Pipeline Integrity Data: An Essential Asset

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Introduction

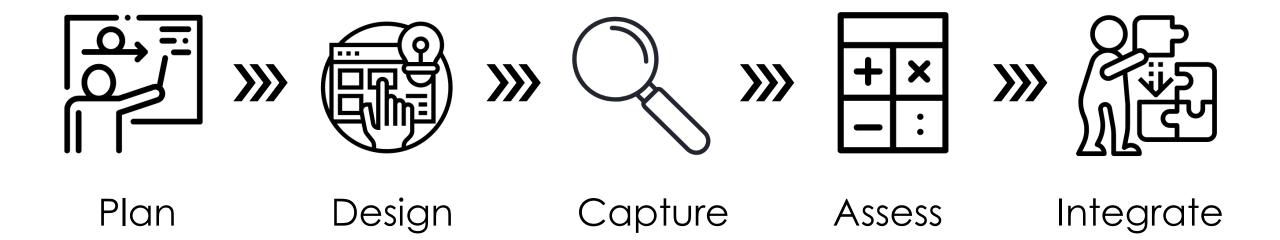
- Capturing and evaluating integrity data is a complex exercise
- As an industry we sometimes do not fully embrace the opportunity
- Efforts made to collect accurate and reliable integrity data are not always on the same level as, for example, those made when designing and constructing new pipelines
- In day-to-day operations, capacity is always maximised so that every possible hydrocarbon molecule moves through the pipeline without interruption
- So why not also maximise the value of our integrity data?







The Integrity Data Collection Process









- It is critical that integrity engineers, as well as operations personnel and management, are aware of the activities and frequencies outlined in the IMP
- IMP activities generate key inputs which, if not fed into the budget cycle promptly, an opportunity to make the appropriate corrections could be missed
- A strong governance system embedded in the PMS is often key to ensuring any deficiencies are addressed in time
- Multi-year plan is often developed, approved and funded for execution.
- A schedule should also be developed in parallel with the budget so that once funds are allocated, the program can begin without delay.

Output	Response	
Cathodic protection survey	Anode bed replacement	
	Transformer/rectifier overhaul, replacement, new installation	
	Fast-tracked coating defect survey	
	Close-Interval Survey, natural-potential survey	
	Test point, cross-bond installations, MIJ/IF replacement	
In-line inspection data	Dig program	
	Re-inspection	
	Repairs	
	Remaining life review	
	Dig up program	
	Coating repairs	
Coating defect survey	Close-Interval Survey, natural-potential survey	
	Fast-tracked ILI	
	Dig up program	
Pipeline history (same or similar pipeline)	Coating repairs	
	Close-Interval Survey, natural-potential survey	
	Fast-tracked ILI	







Take the time to think about and engage stakeholders!

- Pipeline Integrity/Engineering
- Field surveyors
- Engineering Consultants
- Inspection vendor(s)
- Construction contractors (excavation, coating removal/reinstatement, pipeline repairs)
- Pipeline operations and Control Room
- Commercial and customers
- Landholders, Cultural Heritage and other third parties
- HSE
- HR and Training
- State Regulators









- Ensure that the desired resources and conditions are in place
- Establish Roles and Responsibilities
- Hold regular meetings
- Communications















- Expected feature type, required integrity assessment, possible repair methods
- Pipeline history
- Data requirements
- Required operating conditions
- Equipment, materials and consumables
- Personnel (transport, accommodation, induction and training requirements)
- Procedures, forms and templates
- Communications protocol, Emergency Response
- Risk Assessments, JHAs and Work Permits
- Access to site, land permits, weather patterns
- Supporting equipment (i.e. excavation, sandblasting and coating, lifting, venting/flaring, welding)









	Continue Namework A Reference of the Annual State of the
	Downstream totge Datance from RGW (n): Ups Fear AGM GPS Long tude:
	Upstnam Edge Wheel Count (n): CALCULATED VALUE Upstnam AGM Chainage (n): Downstmam Edge Wheel Count (n): CALCULATED VALUE Downstmam AGM GPS Latitude:
COATING CONDITION GUIDELINES	Downsiteam AGM GPS Longitude:
1. Excellent: No visible holidays, blisters or discontinuities. Coating completely adhered to the surface of the pipe. 'As new' condition.	Downstmam AGM Chainings (n):
2. Good: Coating completely adhered to the surface of the pipe. Presence of minor blisters, discontinuities or chips with diameter less than 5mm (0.2")	SOIL DATA NOTES Use pri paper to leat natural ground ve leahind solare or mits ast and vecter in clear jar, let the dat selfle to at least 20 the height of the vecter and measure the pri of the vecter
3. Fair: Coating mostly adhered to the surface of the pipe. Signs of isolated but visible breakage, cracks, blisters larger than 5mm (0.2 inches),	Australian Land Use and Management Cascellonian Hips: //www.gythol.law.gov.au/abarea/ischargaland-caseldum-classification
showing bare pipe with/without corrosion deposits.	Sel Crypt (doze)
	Paraige (doox) Residuity (doox) Card Weeker Content Classification (doox) Land Weeker Constitution (doox)
4. Poor: Mostly disbonded and /or wrinkled. Generalized blistering and breakage or cracks. Evident corrosion deposits	Method (doox): Antiset Temperature in "C (socie text): Soli pH adacent to ROM:
5. Disbonded: Large areas (50cm or more) showing bare pipe, coating collapses after exposing or touching. No coating found or coating indistinguishable from the soil.	Soil Bactoria Teating Results (doox) Procision Processor Chloridas present? (doox) Procision Processor
NOTE: For under-coating pH readings, if pipe surface is dry, lightly scrape and add a line of distilled water against a putty spatula for placing of the pH paper. Indicate in the comments that	Bulphalas present? (docus)
a 'dry' pH reading was taken	CATHODIC PROTECTION DATA
	777 (Juntum 777
	Both meet Both meet
	A Rest
	Pendiditar a Patanta Ase
	Retrementa Celt CP Reading Upstheam Edge (mV)
	CP Diversities Edge (w/c) CP Interferences? (docw): CP Interferences? (docw): CP Interferences?
	Distance from RCW to C is seal Rectifier (n): OP Reading at Ground Level (n/): Was removal of CP Test Station Required? (Incore) ER Drop (n/): CALCULATED VALUE
	DC Current (mA):
	AC Potential (V)
	COATING DAMAGE DATA
INSTRUCTIONS	COALING CONDITION GUIDEUNES
	1. Boolinit: No valible holdays, blatera or discontinuites. Casting competitivity adhered to the surface of the pps. "An environation." Z. Good: Coaling completing adhered to the surface point. Presence of minor blatera, discontinuities or chapse." Market Coaling Completing adhered to the surface point. Presence of minor blatera, discontinuities or chapse."
- All data values are required and no boxes shall be left blank. Use "NA" if value not obtainable and explain reason in the 'Comments' section	 Fair: Coaling mostly adversed to the surface of the pipe. Signs of solated but visible breakage, crucks, bister s larger than Smm (0.2 inches), showing bare ope with/without correction deposits.
- All GPS values to be expressed in decimal (sub-cm) e.g. 38.00008897°, -77.00000089°	 Poer: Mostly diabonded and for wrinkled. Generalized bitstering and breakage or cracks. Evident correction deposits
	 Dationabit [Large areas 600m ormon] allowing bare pipe, coaling collapses after exposing or building. No coaling found or coaling indistinguishable from the woll, where
- If a distance is measured upstream of the corresponding reference point, use negative values	NOTE: for under-coaling phreadings, if pipe surfaces dry, lightly scape and add a line of dollied value against apulty spatual or placing of the physics. Indicate in the comments that a 'dry phreading vaca later.
- Data values in blue cells must be selected from the provided drop-down list. If a value is not applicable, choose the best match and provide clarification in the comments	Line Pipe Coding
- Data values in red cells are calculated	Coaling Type: Application Method (doce); Scale or Mosture Under Cealing (doce); Coaling Condition (share)
- Clock position is also determine by looking downstream. Note 'Downstream' refers to the pipeline's normal direction of flow.	Mechanical Damage (choose): If Pair to Poor, pH Under Coating
	Case of Mechanical Demage (Rivarit) Cate recus Departing (doore) Carreation by roducing (doore)
- If the actual RGW number exposed, and associated coordinates on site defer from what was stipulated in the dig sheet, please use the former and note in comments below.	Field Joint Casting
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DIRECT EXAMINATION FORM

DIG SITE DETAILS

IN STRUCTION

EX CAVATION SITE DETAILS

2. Excavation

Upstream Edge of Excav abon Datance From RCW (n); Downstream Edge of Excav abon Datance From RCW (n); Na stmum Depth of Excavation in on grand level to bp of pipe);

4. Above Ground Markers (AGM) - Refer to IU Feature Lister Dig Sheet

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Date 601000

Inspection Date: HROM PIPELINE INFORMATION SHEET

(OSD)

Clata values in red cells are calculated

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eference Girth Weld (RCW) -Rafe to Li Fesure: Listor Dig Sheet R CW Number (Li Dig Sheet)

ROW Location (decare RCWCPS Latitude (Lineping): RCW CPS Longitude (Lineping): RCW LI Wheel Court (n): R GW Chainage ()

Dg Number: FROM RIPELINE INFORMATION SHEET

All data values are required and no booss shall be left black. Use 745° if value not obtainable and explain respond the Co All GPS values to be expressed in distinat (sub-cm) e.g. 38.00008897°, -77.00.000089°

Cock position is also determine by looking do wraineers. Note "Coversineers' refers to the pipeline's normal detection of flow. If the actual RGW number exposed, and associated coordinates on site defer from what was signified in the digities, please





- Pipeline location
- Girth weld location and verification
- Excavation and pipeline exposure
- Close visual inspection (pre-coating removal)
- pH and damaged coating sampling
- Cathodic protection readings, soil sampling
- Coating removal and grit-blasting
- Pipe wall inspection
- Review of data collection forms
- Integrity assessment
- Repairs and/or re-coating
- Backfilling







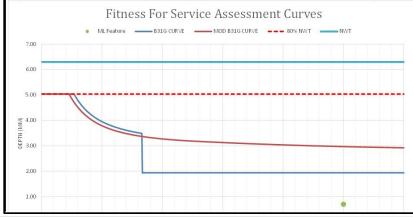


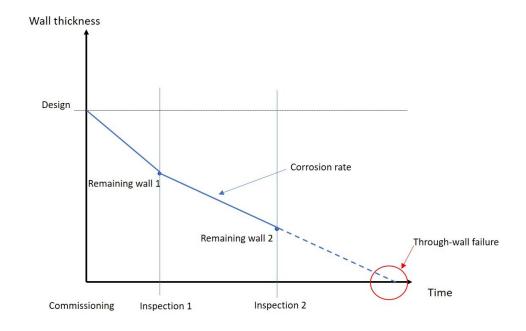


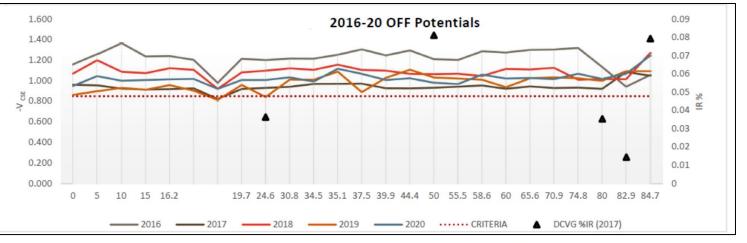
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Assess, Integrate

	4	Client:				Document No:		
(OSD a verbrec	Project:				Revision:	0.00	
	Ŷ	Description:	ASME B31G FITN CALCULATION	ESS FOR SERV	1CE	Date:	29/09/2021	
				Unit				Note
1 (GENERAL PIPELINE INFORM	IATION				Input Val	lues	
1.1	Pipeline name			63				
1.2	KP			(e)				
1.3	API 5L Pipe Grade (Select)			-		X-46		
1.4	Nominal Diameter (Select)			mm		DN 200 (8")	
1.5	Nominal Wall Thickness			mm		6.30		
1.6	Design Factor (f)			(3)		0.72		AS2885.1
1.7	MAOP			MPag		10.10	L.	
1.8	P&ID			10 C		NA		
1.9	Line Number			121		TBA		
2	PIPELINE CALCULATED PAR	AMETERS				Calculated 1	Values	
2.1	Pipe Grade SMYS			MPa		320		
2.2	Pipe Outside Nominal Diam	eter		mm		219.1		
2.3			MPag		175.63	3		
2.3	Hoop Stress at MAOP			%SMYS		54.88%		
2.4	Yield Pressure (Barlow)			MPag		18.40	0	Py = 2St/D
2.5	Max Design Pressure			MPag		13.25	§	$Py \times f$
3	ANOMALY/DEFECT DIMEN	SIONS				Input Val	lues	
3.1	Depth			mm		0.70		Max depth
3.2	Length			mm		500.00	0	Max length
3.3	Corroded wall pipe			mm		6.30		
4			ASSESSME	NT CURVES				











Assess, Integrate

- It is the ability to utilise the full range of data collected during the inspection what will allow the integrity engineer to also understand the possible cause for the damage, as well as identifying the best mitigation measures so that there are no more occurrences.
- This is the phase of the data collection cycle where the most value can be extracted out of the opportunity, but once again relying on the quality and completeness of the data collected.





+× Assess, Integrate

Use, store, manage, re-use all your data

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Data Set	Benefit
Detailed coating defect data	- Validate DCVG data
(pipe, joint, transition)	- Align coating defect and ILI metal loss
	- Define levels/severity of disbondment
	 pH (validate effectiveness of CP)
	 Identify possible blistering (CP over-protection, poor installation conditions)
	- Effects of soil type
	- Identify interference (AC and/or DC)
Soil type/condition	- Effects of soil on coating
	- Drainage, moisture, resistivity
	- Bacteria and contaminants in soil
Cathodic protection potentials (at	- Validate %IR for future CP surveys
pipe level)	- Effects of CP on coating condition
Pipeline alignment	- Identify high/low points
	- Sources of soil moisture (creeks, drainage)
	- Evidence of soil movement
GPS coordinates (anomalies, girth	- Validate ILI mapping tool accuracy
welds, appurtenances)	- Validate DCVG equipment accuracy
	- Validate GIS alignment data
	- Identify pipe movement
Material Identification	- Pipe grade, SMYS
	- Weldability
	- Hard spots
Anomaly data	- Clock position
(pre and post coating removal)	- Distance from reference girth weld
	- Interaction with other anomalies/seam weld
	- Presence of corrosion bi-products





Closing

- The collection of integrity data is often highly technical and requires great attention to detail to ensure reliability
- Opportunities to conduct these activities can be rare and it is incumbent on the pipeline operator to maximise their value
- Identifying stakeholders and ensuring they all understand the purpose of the activity, as well as making sure the data parameters are appropriately identified, is key
- The time and effort spent planning and preparing for the activity will always turn into a valuable investment when compared to possible re-work or the cost of collecting unusable data.





