Presentation

Development of Pipeline Integrity Management System (PIMS)

29 November 2016
Presentation Outline

1. Identity Card – Bureau Veritas
2. PIMS – Definitions & Overall Process
3. Integrity Risk Assessment System (IRAS) Software Suite – An Overview
4. Q&A
What we do?

Testing, Inspection, Certification and Technical Assistance

Helping clients meet their growing challenges of quality, health & safety, environmental protection and social responsibility
From conformity to performance

1. Conform to regulation
   - Identify applicable regulation
   - Assess conformity
   - Report QHSE compliance

2. Reduce risks
   - Control supply chain
   - Perform risk analysis
   - Reduce QHSE risk exposure

3. Increase performance
   - Recognition through certification
   - QHSE services outsourcing
   - QHSE function optimisation

Conform to regulation
Reduce risks
Increase performance

1
2
3
An extensive geographic footprint

66,500 employees
1,400 offices and laboratories in 140 countries

Africa, Middle East, Eastern Europe
9,000
260

Europe
14,400
400

Americas
20,100
330

Asia, Pacific
23,000
410

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A large portfolio of businesses

2014 Revenue: € 4.17 billion

- Marine & Offshore: 8%
- Commodities: 17%
- Consumer Products: 14%
- Government Services & International Trade: 6%
- Industry: 23%
- In-Service Inspection & Verification: 13%
- Construction: 11%
- Certification: 8%
Our services to O&G Pipelines Operators

Design Appraisal  Procurement  Construction  Installation On-Site  Commissioning  Expertise

Asset Integrity Management Services
Data Management  Integrity Analysis  Inspection Strategy  Mitigations Strategy

CAPEX PHASE  OPEX PHASE

Full range of services covering the whole life cycle from design to abandonment
Who are we?

- Headquartered in Calgary, Alberta, Canada
- Celebrating our 20th anniversary in 2016
- Premier pipeline system risk management firm
  - Expertise: 25-40 years experience of management and technical leaders
  - Reputation: international national, regional, local regulatory agencies
  - Risk focus: core business, not opportunistic niche
  - Technical leadership and innovation: RSTRENG, POE, QRA, Annex O, Reliability Design, Management Systems
  - Experience: worked with and supported nearly every major pipeline operator in North America and many across the globe
Who are we?

**Our Goal**
To partner with the industry and each of our clients to help eliminate pipeline failures by:

- Effective identification and assessment of threats and consequences
- Managing risk throughout the pipeline system life cycle
- Optimizing risk-informed decision making in pipeline daily operations
- Adopting a risk management focused safety culture

**Our Commitment**
Ever-continuous improvement in our technology and engineering solutions to help each of our clients:

- Achieve exceptional operational efficiency and safety performance
- Meet compliance requirements and objectives
- Reduce operating costs and optimize investment planning
- Move towards the goal of zero incidents

Who are we?
Who are we?

Pipeline System Life Cycle Risk Management
- Improved Safety - Greater Reliability - Higher Asset Performance - Lower Operational Cost -
Who are we?

“Risk-based” consulting services and technology solutions

- Consulting services
  - Regulatory Compliance and Advisory Services
  - Pipeline Safety Management Systems
  - Enterprise Risk Management
  - Operational Risk Management
  - Integrity Management Program Support
  - Engineering and Technical Assistance
  - Investment Planning Support
  - Integrity Data Management and Staff Augmentation
  - Professional Upstream Field Services

- Risk and integrity management software solutions*
  - Data Integration, Dashboard, Reporting, General analytics
  - Inspection/Assessment (ILI/DA) Data Management and Analysis
  - Risk Modeling and Analytics
  - Pre and Post Integrity Assessment Support
  - Compliance Support

(*) Integrated Risk Assessment System (IRAS) Software Suite
Who are we?

- Best in class risk management tools and analytics
  - Qualitative, semi-quantitative, quantitative analytics
  - International, national, regional, local regulator acceptance
    - “IRAS” at center of > 75 integrity (PHMSA, NEB, AER, others) audits
Why Bureau Veritas?

Move Forward with Confidence
Why Bureau Veritas?

Exceeding Client Expectations
PIMS – Definitions & Overall Process
Why Asset Integrity Management?

- **Canada**
  - 2013

- **San Bruno**
  - 2010 - 8†58+

- **Texas Natural Gas**
  - 1937 - 500†

- **Belgium**
  - 2004 - 24†120+

- **Kenya**
  - 2011 - 68†
Some recent accidents with significant impact

Indian Oil terminal 2009: 11 tanks destroyed, 15 dead, 150 injured
PIMS Objectives

Safety & Reliability
Assist pipeline operators in maintaining their pipelines in a safe and reliable condition

Incident Prevention
Assist pipeline operators in identifying and analyzing actual and potential threats

Operating License
Assist pipeline operators in maintaining their transport license by responding to regulations.

Data Integrity
Assist pipeline operators in performing and maintaining the integrity of pipelines data.
A step-by-step process

- Methodology
- TAME
- Integrity Model
- Company Strategy and Policy
- People and Process
- Procedures
- Data gathering
- Databases
- Geographical System
- Decision “Making Tool”
- Integrity Analysis
- Mitigation Policy
- Inspection Policy
- Integrity Program
- Expertise
- NDT Inspections
- Company Strategy and Policy
- People and Process
- Procedures
- Data gathering
- Databases
- Geographical System
- Decision “Making Tool”
- Integrity Analysis
- Mitigation Policy
- Inspection Policy
- Integrity Program
- Expertise
- NDT Inspections
The wheel of PIMS
The wheel of PIMS

- Policy
- Methodology
- Data
- Studies and Analysis
- Inspections
- Expertise

PIMS Process
The wheel of PIMS
The wheel of PIMS

PIMS Process

- Expertise
- Policy
- Methodology
- Data
- Studies and Analysis
- Decision Making Tool

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The wheel of PIMS

- Expertise
- Policy
- Methodology
- Inspections
- Data
- Decision Making Tool
- Studies and Analysis
The wheel of PIMS
The wheel of PIMS

- Policy
- Methodology
- Data
- Decision Making Tool
- Studies and Analysis
- Inspections
- Expertise

PIMS Process
The loop is closed

- Expertise
- Policy
- Methodology
- Inspections
- Studies and Analysis
- Data
- Decision Making Tool
Integrity Risk Assessment System (IRAS) Software Suite – An Overview

Dynamic Risk
Who are Dynamic Risk?

- Headquartered in Calgary, Alberta, Canada
- Celebrating our 20th anniversary in 2016
- Premier pipeline system risk management firm
  - Expertise: 25-40 years experience of management and technical leaders
  - Reputation: international national, regional, local regulatory agencies
  - Risk focus: core business, not opportunistic niche
  - Technical leadership and innovation: RSTRENG, POE, QRA, Annex O, Reliability Design, Management Systems
  - Experience: worked with and supported nearly every major pipeline operator in North America and many across the globe
How IRAS Support PIMS*?

(*) Integrated Risk Assessment System (IRAS) Software Suite

<table>
<thead>
<tr>
<th>Step</th>
<th>IRAS</th>
<th>Services Support</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
<td>12</td>
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</table>
IRAS – Data View Suite

- Corporate-wide Data Access and Visualization
IRAS – Risk Analyst Suite

- Risk Modeling & Analysis
IRAS – ILI Analyst Suite

- ILI Data Alignment, Analysis & Management
IRAS – DA Analyst Suite

- DA Alignment, Analysis & Management
IRAS – Data Exchange Suite

■ Date Integration

Enterprise GIS & Data Management System
- Pipeline Centerline
- Pipeline Attributes
- Spatial
- Hydrotest
- Subject Matter Expertise
- HCA Class
- MAOP/MOP

“Other” Integrity Relevant Data Sources
- ERP
- EDM
- Compliance/Inspection
- Asset Management

Pipeline GIS

Esri, GE SmallWorld, Intergraph
- APDM, POPS, Other

IRAS Database

Risk Management
- Risk Algorithm
- Analysis
- Reporting
- Data Mining
- Custom Queries
- Reporting
- Data Viewing
- Data Integration
- Reporting

Inline Inspection Management
- Align and Load
- Sentiencing
- Reporting
- Data Analysis
- Corrosion Growth
- PEO and PDSheets

Compliance Management
- Class Analysis
- HCA Analysis
- MAOP Analysis

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Presentation – TRC – Development of PIMS
## Our references in PIMS [1/2]

<table>
<thead>
<tr>
<th>Client</th>
<th>Country</th>
<th>Site</th>
<th>Dates (start/end)</th>
<th>Who?</th>
<th>Project</th>
<th>Gas/Oil/Other</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIGF</td>
<td>France</td>
<td></td>
<td>2007 - 2010</td>
<td>BV is the main contractor and subcontracts the IT part to ATP</td>
<td>Implementation of a Pipeline Integrity Management System based on Bureau Veritas’s Threats And Mitigations mEthodology (TAME). ATP’s software modules implemented are Slide4PIMS – client &amp; server and T&amp;M Expert.</td>
<td>Gas pipeline</td>
<td>Grid size: 5000km Onshore</td>
</tr>
<tr>
<td>PTT</td>
<td>Thailand</td>
<td></td>
<td>2008</td>
<td>ATP is the main contractor and subcontracts the operational expertise to Bureau Veritas</td>
<td>ATP’s software modules implemented are Slide4PIMS – client &amp; server, Risk Expert and InPipe. Bureau Veritas provides expertise on risk analysis and on how to create risk model for Risk Expert. Bureau Veritas also gives the trainings.</td>
<td>Gas pipeline</td>
<td>Grid size: 600km (pilot) Onshore and offshore</td>
</tr>
<tr>
<td>TEPNL</td>
<td>Netherlands</td>
<td></td>
<td>2008</td>
<td>Bureau Veritas</td>
<td>TOTAL E&amp;P NL has asked Bureau Veritas to perform the inventory of its current Pipeline Integrity Management status and to analyse the already existing TEPNL’s PIM business processes in order to assess the gaps and to provide TEPNL with PIM recommendations.</td>
<td>Gas pipeline</td>
<td>Grid size: 4000km Offshore</td>
</tr>
<tr>
<td>TIGF</td>
<td>France</td>
<td></td>
<td>2009</td>
<td>Bureau Veritas</td>
<td>Bureau Veritas assisted TIGF in setting up their procedures related to establishing the pipeline integrity plural-annual plans.</td>
<td>Gas pipeline</td>
<td>Grid size: 5000km Onshore</td>
</tr>
<tr>
<td>TIGF</td>
<td>France</td>
<td></td>
<td>2010 - Ongoing</td>
<td>Bureau Veritas</td>
<td>Bureau Veritas assisted TIGF in using its Pipeline Integrity Management Software in order to realise Integrity Assessment and to set up Inspection Strategies.</td>
<td>Gas pipeline</td>
<td>Grid size: 5000km Onshore</td>
</tr>
<tr>
<td>PTT</td>
<td>Thailand</td>
<td></td>
<td>2010</td>
<td>Bureau Veritas</td>
<td>Bureau Veritas provided technical training to PTT on Pipeline Integrity Management and more globally AIM policy.</td>
<td>Gas pipeline</td>
<td>Grid size: 4000km Onshore and offshore</td>
</tr>
<tr>
<td>LLX</td>
<td>Brazil</td>
<td>Açú Superport Industrial Complex</td>
<td>2011</td>
<td>Bureau Veritas</td>
<td>Bureau Veritas performed a threat and mitigation analysis using TAME methodology on the project of three 48” pipelines aiming at transporting oil between tankers and tanks farm.</td>
<td>Oil pipelines</td>
<td>CAPEX phase</td>
</tr>
<tr>
<td>PII - GE</td>
<td>USA</td>
<td>Qatar</td>
<td>2011 - ongoing</td>
<td>Bureau Veritas</td>
<td>Bureau Veritas performed Quality Control / Quality Assurance (QA/QC) on pipelines data.</td>
<td>Oil pipelines</td>
<td>Offshore and onshore</td>
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<tr>
<td>Confidential client</td>
<td>France</td>
<td>-</td>
<td>2011 - 2012</td>
<td>Bureau Veritas</td>
<td>Bureau Veritas assisted an Oil &amp; Gas operator in the specification of their needs for a RBI tool for pipelines.</td>
<td>Oil pipelines</td>
<td>Offshore and onshore</td>
</tr>
<tr>
<td>PETROBRAS</td>
<td>Brazil</td>
<td>Olapa</td>
<td></td>
<td>Bureau Veritas</td>
<td>Quantitative RBI for Pipeline</td>
<td>C-FER Software</td>
<td>-</td>
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<tr>
<td>CILOC</td>
<td>Vietnam</td>
<td>-</td>
<td>2012</td>
<td>Bureau Veritas</td>
<td>Bureau Veritas delivered a full assistance to CILOC in the development and the implementation of a RBI methodology and tool (TAME+) on their offshore pipelines system aiming at defining an integrity management programme.</td>
<td>Oil and Gas pipelines</td>
<td>Offshore pipelines</td>
</tr>
<tr>
<td>PCVL</td>
<td>Vietnam</td>
<td>-</td>
<td>2012</td>
<td>Bureau Veritas</td>
<td>Bureau Veritas delivered a full assistance to PCVL in the development and the implementation of a RBI methodology and tool (TAME+) on their offshore pipelines system aiming at defining an integrity management programme.</td>
<td>Oil and Gas pipelines</td>
<td>Offshore pipelines</td>
</tr>
<tr>
<td>Petronas Carigali SDN BHD, SKO</td>
<td>Malaysia</td>
<td>SKO Miri</td>
<td>2013</td>
<td>Bureau Veritas</td>
<td>Bureau Veritas assisted SKO to describe their Pipeline Register Database and PIM software specification. Bureau Veritas assisted SKO to describe their integrity model (TAME+ for screening / detailed assessment as a further step)</td>
<td>Oil and Gas pipelines</td>
<td>Offshore and onshore pipelines</td>
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<tr>
<td>SCAL</td>
<td>Spain</td>
<td>CASTOR project</td>
<td>2014</td>
<td>Bureau Veritas</td>
<td>Bureau Veritas delivered a full assistance to SCAL in the development and the implementation of a RBI methodology and tool (TAME+) on their offshore pipelines system aiming at defining an integrity management programme.</td>
<td>Gas pipelines</td>
<td>Offshore pipelines</td>
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<tr>
<td>PII - GE</td>
<td>USA</td>
<td>Qatar</td>
<td>2014 - 2015</td>
<td>Bureau Veritas</td>
<td>Bureau Veritas performed review of Pipelines FFP report.</td>
<td>Oil pipelines</td>
<td>Offshore and onshore</td>
</tr>
</tbody>
</table>
THANK YOU
Move Forward with Confidence