Integrity Management of Steel Pipeline Network in MGL

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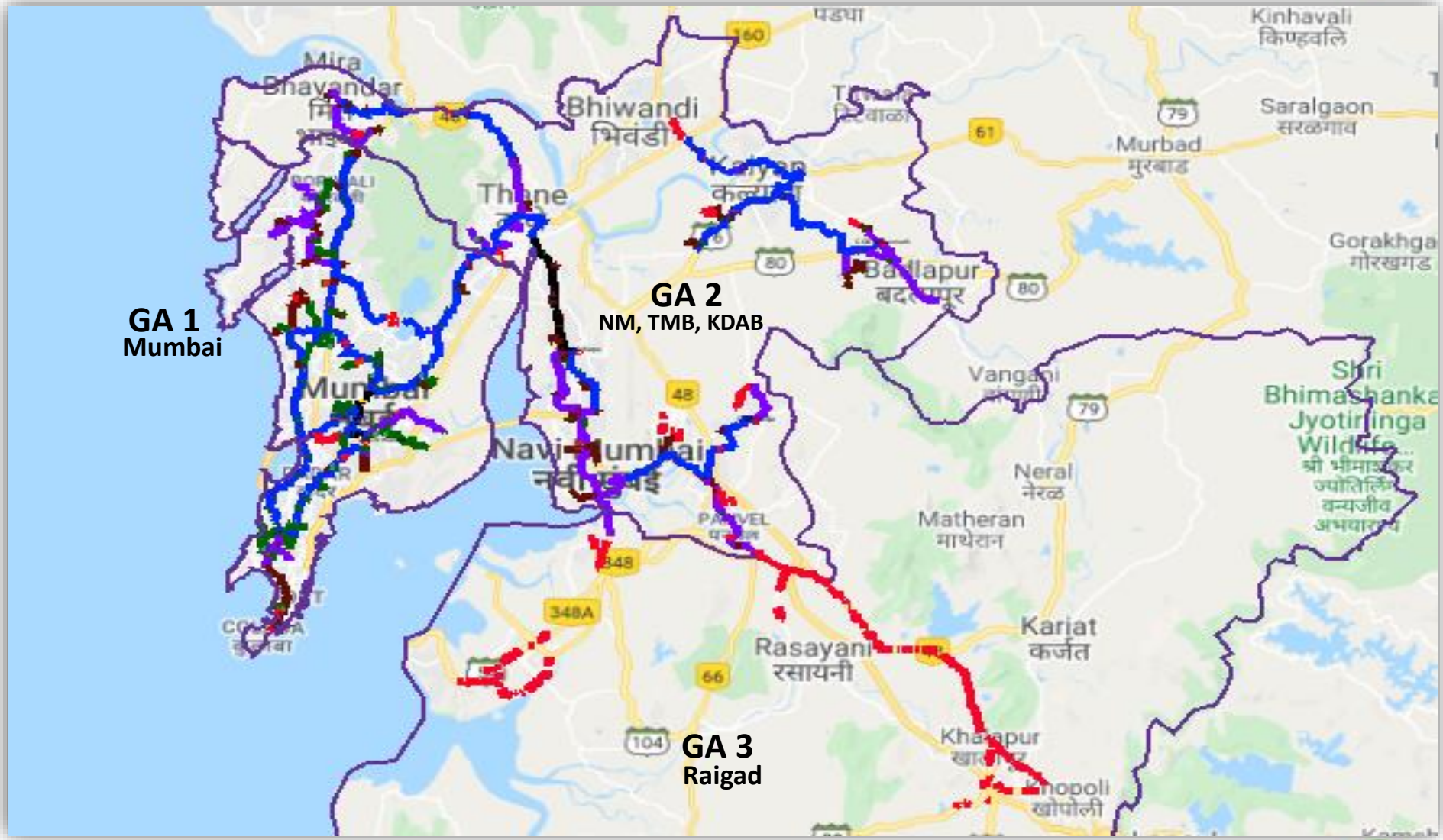
MGL Steel Network



Pipeline Threat & Mitigation Plan

Threat	Cause	Consequence	Mitigation Plan
Mechanical Damage	• Third party Excavation • Theft / Sabotage	Gas leak, Fire	• Daily Patrolling • Excavation Monitoring • Leak detection • Dial before Dig
External Corrosion	• Coating defect • AC/DC Interference	Metal loss, pin hole	• DCVG survey • ICCP • Interreference study
Internal Corrosion	• H2S • Moisture	As above	• Gas analysis • Opportunistic Coupon test
Construction	• Weld defect • Coating defect	As above	• Radiography • Holiday test • Quality Assurance through PQR, WPS
Equipment related	• Defective valves	As above	• Routine Maintenance of Valve & Valve chambers • Management of change • Risk audits - Safety Critical equipment
Manufacturing defect	• Inadequate inspection	Poor quality material	• QAP review • Vendor assessment
Incorrect operation	• Non availability of SOP • Incompetency	• Gas leak • Supply failure	• STC Training • COP / SOP review

CGD Network Threats

- Third Party Excavation
- Single utility corridor
- Change in as build Ref.
- Rodent bite on PE pipe

Third Party Damage

- Coating Defects
- Cased crossings
- Few FB coated pipes
- AC/DC Interference

External Corrosion

Asset Ageing

- Weld end valves
- Network >25 yrs. old
- ROU space constraint
- (for pipeline relaying etc.)

Internal Corrosion

- Non piggable pipelines
- Non spec. Gas (if any)
- Water bodies crossings
- P/L Drying operation

Routine Network Monitoring

Network Surveillance
(Patrolling - On day basis)

CP Monitoring

(PSP: -0.85 to -1.2 V)

Dial Before Dig
(1800229944 / 24012400)

Corrosion coupon
Corrosion rate (<5mpy)

Leak Survey
(Identify leak spot)

DCVG Survey
(Coating Defect)

Network Surveillance

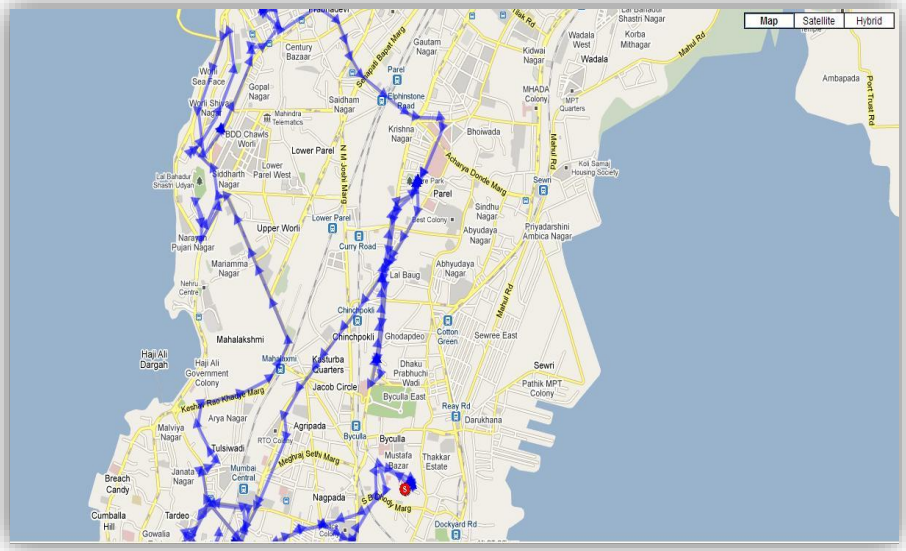
Patrolmen keep watch over pipeline network. Entire Steel & PE network is monitored everyday

Excavation site supervisors deputed on major / critical sites

VTS - Effective Patrolling & Monitoring

- Ability to track Patrolman bike from Point to Point in real time
- Visual representation of the geographical location
- Real time two-way communication between the base, Operations and vehicles
- Ability to provide accurate network wide location information of the entire fleet
- Grouping of Vehicles by user

VTS instrument installed on Motor bike



Patrolman Traveled Route in VTS

Pipeline Integrity Management System (PIMS)

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Pipeline Threat Identification

TR Segment

Mains | Tap

-1- | -2- | -3-

Threats
- Third Party Damage
- External Corrosion

Model Execution

Ext. Corrosion
- Analysis / Lab Reports
- Survey reports

Third Party Damage
- Field Visit
- Data Collection

Third Party Damage	
Factor	Weight
Patrolling	0.3
Pipe wall thickness	0.25
Pipeline top cover	0.25
Road Surface above Pipeline	0.2

External Corrosion	
Factor	Weight
Soil resistivity	0.2
Coating defect	0.2
CP system failure	0.2
AC / DC Interference	0.2
Cased crossing	0.1
CIPS / DCVG Survey	0.2

Assessment & Estimation of risk level of each pipeline segment & identification of critical segments within MGL gas pipeline network.

Risk Matrix

RISK RATING	MANAGEMENT REVIEW
• HIGH RISK SCORE	• PNGRB Norms
• Local authority Requirements	• Upgradati
	• Business Requirements

Identification of Critical Segments

Description	Action plan
Steel pipeline (12"/18") behind Wadala CGS)	Diversion
Steel pipeline (2") at NHTC, Amar Mahal	Up gradation to 6" NB
Steel pipeline (12") at Dahanukar Kandivali	Diversion
Steel pipeline (4") at Majas Depot, JVLR	Diversion
Steel pipeline (2") at MTA Kurla	LRUT & Remaining life study

Mitigation Plan

Risk Assessment

Third Party Damage				
Factor	**Weight**	**Criteria**	**Criticality**	**Score**
Patrolling	0.3	2 trips (day & night)	Low	1
		Daily patrolling - 1 trip	Below Avg.	2
		1 trip in 3 day	Avg.	3
		3 days or no patrolling	High	4
Pipe wall thickness	0.25	Exceeding standard	Low	1
		As per standard	Below Avg.	2
		Less than standard	Avg.	3
		Not known	High	4
Pipeline Top Cover	0.25	as per spec (1.2 m)	Low	1
		0.85 m to 1.2	Below Avg.	2
		< 0.85m but ≥ to 0.6m	Avg.	3
		less than 0.6m	High	4
Road Surface above Pipeline	0.2	Below 300 mm thk. RCC	Low	1
		Below Asphalt	Below Avg.	2
		Below un-made ground	Avg.	3
		Pipeline exposed	High	4

Risk Assessment

External Corrosion				
Factor	Weight	Criteria	Criticality	Score
Soil resistivity	0.2	Soil 20 to 100 ohms-meter	Low	1
		Soil 10 to 19 ohms-meter	Below Avg.	2
		Soil 5 to 9 ohms-meter	Avg.	3
		Soil 0 to 4 ohms-meter	High	4
Coating Defect	0.2	Unattended defect (<1 month)	Low	1
		1 - 6 month	Below Avg.	2
		6- 12 month	Avg.	3
		> 12 month	High	4
CP system failure	0.2	For 3 days	Low	1
		4 - 15 days	Below Avg.	2
		16 - 30 days	Avg.	3
		> 30 days	High	4
AC / DC Interference	0.2	< 5 amps	Low	1
		5 - 50 amps	Below Avg.	2
		51 - 99 amps	Avg.	3
		> 100 amps	High	4
Cased crossing	0.2	No Cased crossing	Low	1
		Casing with spacer	Below Avg.	2
		Casing without drain	Avg.	3
		Improper casing	High	4

Risk Assessment

Likelihood X Consequence

Factor	Wt.	Criteria
Patrolling	0.30	Patrolling - 2 trips
		Daily patrolling - 1 trip (day & night)
		Patrolling 1 trip in 3 days
		Patrolling frequency > 3 days
Pipe wall thickness	0.25	Pipe thickness exceeding standard
		Pipe thickness as per standard
		Pipe thickness less than standard thickness (less up to 12.5%).
		Pipe thickness not known
Road Surface above Pipeline	0.20	Below 300 mm thickness RCC
		Below Asphalt
		Below Un-made ground - dirt track, field, soil surface.
		Pipeline exposed
Pipeline top cover	0.25	Top cover as per spec (1.2 m)
		Top cover 0.85 m to 1.2 m
		Top cover < 0.85m but ≥ to 0.5m
		Top cover less than 0.5m

Factor	Weight	Criteria
No. of Buildings in PIA	0.25	No. of buildings <100
		No. of buildings 100 - 200
		No. of buildings 200-300
		No. of buildings >300
No. Buildings where population with impaired mobility	0.25	No. of buildings =0
		No. of buildings 1-2
		No. of buildings 2-5
		No. of buildings >5
Property Damage	0.25	Worth upto Rs.1,00,000
		Rs.1,00,000 - 10,00,000
		Rs.10,00,000 - 1,00,00,000
		Worth > Rs.1,00,00,000
Reputation loss	0.25	No attention
		Local area attention
		State level attention
		International attention

Risk Score

Segment location	Indus filling station (IBP Wadala)	Lucky Auto Sion
Likelihood	1.85	1.6
Consequence	1.75	1.5
Score	3.2	2.4
	ALARP	LOW

AC Interference Study

Objective

Possibility of AC Induced corrosion on Steel pipeline network due to its proximity to overhead HT Transmission lines, Railway Traction system etc.

Purpose

To bring the impacts of AC interference voltages to tolerable levels on the pipeline and reduce the possibility of AC corrosion.

NACE Criteria

Max Induced Voltage - 15V, Max Induced Current Density - 30 A/m2

Steps to Follow

Field survey, Gathering power line data from utility, Software simulation, Data logging for 24 hrs (Voltage & Current measurement), Mitigation design etc.

Mitigation measures

Anode beds, Ribbon anode, Deep well etc.

External Corrosion Direct Assessment (ECDA)

Objective

ECDA is one of Integrity assessment technique for Non-piggable pipelines, recommended by PNGRB IMS regulation & ASME 31.8 S

Purpose

ECDA is a continuous improvement process targeted to identify and address locations where external corrosion activity has occurred, is occurring, or may occur.

- Priority given for older pipeline segments in Phase 1.

- Undertaking the assignment in 04 stages as per NACE standard

  - Pre assessment : Pipeline Data gathering, Identifying ECDA Regions
  - Indirect Inspections : CP Surveys (CIPL / CAT / DCVG)
  - Direct Examination : Field excavations, Soil test, Peel test, Thick. measurement etc
  - Post assessment : Thickness loss, Remaining life

Thank You...

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