Steel Pipeline Experience in MGL

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Agenda



- ✓ MGL Steel Network Information
- ✓ CGS Pipeline Network Integrity Threats
- ✓ Case Study 1 Black Powder in P/L
- ✓ Case Study 2 Valve Failure



MGL Steel Network Information



Asset Stage	Parameters	Steel pipeline
Desian	Grade	API 5 L Gr. B, X 60
	Pipe size	18", 12", 10", 8", 6", 4" NB
	Location class	Class IV
	Thickness	Mostly 9.52 mm (Min.6.4mm)
	Pressure Rating	# 150 / # 300
Construction	Pipeline Network	Non Piggable
	Protection (TPD)	RCC Tile & Warning Tape
	Protection (CP)	ICCP
	Jointing	Weld Joint (100% RT)
	Hydro Testing	31 kg / 80 kg
	Valve spacing	3.0 km (Max)
Operation	Operating Pr.	19 bar (max)
	Velocity	20 m/sec.
	Surveillance	Patrolling (Twice a day)
	Leak survey	Once in a year
	TR / TLP spacing	6-8 km / 0.5 km (Avg.)

CGD Network - Integrity Threats





Case Study -Black Powder in Gas Pipeline Network

- Typical containment in transmission pipelines in the form of:
 - Iron sulphide,
 - iron oxide,
 - iron carbonate
- Formation of Black Powder due to chemical / microbial processes. Liquid water is necessary.
- In addition of water, presence of O2, H2S, & CO2 creates favourable condition of corrosion
- Even 1 ppm of H2S can lead to high level of corrosion



- Erosion of control valves
- Erosion of gas meters
- Deposits inside compressors
- Fouling of instrumentation
- Operating issues at end users
- Consequences



Mitigation



- Use of internal coating
- Separation technologies

Background





- Third Party Damage @ Malad (WEH)
- Piling activity in Metro work by MMRDA contractor
- Incident Date 29.03.2017.
- Pipeline cut & reweld
- During rectification, traces of Black powder observed





- Pipe size 12" NB, API 5L X 60, 6.4 mm Thick
- Pipeline protected with ICCP
- Year of construction 2000/01
- Depth of pipe at damage location 6.0 meter from road surface



- Engaged L&T Hydrocarbon Ltd (LTHL)
- Findings -
 - Particle type mostly Iron oxide
 - Particle Range 0.3 to 175 micron meter
 - Mostly 1-15 micron meter
- Recommendations Pigging, Filtration

Pipeline Elevation Profile





Distance (In meters)

ipeline Depth Profile



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Action taken



Question - Are the solids being generated within the network or are they being dumped into it?

O Gas sample drawn @ CGS terminal and tested for particle size.

Ageney	Date	Findings					
Agency		Particle Type	Particle Size Range				
M/s PALL	10-05-2018	Mostly Iron oxide (> 90 %) with trace amount of black carbon particles.	5-15 μm - Majority				
M/s SGS	27-7-2018	Mostly Metal Oxide & Fibrous Material	4-15 μm (95%), 5-15 μm (65 %)				
M/s PALL	27-7-2018	Mostly Iron oxide (> 95 %) with trace amount of black carbon particles.	5-15 μm - Majority				

- **•** To arrest dust particles at receiving station.
- Possible solution....
 - **O** Filtration skid
 - Install additional filter in MGL custody (0.3 micron)
 - O Site feasibility survey carried out.
 - **1** Technical specification for filtration skid has been finalized.
 - Tendering & Procurement by Jan'19

Internal Corrosion Direct Assessment (ICDA)



Trace of Black Powder in P/L Diversion



Location	Pipe size	Thick	Pipeline Cover	Year of P/L construction	Month & Year	BP Exists?
Botanical Garden, Sion	18" NB	8.2 mm	1.2 m	1998-1999	May'18	No
Botanical garden, Sion	12" NB	9.5 mm	1.2 m	1998-1999	Apr'18	No
Saket kalwa, Thane	12" NB	9.5 mm	2.0 m	2004-2005	Jun'18	No
Grant Road Metro Stn.	8″ NB	8.2 mm	1.3 m	2001-2002	Aug'18	No
Mahalaxmi Metro Stn.	8″ NB	8.1 mm	1.4 m	2001-2002	Sep'18	No





Botanical Garden



Mahalaxmi



Grant Road

Case Study -Valve Failure

Valve Failures Incidents

Date - 17th July'2014 Location - Worli Naka 3", Tap off Valve, Stem blow out Injury - Nil Media Coverage - Yes Make - Microfinish (Year 2003)



Date - 31st July'2017 Location - Nr. Radiant RO, Chembur 4", Tap off Valve, Stem blow out Injury - Nil Media Coverage - Yes Make - Microfinish





Initiatives



Failure analysis by <u>expert</u>	Failures during field	<u>Metallurgical</u> analysis	<u>AP Review</u>
agencies	testing <u>analysis</u>	Action - Comparison	Action - Benchmarking
(IIT, L&T, TCR etc.)	Action - Diameter	between MGL Tech	study with various QAP's,
Action - Recommendations addressed in Valve Tech Specifications	data of field hydrotesting (2014 Onwards)	Test Certificates	parameters.

Root Cause

- Non conformity of stem bolts to ASTM A 193 Gr. B7 (high hardness 45- 46.6 HRc, Required 23 HRc)
- Stem design not anti blow out type (15 years old design)
- Localized stress corrosion cracks on the threads.

Action Plan

- QAP strengthening
- Valve Assurance Framework
- Facility inspection of valve manufactures

Valve Maintenance

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- Maintenance Frequency Once in a six month. (Previously it was once in a year)
- Activities (as per approved SOP)
 - O2 and Gas % check
 - Chamber cleaning & dewatering
 - Stem holding clamp mounting
 - Valve operation (closing & opening) Min. 20%
 - Leak check with soap solution
 - Greasing @ stem & stud bolts
 - Records
- Trained contractor staff
- 100% Supervision by MGL engineer



Precautionary Measures - Clamp





Stem Holding Clamp used at site



Stem Holding Clamp Assembly



Valve Replacement Plan



Sr.	Valve Make	No. of	<10 Years		10-15 Years		> 15 Years	
No	valves	3"	4"	3"	4"	3"	4"	
1	Automech	34	1	1	2	19	9	2
2	Flowchem	86	2	8	8	55	7	6
3	Hawa	2	0	0	2	0	0	0
4	Microfinish	40	0	38	0	1	1	0
5	Microfinish Type B	29	2	5	5	1	5	11
6	Microfinish Type C	40	4	15	8	9	1	3
7	Make not known	1	0	0	0	0	1	0
8	Oswal	16	5	9	0	1	1	0
9	Petro	5	0	1	0	3	0	1
	Grand Total	253	14	77	25	89	25	23

3" NB - 64 nos. , 4" NB - 189 nos.

	Priority	Valve Details	Target
	1	Microfinish C type valves	38
Replacement Plan	2	Microfinish valves > 15 years	17
	3	Flowchem valves > 15 years	7
	4	Petro Make Valves	4
	5	Automech > 15 years	11
		Total	77

Thank You...



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