Asset Integrity Optimization through Corrosion Based Risk Management

INDOCOATING AND CORROSION SUMMIT 2008

Jakarta, August 13, 2008

PT. Surveyor Indonesia

Presentation Content:

1. What is Asset Integrity Management (AIM) and Optimization
2. What is Common Corrosion Control Management Program
3. What is Corrosion Risk Based Management
4. Some Metric and Performance Indicators Applied
5. How does Corrosion Risk Based Management will improve AIM
6. Some Industrial Examples (PIM & RBI)
7. Summary & Conclusions

1. What is Asset Integrity Management (AIM) and Optimization

Plant Asset (Integrity) Management

The set of disciplines, methods, procedures, and tools to optimize the whole business impact of cost, performance and risk exposures (associated with the availability, efficiency, quality, longevity, and regulatory/safety/environment compliance) of the company physical asset. (Institute Asset of Management, UK)

The systematic and coordinated activities and procedures through which an organization optimally manages its physical assets and their associated performance risks (British Standard)

AIMS is applied to physical assets and systems, such as process equipments & machinery, mechanical piping, pipeline system, each of it has its own inspection & maintenance strategy (PIM, RCM/FMECA, RAM, RBI, etc)

What is Asset Integrity Management (AIM) and Optimization

Optimizing Asset Integrity can be done by integrating operation, inspection, maintenance effort by implementing risk approach nit only from technical aspect regarding plant safety, reliability and availability, but also from life cycle cost.

More precisely, all inspection and maintenance efforts should be directed toward those equipments, or systems having highest risk levels.

In this context, corrosion control should be implemented by considering likelihood of failure and consequence of failure of the equipment.

Asset Defined in This Presentation

- Offshore and onshore platform – steel structures
- Oil / gas production – wells, flowlines and manifolds, separation plant, pipelines
- Refineries – storage tanks, cat crackers, distillation columns,
- Chemical plant – reactors, pressure vessels, heat exchangers, pipeworks, etc

2. What is Common Corrosion Control Management Program

Corrosion Management is part of the overall management system, which is concerned with the development, implementation, review and maintenance of the corrosion policy

Why Manage Corrosion?

- Statutory or Corporate compliance with safety, Health and Environment policies
- Reduction in leaks
- Increased plant availability
- Reduction in unplanned maintenance
- Reduction in deferment costs

2. What is Common Corrosion Control Management Program

Corrosion Control & Monitoring

1. Protective Coating and Painting – Field Test & Observation
2. Cathodic Protection (Impressed Current & Galvanic) - CP Survey
3. Chemicals Treatment (Inhibitor & biocides) – Coupon Test
4. Materials Selection (Stainless Steel, etc)
5. Process Parameters Control (Dehumidification, through put)
6. Design (Concept, engineering, life implication, risk)

Problems, how do we prioritize those control ? For each equipment or system, in order to effectively manage and optimize industrial asset?

What is Corrosion Risk Based Management

1. Priority must be based on Criticality and Risk Factor
2. Metrics and Key Performance Indicator for AIMS are assigned
3. Risk Assessment are Performed (RBI, PIM, ….)
4. Inspection and Maintenance Time Interval are Planned

All corrosion monitoring and inspection as well as maintenance efforts should be directed toward those equipments, or systems having highest risk levels – **There are prioritization**

In this context, corrosion control should be implemented by *considering likelihood of failure* and *consequence of failure* of the equipment.

AIMS and Corrosion Monitoring Program

Level 1 : Basic

Level 2 : Risk Approach

High Level Management Policy

AIMS - Asset Integrity Management System, ***or***

Corporate Risk Management

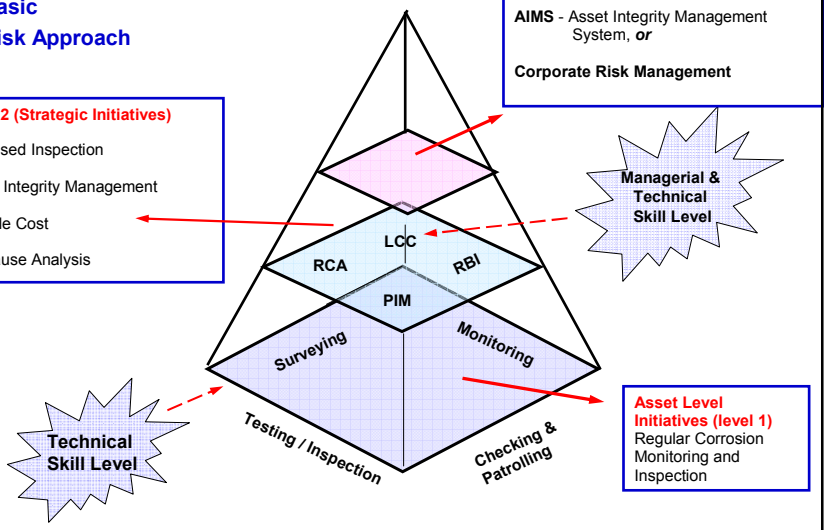
Medium Level 2 (Strategic Initiatives)

RBI - Risk Based Inspection

PIM - Pipeline Integrity Management

LCC – Life Cycle Cost

RCA – Root Cause Analysis



Asset Level Initiatives (level 1)
Regular Corrosion Monitoring and Inspection

Asset Integrity Management System and Maintenance Hierarchy

9

Priority based on Criticality and Risk Factor

A. Example Statistics on Causes of Pipeline Failure

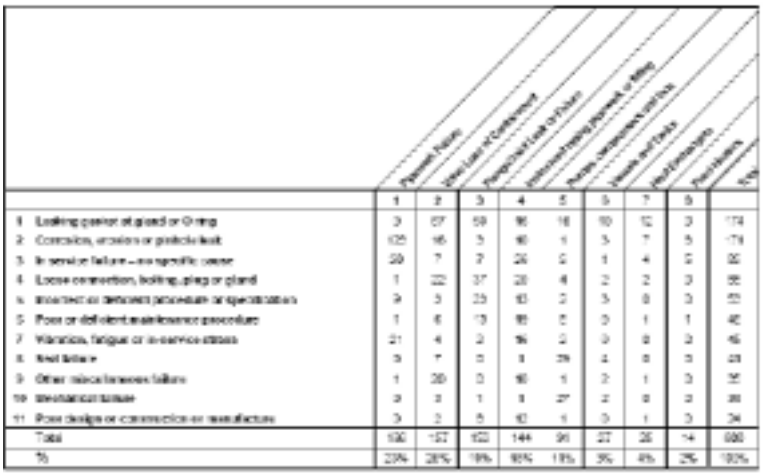
Causes for Pipeline Failure (Leak and Rupture)	Percent of Total
Outside Forces /Third Damage Party	**25**
Corrosion	**25**
Equipment Failure (metal fatigue seat gasket, age)	6
Weld Failure (all welds except longitudinal seam welds)	5
Incorrect Operation	7
Unknown	14
Repair/Install	7
Other	7
Seam split	5
Total	**100**

Asset Integrity Optimization through Corrosion Risk Based Management

10

Priority based on Criticality and Risk Factor

RANKING OF CAUSES OF INCIDENTS VS TYPE OF EQUIPMENT



	1	2	3	4	5	6	7	8	
1	3	57	59	16	10	12	3	174	
2	125	16	5	10	1	5	7	5	174
3	20	7	2	24	0	1	4	0	62
4	1	22	37	23	4	2	2	3	95
5	3	3	23	10	2	3	0	3	53
6	1	6	13	10	5	3	1	1	40
7	21	4	2	16	2	3	0	3	46
8	3	7	0	1	29	4	0	0	43
9	1	20	0	10	1	2	1	3	38
10	3	3	1	1	27	2	0	0	36
11	3	2	5	10	1	3	1	3	28
	186	157	150	144	90	37	20	14	686
	27%	23%	19%	21%	13%	5%	3%	2%	100%

Priority based on Criticality and Risk Factor

System	No. of Incidents	% of Total
Flowlines & Manifolds		
Gas	4	23%
Oil	24	
Separation Plant		
Oil Test Separation	6	
Oil Production	15	23%
Gas Production	4	
Processing Plant		
Oil - Oil Treatment	3	
Gas - Produced Water	5	
Gas - LPG/Condensate	6	19%
Gas - Methanol Injection	1	
Oil - Produced Water	1	
Compression / Metering		
Gas	5	
Oil	1	6%
Condensate	1	
Export & Import Lines		
Oil	16	
Gas	8	21%
Condensate	2	
Drains & Vent		
Open	7	
Closed	1	12%
High Pressure	4	
TOTAL	121	100%

4. Some Metrics and Key Performance Indicator Applied

KPI

1. Top Level Corporate Strategic Business Metrics

RONA, RAV

2. Operational / Process Metrics

Uptime, Unscheduled Down Time

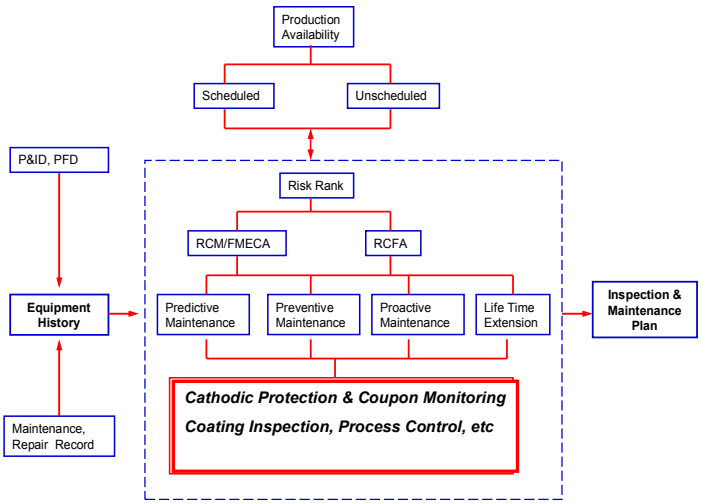
Availability (%)

Maintenance Cost, Safety Index

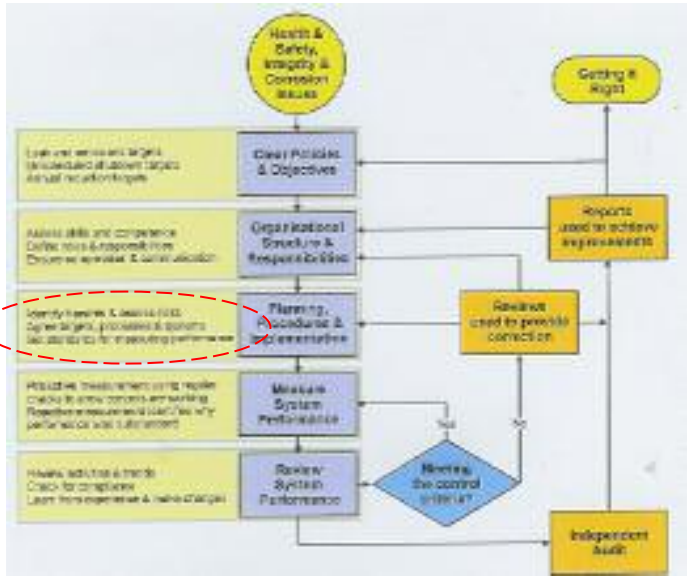
3. Tactical (Program Effectiveness) Metrics

MTBF, MTTF, MTTR

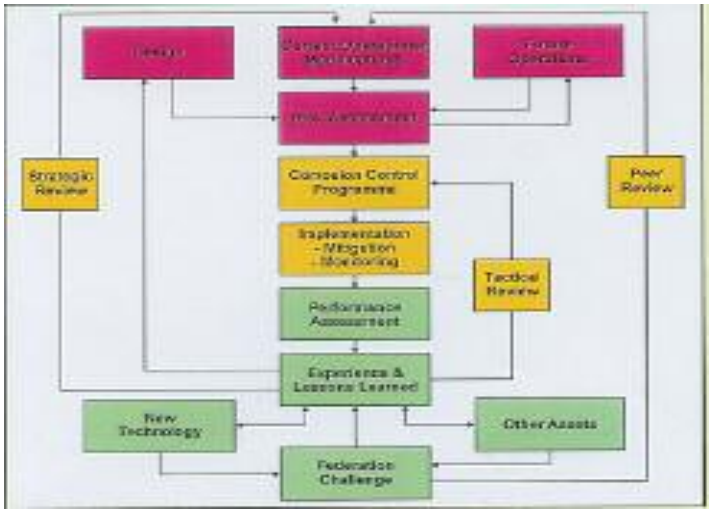
Overtime, Pareto



Risk Approach for Corrosion Control Management



Risk Approach on Corrosion Evaluation Process Flow Chart



5. How does Corrosion Risk Based Management will Improve AIM

If fully and properly implemented, it can lead to :

1. Safety, environmental and social excellent
2. Organizational, process and equipment effectiveness
3. Operating excellence and efficiency
4. Minimized unplanned shutdown
5. Maximized reliability and availability of the systems that are critical to the operation
6. Optimal spending on asset maintenance and minimum unnecessary maintenance activities (reduction up to 25% off all operation, inspection and maintenance cost)
7. Etc ….

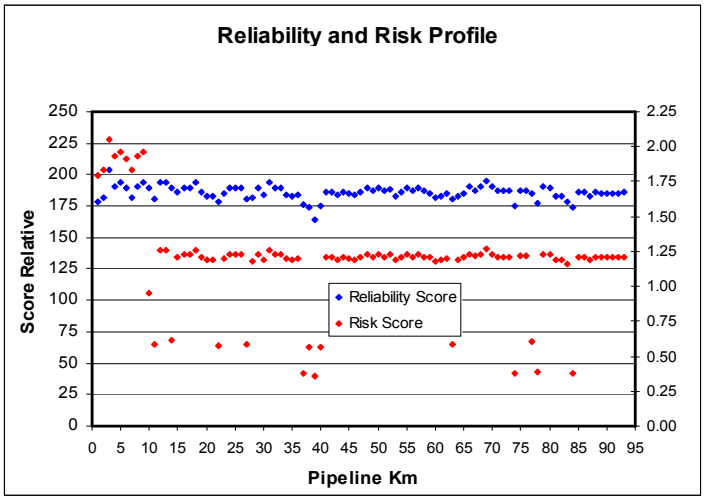
6. Example of Corrosion Risk Assessment Program
Pipeline Integrity Management (PIM)

PIM is planning, organizing, executing and controlling all pipeline risk and mechanical integrity in order to operate the oil and gas pipeline safely and reliably in the most cost effective way.

The risk is mitigated up to acceptable levels and mechanical integrity is maintained by using proper a inspection and maintenance strategy.

The first important step of PIM covers risk and integrity management plan, performance plan, communication plan, management of change plan and quality control plan.

It is a closed loop operation and executed during pipeline life.



Typical Performance Metrics for Pipelines

	Pipeline	Pumping	Measurement
Maintenance	Leaks per distance (number of leaks/km)	Reliability (%) Availability (%)	Meter accuracy (correction per meter)
Cost Effectiveness	O&M cost per throughput ($/volume moved) O&M cost per diameter and length ($/cm km)	O&M cost ($/kWh) O&M cost per throughput ($/volume moved)	O&M cost per meter run ($/meter run)
Efficiency	Pressure drop per distance (pressure drop/km)	Specific fuel consumption (MJ/kWh)	NA
Utilization	Impact days (no of days service is interrupted)	Usage (%) Load factor (%)	NA
Safety	Incidents/accidents (number/year)	Incidents/accidents (no/year)	Incidents/accidents (no/year)

AIMS and Corrosion Monitoring Program

Level 1 : Basic

Level 2 : Risk Approach

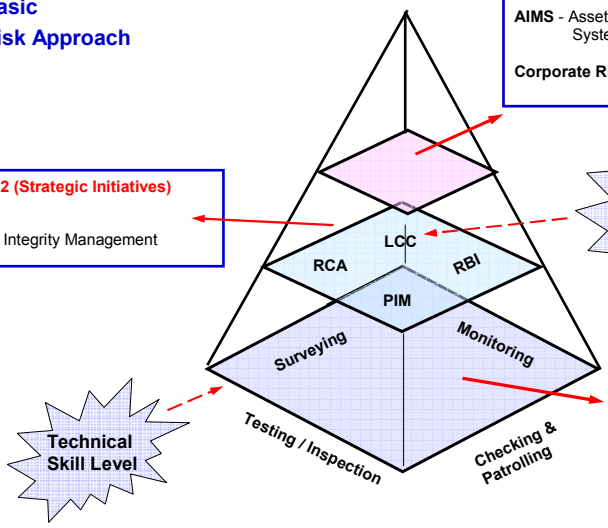
High Level Management Policy

AIMS - Asset Integrity Management System, ***or***

Corporate Risk Management

Medium Level 2 (Strategic Initiatives)

PIM - Pipeline Integrity Management



Managerial & Technical Skill Level

Technical Skill Level

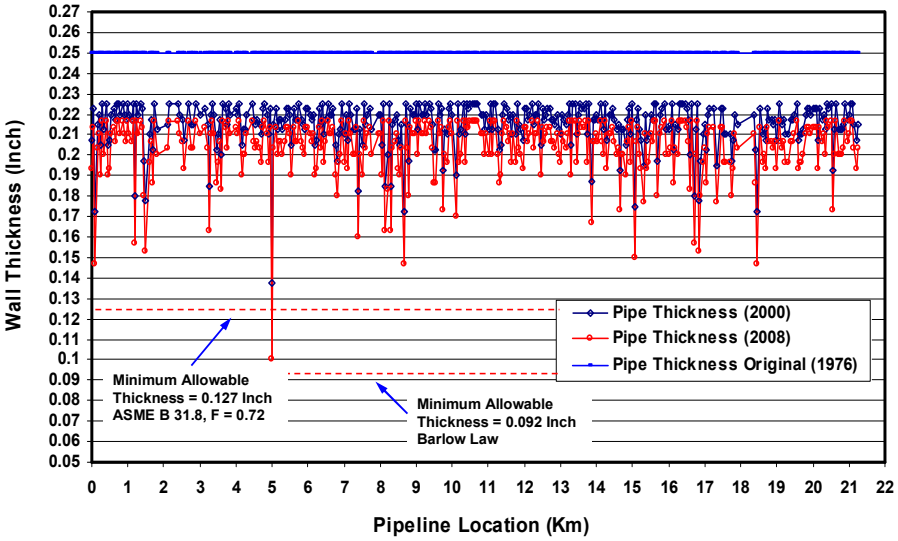
Asset Level Initiatives (level 1)
Regular Corrosion Monitoring and Inspection

Asset Integrity Management System and Maintenance Hierarchy

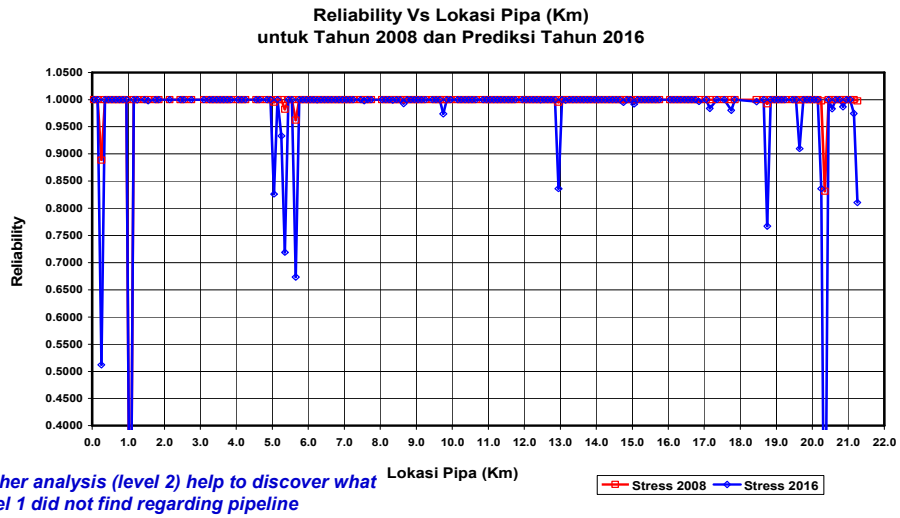
21

16" OD Gas Pipeline Thickness Vs Pipeline Location

LEVEL - 1



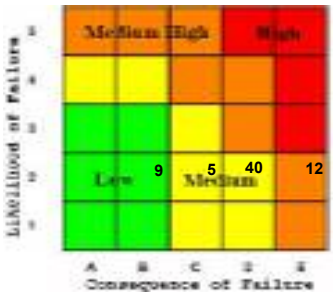
LEVEL - 2



Higher analysis (level 2) help to discover what level 1 did not find regarding pipeline reliability and so helping the management to make long term and strategic decision

Example of AIMS Program

Gas Receiving Plant Risk Based Inspection (RBI)



Current distribution of risk for a Gas Receiving Plant

Equipments ID Number	Risk Category	Inspection Time Interval (Years)
6”-HG-3003-6B Piping Bypass 6” DSHG 6”-HG-3004-6B MBFBR 103 (TOP) MBFBR 103 (SHELL) ……	2E (Medium High Risk)	5
10”-HG-3000-3B 8”-HG-3001-3B Pipe 6”-SIHG MBFBR 101 (BOTTOM) 10”-HG-3002-3B Piping 6” SHG Piping Bypass 6” SSHG MAJBR 105A (SHELL)	2D (Medium Risk)	7
3”-DC-9500-1B 3”-DC-9505-1B 3”-DC-9505-1B ……	2C (Medium Risk)	8
3”-FL-9400-1B 3”-FL-9403”-FL 3”-DC-9503-1B 2”-DC-9504-1B ……	2B (Low Risk)	10

Inspection Planning

Years until Next Inspection by Risk

Likelihood Category	A	B	C	D	E
5	6	4	3	1	1
4	8	6	4	3	2
3	9	9	7	5	2
2	10	10	8	7	5
1	12	12	11	11	11

Consequence Category

RBI result produce : larger equipments number to be inspected in the next 6 – 10 years instead of every year

7. Summary & Conclusion

Asset integrity optimization trough corrosion risk based management is a new, comprehensive, fully integrated strategic program directed to safely gaining and sustaining greatest lifetime value, utilization, productivity, effectiveness, profitability and return on asset, from physical production and operation and infrastructures asset.

It is a strategic level of asset management which fully utilize corrosion risk approach and management and gradually applied in oil and gas industries world wide and it will move for other industries as well.

Experiences of PT. Surveyor Indonesia in Corrosion

- Consulting Services for Laboratory Analysis and Corrosion Management System (EMP Kangean Ltd), PT. Superintending Company of Indonesia Consortium with PT. Surveyor Indonesia, year 2006 – 2009
- Positive Material Identification (PMI), Corrosion Assessment, ConocoPhillips Indonesia Inc. Ltd, year 2005 – 2006
- Pipeline Inspection, Supervision, Support Services & Corrosion, Total E&P Indonesie, year 2004 – 2006
- Inspection Corrosion under pipe, Pipe Crawler, Acoustic Emission, Coating, PMI Inspection, ExxonMobil Oil Indonesia Inc, year 2005 – present
- Failure Analysis Project – Logistic Quality for Toyota CBU, 2008
- Risk Based Inspection, ConocoPhillips, Pertamina E&P (2005 & 2006)
- Pipeline Integrity Management, MEDCO E&P, Pertamina E&P (2006 & 2008)