of the art electronics and smart engineering, Rosen engineers were able to integrate all necessary components in a single body tool. With a battery life of 19 hours for a 10 inch tool the active range is more than enough for Access’ pipelines that are typically not longer than 16 km.

Conclusion

Access’ benefits of the new low -flow and low-pressure (LFLP service:

- **Cost effective** – no impact on operation, no need for boosters/pumps, hydrotest can be avoided
- **Safe and reliable** – robust and proven MFL technology that only requires moderate cleaning
- **Flexible operation** – less dependent on production planning
- **State-of-the-art inspection quality** – same performance as Rosen’s uni-directional MFL tools
- **Light weight and easy to handle** – no need for cranes, less manpower and shorter door open to door close times;

Ultimately the new LFLP service enables Access to continue safe operation of their pipelines at lower cost and minimised risk.
A.hak Industrial Services

A.Hak Industrial Services’ offers a unique range of integrated services to provide each challenge a suitable solution. Since each pipeline is unique, standard technologies and services do not always suffice. The majority of pipelines have been designed without contemplation of intelligent pigging, or even any pigging at all.

Over the years, A.Hak has specialised in non-piggable pipelines and has formed a unique concept, based on extensive experience in the field. The company’s highly skilled and knowledgeable team aims to find one solution for any challenge a client presents.

Decades of experience combined with cutting edge technology allows A.Hak to find creative solutions for specific challenges, while simultaneously providing customised technical solutions and adaptive field application. High-end engineering enables us to develop custom tools and equipment, while a certified, well-trained and seasoned group of field engineers can apply these solutions anywhere in the world.

A wide variety of pigging materials are available in stock including temporary pig traps ranging from 4 to 40 inch, as well as a wide variety of pumping equipment to allow pigging of small to large diameter pipelines. Customised equipment for project-specific solutions can be designed, engineered and fabricated in-house and are aimed at a safe, efficient and adaptive fulfilment of client’s requirements.
Rosen Group

The Rosen Group provides innovative, state-of-the-art integrity solutions to the oil and gas industry. As a technology driven company, Rosen offers service excellence with regard to non-destructive testing, in-line inspection and engineering consultancy.

The range of products includes pipeline cleaning and monitoring devices to ROAIMS, the integrity management software suite and communication platform.

Rosen operates in more than 100 countries worldwide with local offices, research facilities and representatives in all the major oil and gas hubs.

- The company is able to provide:
- Pipeline cleaning tools and accessories
- In-line cleaning
- Pipeline in-line inspection
- High-resolution geometry inspection
- Xyz mapping
- High-resolution metal loss inspection
- Customised in-line inspection
- Emat crack detection and coating disbondment detection
- Ultrasonic crack detection
- Multi-diameter pipeline inspection
- Leak detection
- Robotic inspection
- Video inspection
- Plant and terminals inspection
- Coiled tubing inspection
- Inspection of flow lines
- Inspection of gathering lines
- Data services
- Asset integrity management support
- Integrity management software
- Engineering consultancy
- Feasibility studies
- Pipeline-, plant- and facility rehabilitations.
What are typical benefits for the operators?
The benefits to operators will range with the different types of unpiggable tools used. In a general sense most tools will be cost effective, safe and reliable and easy to handle. They will also provide the information needed quickly and in a format that will be easy for the operator to read and take the next steps in ensuring a well-maintained pipelines. It is best to consult the tool matrix to see compare your needs to the tools available and make sure to ask the supplier any subsequent questions.

What are typical applications?
Typical applications of the unpiggable tools are for pipelines that may have some of the following:
- (Off)-loading lines
- Flow lines
- Low flow/ low pressure pipelines
- Storage systems
- Branch connections
- Risers.

What are the main differences from a tethered solution?
The biggest difference between a tethered solution is that the bi-directional (BiDi) approach requires the tool to be reversed by either reversing the flow or pulling it back while with the tethered approach the line is inspected in stagnant medium.
- The BiDi approach allows for effective cleaning while the MFL is less sensitive to debris which helps with better results in dirty pipelines.
- Due to the free swimming design BiDi’s can pass unlimited bends and are not restricted in inspection length
- BiDi tools record 100 per cent of the pipe circumference in one pass while it also records on the way back. This does not only provide redundancy but also allows the operator to check the repeatability of the recorded data, thus providing more confidence.
- BiDi tool can run up to 3 m/s. Assume a realistic speed of 1 m/s and a 10 km pipeline can be inspected in approximately six hours whereas the maximum speed of a tethered solution is 500 m/h. The inspection of the same 10 km would take at least 40 hours. This is multiplied by the amount of runs required.

What are some common mistakes when looking for the right product?
According to Rosen, the selected solution should be tailored to the real conditions in a pipeline – e.g. if the solution does not consider proper cleaning than the pipeline should be clean or the solution should be able to cope with debris. To avoid this, the company suggests that the inspection vendor should be involved in the early stages of selecting the most suitable solution.
Checklist for unpiggable tools

☐ Have you considered the overall cost impact for the pipeline operator including pipe modifications and production deferment (if applicable)?

☐ Have you considered inspection coverage, quality, reliability and risk (which fail safe measures are in place)?

☐ Do you have the capability to deal with debris?

☐ Do you have an understanding of the coverage/quality/reliability of the conditions of the project?

☐ Is there an acceptable level of risk?

☐ Have you considered the need for repeat inspections/remaining life time (may justify modifications to make a pipeline piggable)?
About the Publishers

The Pipelines International team

Pipelines International is being published by the coming together of two long-standing pipeline media companies.

John Tiratsoo and his company Scientific Surveys are long-time publishers of information on pipelines – including information on companies, projects, the latest news and technical information. John is also the editor of the must-have book on pigging, Pipeline pigging and integrity technology.

Great Southern Press has been publishing about pipelines since 1972. It publishes The Australian Pipeliner – the flagship of the Australian pipeline industry – as well as a number of other industry titles including Gas Today.

Current and former publications from the Pipelines International team include Pipeline World, Pipeline Asia, Pipes & Pipelines International, The Indonesian Pipeliner, Pipeline, Plant & Offshore, and the Journal of Pipeline Engineering.

Tiratsoo Technical

Tiratsoo Technical, previously known as Scientific Surveys, is now a division of Great Southern Press. For over thirty years, principal John Tiratsoo has planned and organised high level technical training courses and events in a wide range of pipeline-engineering subjects, as well as editing various industry publications including the Journal of Pipeline Engineering.

The range of training courses, specially customised to the needs of utilities and major companies, is being expanded also to include trenchless training.
- Technical training experience
- Worldwide experience
- Worked closely with asset owners and stakeholders
- Respected and well known

Global reach

Training programmes have been held in Houston, Pittsburgh, Calgary, Rio de Janeiro, Aberdeen, Newcastle, Amsterdam, Berlin, Istanbul, Singapore, Sydney, Perth and Auckland.

Pipeline courses

Pipeline courses include, in partnership with Clarion: defect assessment, inline inspection, evaluation and rehabilitation, pipeline pigging and integrity management, risk management, stress corrosion cracking, and onshore and subsea engineering.

Clarion Technical Conferences & Tiratsoo Technical

Clarion Technical Conferences and Tiratsoo Technical have been organising pipeline conferences and training events together around the world for over 25 years. Their conferences include Pipeline Pigging and Integrity Management; the Fixing Pipeline Problems Conference; and Transportation of CO2 by Pipeline. For Best Practices in Pipeline Operations & Integrity Management they have once again partnered with the highly experienced Global Webb Energy Consultants.