The Challenges of Pipeline Pigging

Tracerco
Providing Insight Onsite

Gain Insight, Eliminate Risk & Pig with Confidence

Pigging Products and Services Association 2010

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Contents:

Managing / Obtaining data

Eliminating the risk

What part can Radiation play?

Case studies

Conclusion

Eliminate the Risk

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Question?
How many operators are currently taking a risk with their pipelines?

Answer:

1. Those who do not understand or know their pipelines and its contents
2. Those without a routine pigging program
3. Those without data on the volume or location of any deposits
4. Those with little or no knowledge or experience pigging pipelines
5. Those who just hope for the best

The Data Challenge

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Both Operators and Inspection companies need to know each pipeline intimately, so what data do they need for a successful pigging campaign?

Gather all of the available pipeline data:

- Flow rates
- Product type
- Deposits
- Damage
- P & IDs
- Weld records
- Operational history

Eliminate the Risk

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First Stages of Feasibility - Data Evaluation

Take a typical oil production scenario, with wax issues, this creates problems in oil production due to 3 main reasons:

1. Restricted flow due to a bore reduction
2. Deposition throughout the pipeline which can lead to complete blockage
3. Increased viscosity
4. Accelerated cooling

Given the issues above then a cleaning regime must be established to:

- Remove the wax
- Improve flow
- Prepare for ILI tools

Eliminate the Risk

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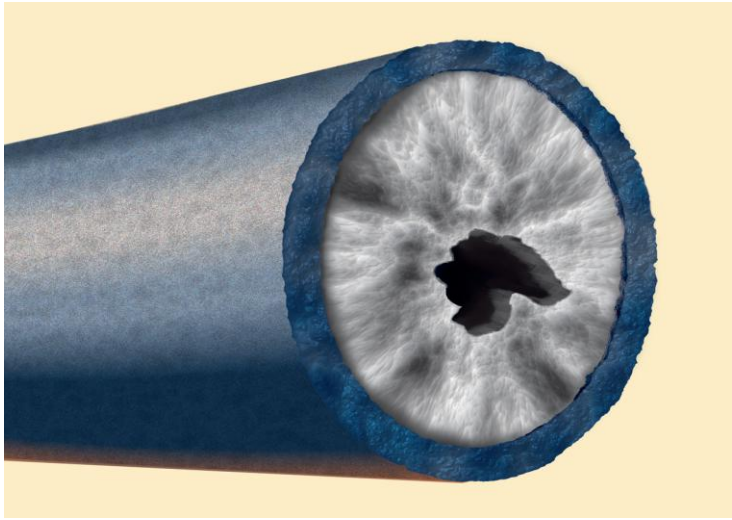
First Stages of a Pigging Assessment:

1. Determine total wax volume for the full pipeline length
    - What size (m^3) is the potential wax plug?
    - Determine pig design, type and numbers
    - Calculate the risk of a stuck pig
2. Determine local deposit profile
    - How much has the bore reduced?
    - Refine the pig design type, size
    - Refine the risk of a stuck pig



The correct design of pig and frequency can eliminate the potential for a stuck pig. It is difficult to predict a pigging frequency by modelling alone because wax deposition is complex and somewhat unpredictable.

Live data plus knowledge and experience are key to success.

Radiological Pipeline Applications

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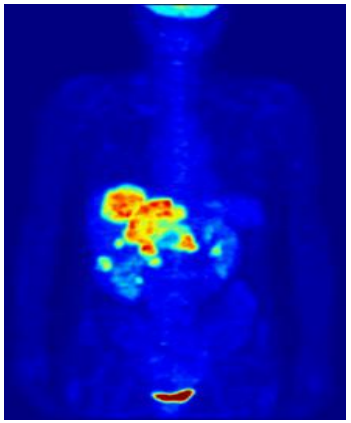
How can Radiation be used for flow assurance purposes?

Medical X-Ray & Tracer techniques used to examine bodily functions and structure are applied on an industrial scale:



Barium meal ≡ Pipeline tracer injection

X-Ray ≡ Gamma Scan

Flow Assurance, Deposit survey, Blockages, Wall thinning, Stuck Pigs, & Slugging, all this information by the application of the two techniques above!

Meeting the Challenges of Flow Assurance

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1. Need to ensure maximum flow from the reservoir to the point of sale
2. Desire to understand, map and study the volatile and unpredictable oil and gas flow from a reservoir

Utilising radio-isotopes, gains the ability to:

- *Assess total pipeline deposits*
- *Accurately assess pipeline orifice restrictions*
- *Identify, locate and quantify pipeline materials such as waxes, scales, sand, sludge & hydrates*
- *Profile pipeline wax build up over long time periods*

Providing accurate data for evaluation

Utilising Isotopes

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'When? 'Where to?' and 'How Much?'

The basic requirements of a tracer are as follows:

- It should behave in the same way as the material under investigation
- It should be easily detectable at low concentrations
- Detection should be unambiguous
- Injection and detection should be performed without disturbing the studied system
- The residual tracer concentration in the product should be minimal

Factors that are important in the selection of the tracer are the:

- Half life, Specific activity, Type of radiation, Energy of radiation

The Route to Success…

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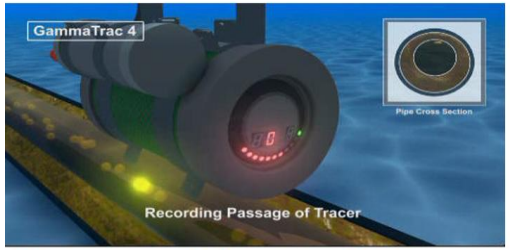
The operational procedure for data collection

Ensure Flow

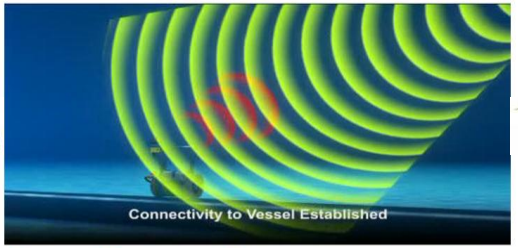
Deploy

Strategic Locations

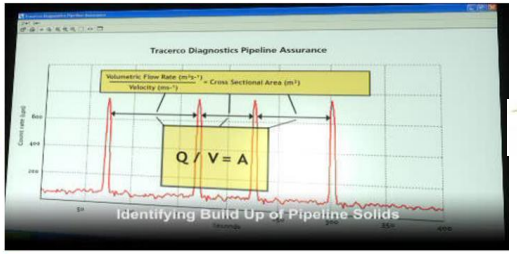
Record Data



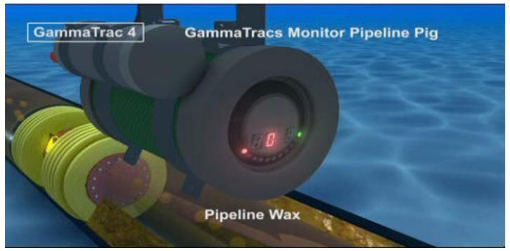
Communication



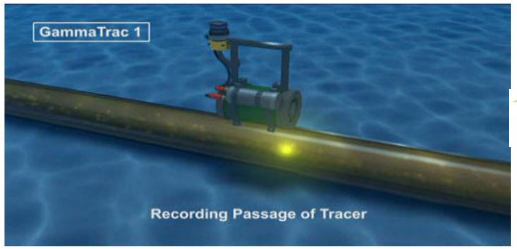
Evaluate



Clean with confidence



Confirmation



Report

Objective: Quantify pipeline deposits

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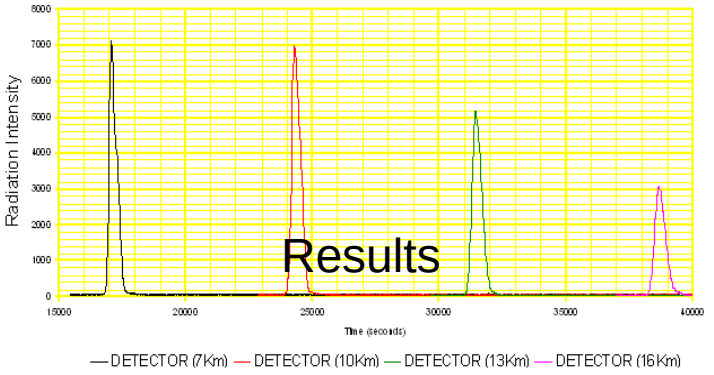
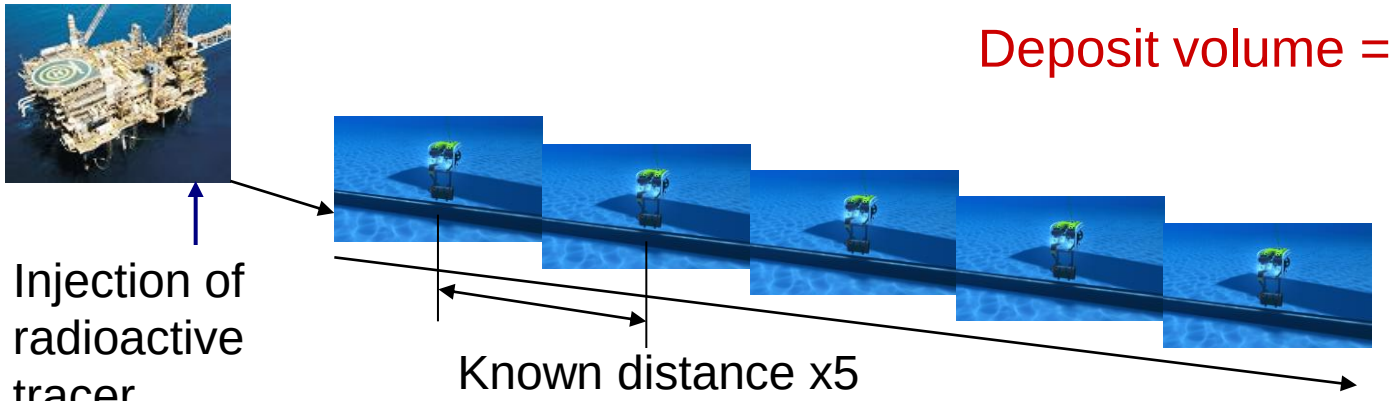
Problem

- 75 Km Line not pigged for some considerable time
- Individual sections to be determined

Solution

- Tracer injection on platform
- Non-intrusive detection on platform, and at known intervals subsea
- Measure the mean velocity between strategically placed detectors
- Total deposit in each section determined





Deposit volume = V_{empty} – (Q x time)

Pig or not to pig?
Let me make the Right Decision

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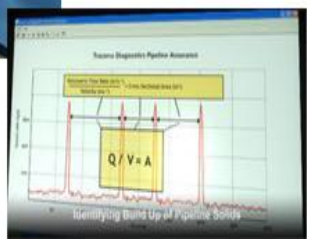
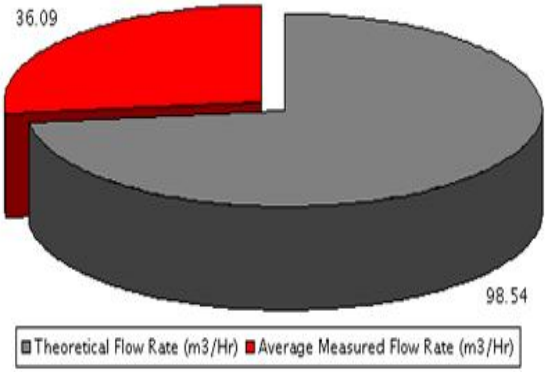
Case Study:

- *>100Km pipeline*
- *8" diameter*
- *Significant reduction in flow*

Study provided.

- modelling proof – year on year
- Strategic decisions on Pigging Campaign
- Assessment of sand 'drop out' points
- Assessment wax build rates
- Location of deposit regions
- Determination of 'free volume'
- *Proof of 12% total volume loss*





Refining the data

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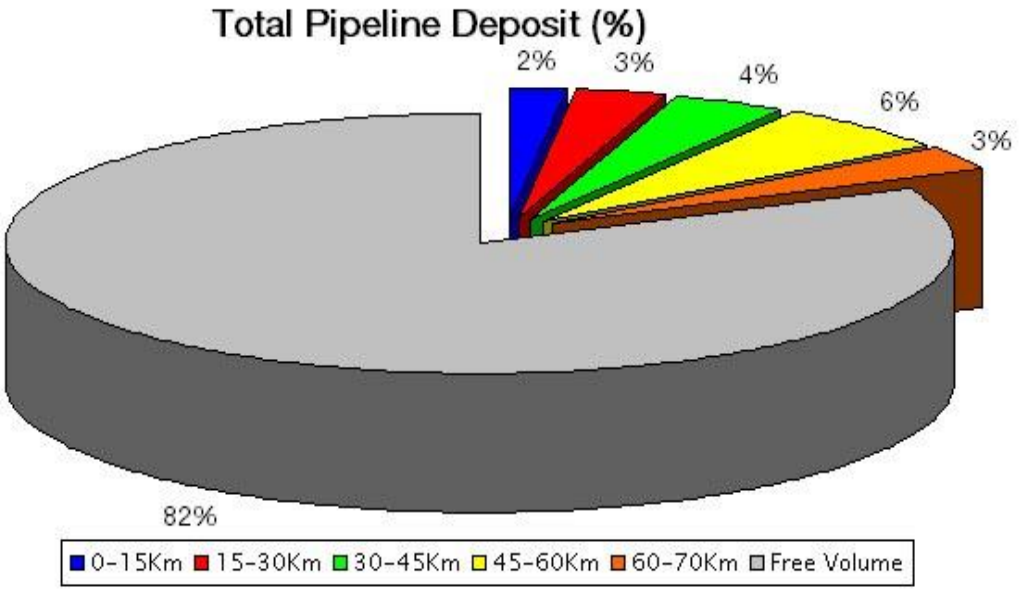
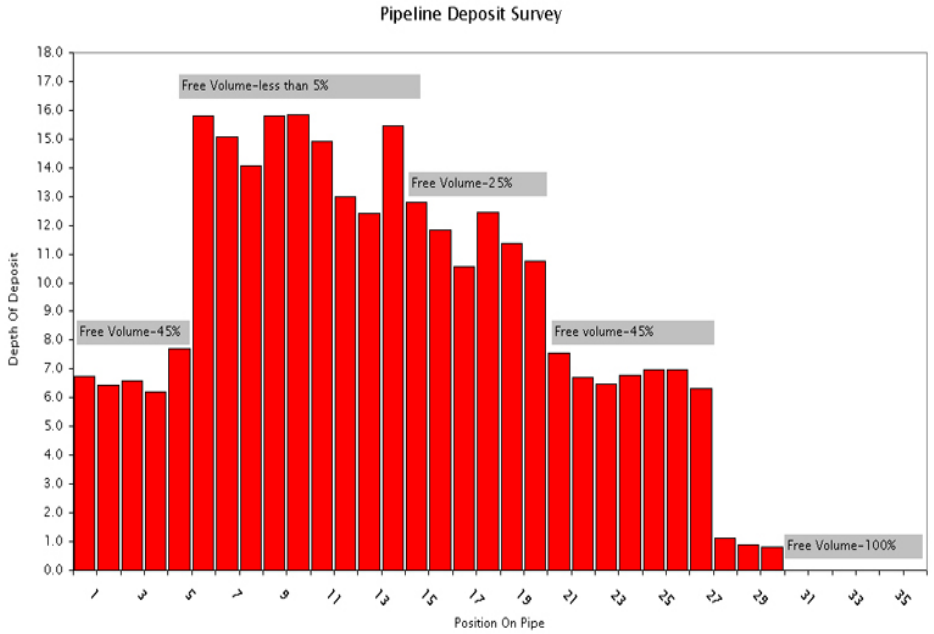
6% of total deposit found to be within 15km section

- Local profiling (gamma scanning) determined size and shape of blockage
- Operator able to determine likely success from pigging company





Decision Made: Now where's my pig?

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The GammaTrac is a vital component in successful, accurate and reliable pig tracking operations and eliminates the risk and costs involved with recovery.

- Provide 100% accurate, safe, reliable pig tracking
- Wireless communication
- Isotope – doesn't turn off!
- Safe radiation handling
- No marine growth removal
- Burial depth, 0.5
- 3000m - Deep Water rated
- Accurate positioning +/- 5cm
- Ultra reliable
- Excellent safety record
- No harm to the environment
- Long battery life

Lose it, find it, recover it….

Conclusion

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Operators often lack knowledge about their pipelines

Operators are fearful of pigging due to the unknown

"Our doubts are traitors, and make us lose the good we oft might win, by fearing to attempt."

William Shakespeare

Having knowledge:

- ✓ Eliminates the fear element and allows for rational decision making
- ✓ Allows for better planning and contingency management

"An investment in knowledge pays the best interest."

Benjamin Franklin