1. **Current situation**
   - Different approaches related to company identity
   - Misunderstandings
   - Time is changing

2. Where and when to start

3. Who are to be involved

4. Risk Assessment

5. RMS

6. PIMS
Different approaches related to company identity

The company’s relation and commitment to the pipeline asset

• **Pipeline: “Non Core business”**
  The pipelines are interconnectors, supply lines between the facilities or sites of a company or transport product flow lines to external stakeholders. The pipeline is a department of the facility/site and is dependable on the existing management systems. The treads and risks are for a cross county pipeline are not the same and therefore not covered in the systems implemented and designed for the site or facility

• **Pipeline: “Core business”**
  The pipelines are the company asset and the corporate success has a direct relation to the economical success of the company. In this situation the management programs are dedicated to the pipeline. In Central Europe most of the companies have procedures and inspection programs implemented as being the methodology to safe guard the integrity of their assets, but this is mostly not implemented as a complete systems that would need and involves all the disciplines to cover all the external and internal risks throughout the complete lifecycles of the pipeline
Misunderstandings

Not many know the differences between RMS and PIMS

- **RMS:** “Risk Management System” for pipelines prescribes and describes all tools and systems to monitor and safeguard the system from all risks involved with the pipeline transport. These risks are not only related to the loss of containment and the costs of repairs or downtime of the pipeline system itself, but are also related to the consequences of an incident to the environment and public safety which could seriously damage the corporate reputation.

- **PIMS:** “Pipeline Integrity Management System” prescribes and manages all the necessary activities (monitoring, maintenance, testing inspections, control, documentation, etc.) to assure that the pipeline remains in a Fit for Purpose and technical safe condition throughout all lifecycles of a pipeline.
RMS & PIMS
Current situation

Time is changing

- Maintenance strategies are in many cases still based on Corrective Maintenance
  - when it fails or breaks down, we react

- Mission statement is often still directed by AU and AC
  - what about the environmental, public and corporate risks?

- Risk management is not everybody’s job (still an individual approach)
  - not leveraged throughout the organisation

- Risk management is not to be confused with Facility Management
  - FM is to safeguard the organisational support facilities and processes

- A PIMS is usually initiated when the integrity problems already exist
  - Costs for the system are to be requested and approved annually
1. Current situation

2. Where and when to start
   - When to start the building of the systems
   - Where to start

3. Who are/is to be involved

4. Risk Assessment

5. RMS

6. PIMS
RMS & PIMS
Where and when to start

When to start the building of the systems

Start of the process
• RMS (Risk Management System)
  – during the feasibility study
• PIMS (Pipeline Integrity Management System)
  – during the engineering phase

Where to start

Risk assessment for gathering, identifying all Risks involved (Quick scan)
• Product related risks
  – fire, explosion, health, environmental
• Production related risks
  – upstream and downstream stakeholders
• Receptors
  – staff, general public, governmental bodies
1. Current situation
2. Where and when to start
3. **Who is/are to be involved**
   - Team-up for the identification of the risks
   - Intern the company
   - Extern company
4. Risk Assessment
5. RMS
6. PIMS
Team-up for the identification of the risks with assessments

Don’t try to manage risks in a vacuum. “Team up to manage risk effectively” all experiences and knowledge is needed. All disciplines need to communicate and work together to produce optimal results.

- **Intern the company:**

  Evaluate the process general (Helicopter view) and try to identify all possible risk in brainstorming sessions to be held with all parties involved being; Operations, Engineering, Procurement, Maintenance of all Production facilities and Storage facilities etc.

  Build teams with dedicated tasks and involve all parties involved in the process. It should not be a culture that only involves a few persons.

- **Extern company:**

  Also the external stakeholders have knowledge

  The most effective risk management is built on interaction among all the parties involved in a hazardous materials transport chain (e.g., shipper, package manufacturer, carrier and consignee).
RMS & PIMS

Table of Contents

1. Current situation
2. Where and when to start
3. Who are to be involved
4. **Risk Assessment**
   - Main tasks
   - Methodology’s
   - Organise the steps in the Risk Assessment
   - Time relation of risks
5. RMS
6. PIMS
RMS & PIMS

Assessment

Risk Assessment

Main tasks

- List all possible and identified risk elements of the system and product. Classify all these risk and identify the baseline programs to assess these risks. Make the targets SMART (Specific, Measurable, Achievable, Relevant, Time-Framed)

- Involve the senior management and make templates for the procedures, emergency response plans, handover protocols, process flow diagrams, and decision making organization diagrams.

Methodology’s

There are many variants of risk assessment that go by many different names, in addition to risk assessment itself i.e. hazard analysis, consequence analysis, worst-case analysis, fault tree analysis, failure modes and effects analysis. In other words there are numerous models and tools that can be used in a systematic quantitative assessment.
Organise the steps in the Risk Assessment

1. **Risk Analysis**
   - Define the defect
   - Quick scan (list all possible backgrounds and causes)
   - History (first time or repeating event)
   - Qualify the Risk (estimation)
   - Consequence (first damage estimate)

2. **Risk Evaluation**
   - Outcome of risk Qualification
   - Risk evaluations (KPI's and SMART goals)
   - Criteria (Boundaries & Limits)
   - What could have happened
     - Perceptions, Class, responsibilities

3. **Risk Control**
   - Mitigation measurements (What, When, How)
   - Evaluation and Control
   - Continuous Improvement
   - Legal/Mandatory reporting
     - Document management system
   - Status stable (need for further investigation)
   - Risk reduction
Most of these threads can be pre-classified in a time depending relation. This time related classification will make the creation of a RBI (Risk Based Inspection) program a lot easier and provides a good base to combining different inspections, measurements and monitoring for time optimizing/HR-effectiveness

- **Time dependent/related threats:**
  - Internal Corrosion
  - External Corrosion
  - Stress Corrosion Cracking
  - Fatigue (including manufacturing defects)

- **Time independent/non-related threats:**
  - Third Party Interference/Mechanical Damage
  - Weather Related and Outside Force / Loss of Stability (including construction defects)
  - Incorrect Operations

- **Additional threats:**
  - Design and Materials
  - Equipment Failure
RMS & PIMS

Table of Contents

1. Current situation
2. Where and when to start
3. Who are to be involved
4. Risk Assessment
5. **RMS**
   - Fundamental rules
   - How to build a RMS
6. PIMS
Fundamental rules

• Commitment
  – A RMS system should not only be used by the pipeline department and its operators, but is to be supported by the company; shareholders, management, operation, engineering, maintenance HSE, HR and third parties that are involved with the pipeline. “Risk management is everybody’s job”

• Culture
  – Risk control is a mindset that can be stimulated by leveraging and teaching the people what the results of failure or incidents can cause. “It’a continuous change in culture”

• Partnership
  – Build teams with dedicated tasks and involve all parties involved in the process. It should not be a culture that only involves a few persons.
• **Prioritization**
  – For all risks you must set the boundaries and levels of acceptance and document them in procedures that are to be approved by the different disciplines involved.

• **Action**
  – Actions are the main issue in a RMS. They involve planning and analyzing and are based on risk severity, damage and consequential costs, mandatory involvement, restrictions and possible legal constrains. Planning and assessments will not reduce the risks, actions will.

• **Continuous improvement**
  – Don’t stop at the moment on which the defect or risk is identified and mitigated. The evaluation and continuous monitoring of the result is important to safeguard the continuity of the mitigation.
How to build a RMS

As for all system and processes you should start with a clear plan that will lead you and supports you through the process and will keep the attention, awareness and dedication mandatory for all parties involved.

The following steps are to be considered (DOT)

- Scope
- Operation Knowledge
- Assessment
- Strategy
- Action
- Verification
- Evaluation
1. Current situation
2. Where and when to start
3. Who are to be involved
4. Risk Assessment
5. RMS
6. **PIMS**
   - When to start
   - Risk identification, tools and mitigation strategy
   - Setup of a Risk Based Inspection program
   - Maintenance strategy
   - Document management system
   - GIS support
When to start building a PIMS

The building of a Pipeline Integrity Management System starts already during the engineering phase of the pipeline by selecting the technical most effective tests, monitoring and investigation methods to identify the technical treads of/on the pipeline system.

The following topics are to be considered (DOT)

• Risk identification, tools and mitigation strategy
• Setup of a (RBI) Risk Based Inspection program
• Maintenance strategy
• Document management system with MOC (Management of Change)
Risk identification

Use the tools that are already being implemented in the company or use the dedicated tools available on the market i.e. HAZID, QRA, HAZOP, FMEA, Swift, etc.

Risk that are to be assessed:

- **Process**
  - AC/AU(Flow), Pressure(MAOP), Density, Viscosity
- **Product specific risks**
  - Toxic, Flammable, Explosive, Temperature limits
- **Equipment reliability**
  - Maintenance history and experiences
- **Environmental risks**
  - Soil conditions
  - Stray current
  - Buoyancy
  - TP infra and activities
Setup of a (RBI) Risk Based Inspection program
Write/prepare an inspection philosophy!

Topics that are to be assessed and what to prepare:

- What data is available and/or needed?
- What standards are prescribed? (Company procedure and mandatory)
- What expertise is needed? (HR)
- Select and plan the inspections
- Make a time planning for all the inspections, if possible for the complete lifecycle of your pipeline
- Consequences of failure i.e. production loss, repair and replacement costs
- Predefine the Tools for integrity testing (new developments)
Maintenance strategy

Differences in maintenance strategies are to be considered

The most frequent used ones:

- **PPM (Planned Preventive Maintenance)**
  - *PPM contains all the work/interventions performed periodically on the critical units according to specified instructions, vendor maintenance manuals, recommendations and procedures.*

- **CM (Corrective Maintenance)**
  - *The maintenance work only consists the repairing of defect equipment. The unscheduled and unpredictable work leads to relative high costs*

- **RBM (Risk Based Maintenance)**
  - *In the risk based maintenance the system and its components are evaluated concerning their probability of failure and the risks involved*

- **CBM (Conditioned Based Maintenance)**
  - *This type of maintenance has to be developed for each individual pipeline system on the basis of the experience achieved during the first years of operation, followed by continuous improvements based on ongoing experience (Deming Circle).*
Document management system with MOC (Management of Change)
Set up administrative systems to check the effectiveness of the Integrity Management and structure the creation of documents, procedures, work processes and document validation and retention

Documents, information, procedures, Inspection reports etc
- Where to store?
- How to store?
- Retention period of document and when are they to be reviewed?
- Who is(are) the creator(s), checker(s), and approver(s)?

The following processes are the ones that should not fail:

- Deming circle / PDCA:
  - Processes for continuous improvement and to not end up in quick fixes without results.

- RCI/RCA Investigation tools/processes to investigate and assess the defects.
  - They will stimulate you too go back to the root of the problem and assess all possible causes and possible mitigations.
The support of a GIS system

A GIS system is, in most cases, used as a librarian to find information’s and data who have a specific geographical reference.

A GIS system is not a PIMS (Pipeline Integrity Management System), RMS (Risk Management System) or PMS (Pipeline Management System)

A GIS system is a tool that makes the access and visualization of measurement, test results visual in combination with their geographical position.

A GIS system can be enhanced to a GPIMS (Geographical Pipeline Management System) by dedicated software development to function as an important component of a RMS and PIMS.

A (G)PMS can help you with i.e.:

- ROW management
- CP system evaluation
- Data and documents of equipment
- External environmental treads
- TPI inspection setup
- Pipeline materials and specification documents
- Construction damage and deformation positions
- History of treads and feature documentation
- Risk assessment corridors (PR and GR)
RMS & PIMS

Thank you for your attention!