



Qatar Petroleum

The Need for Implementing an Asset Integrity Strategy: An Experience in Qatar Petroleum NGL Plants

By:
KHALID AL-DAQAL
Asst. Manager Business Planning (D)

Outline

- Brief about QP's NGL Facilities
- Establishment of Asset Integrity in NGL plants.
- Outcome of the implemented Asset Integrity program.
- Short & Long Terms actions for improving the Asset Integrity.

	Commissioning date	Capacity of Raw NGL Processed (TPD)	Capacity of Gas Feed (MMSCFD)
NGL-1	1980	4000	
NGL-2	1980	4500	200
NGL-3	1991		1023
NGL-4	2002	10100	

How strategic are the NGL Plants for the State of Qatar

- Main Fuel Gas Supplier to power stations and consumers.
- Ethane Gas (Feed Stock) supplier for petrochemical companies in Mesaieed City.
- Export of NGL products of around 4.3 million MT per year

A Major Gas Leak Incident On Feb. 2003:

3/4" Insulated drain valve on Raw NGL Liquid Injection Pump in NGL-2 failed, which resulted in releasing a considerable amount of Gas.

Investigations revealed valve had fallen off due to valve body bolts corroded and broken.

MAINTENANCE PHILOSOPHY THAT WAS BEING FOLLOWED:

▪ **STATIC EQUIPMENT**

- Corrective Maintenance.
- Preventive maintenance.
- Shutdown maintenance (2 Years cycle)

▪ **PSV**

- Test/Overhaul according to Inspection Schedule.

▪ **PIPING**

- Inspection and repairs were carried out on ad hoc basis.

Actual Situation / Findings:

- Shortage of historical piping inspection data (specifically related to piping under insulation) and effective documenting process.
- Unclear long-term inspection planning, and inspection carried out was ad hoc and not risk-based inspection (RBI)
- An increasing trend in piping defects and repairs.
- Organization structural constraints in reporting lines & accountability for Assets.

REMEDIAL ACTIONS TAKEN

IMMEDIATE ACTION

- Higher Management Steering Committee
- Asset Integrity Task Force
- Dedicated Contract Started for Asset Integrity works.
- Initiated emergency material procurement action.
- We planned a series of mini shutdowns for executing the Asset Integrity works
- Inspected/replaced all small Drain/Vent Valves.
- Inspection/Replacement/Grit Blasting/Painting of piping under insulation in NGL Plant

Corrosion Under Insulation (CUI)

- Corrosion under insulation is difficult to detect because of the insulation cover that masks the problem until it is too late.
- The damaged Insulation resulted in ingress of moisture due to deluge system water, or sweating from temperature cycling or low temperature operation such as refrigeration units.

Outcome of this Exercise

Category	Inspected/ Replaced
Drain & vent Valves	440 nos.
CAIRS/ defective pipes	660 CAIRS
Inspected piping	All piping under cold Insulation

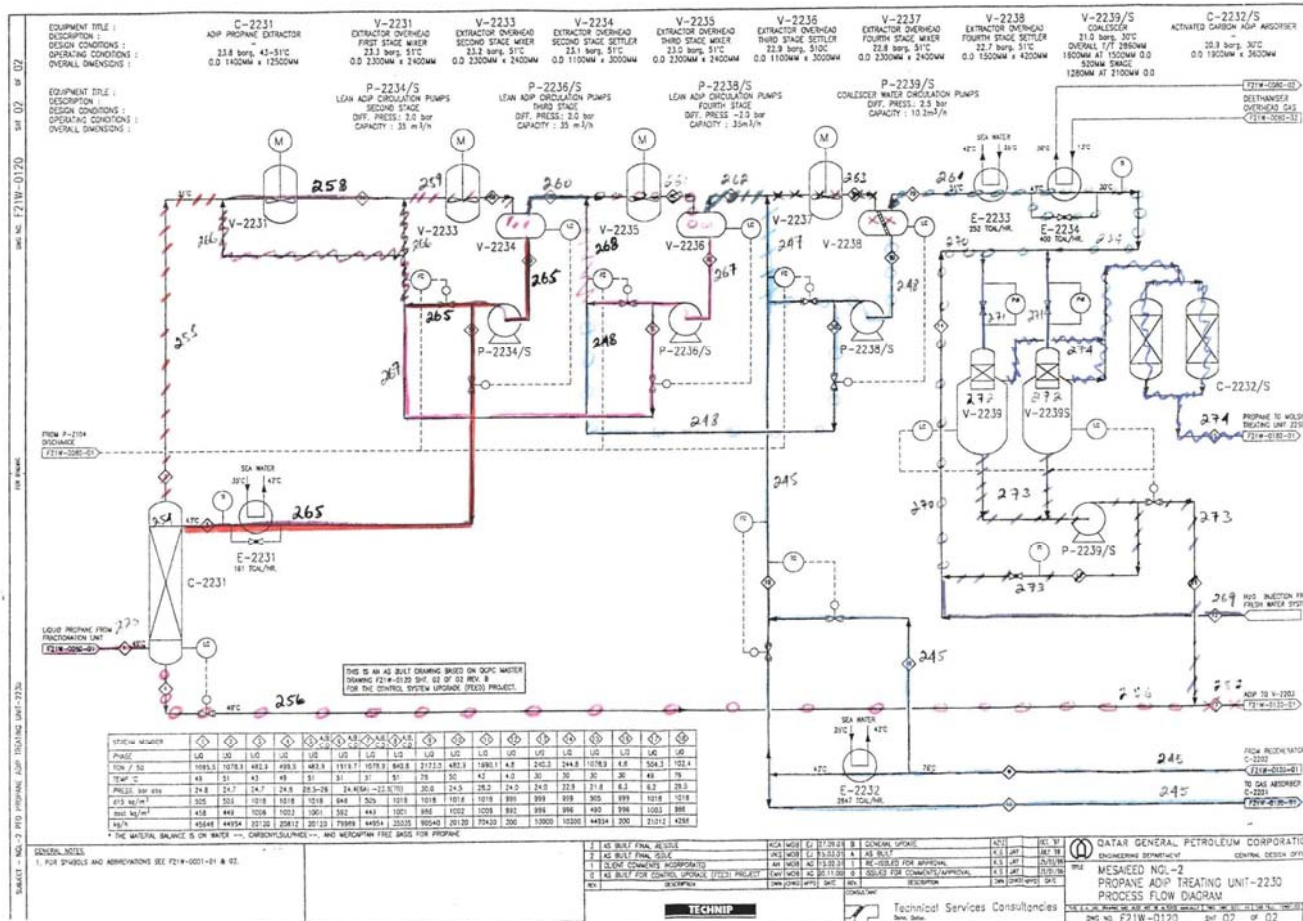
➤ All this was achieved by planning a series of mini plant shutdowns in succession without affecting plants availability and with no disturbance to the consumers.

Long Term Actions

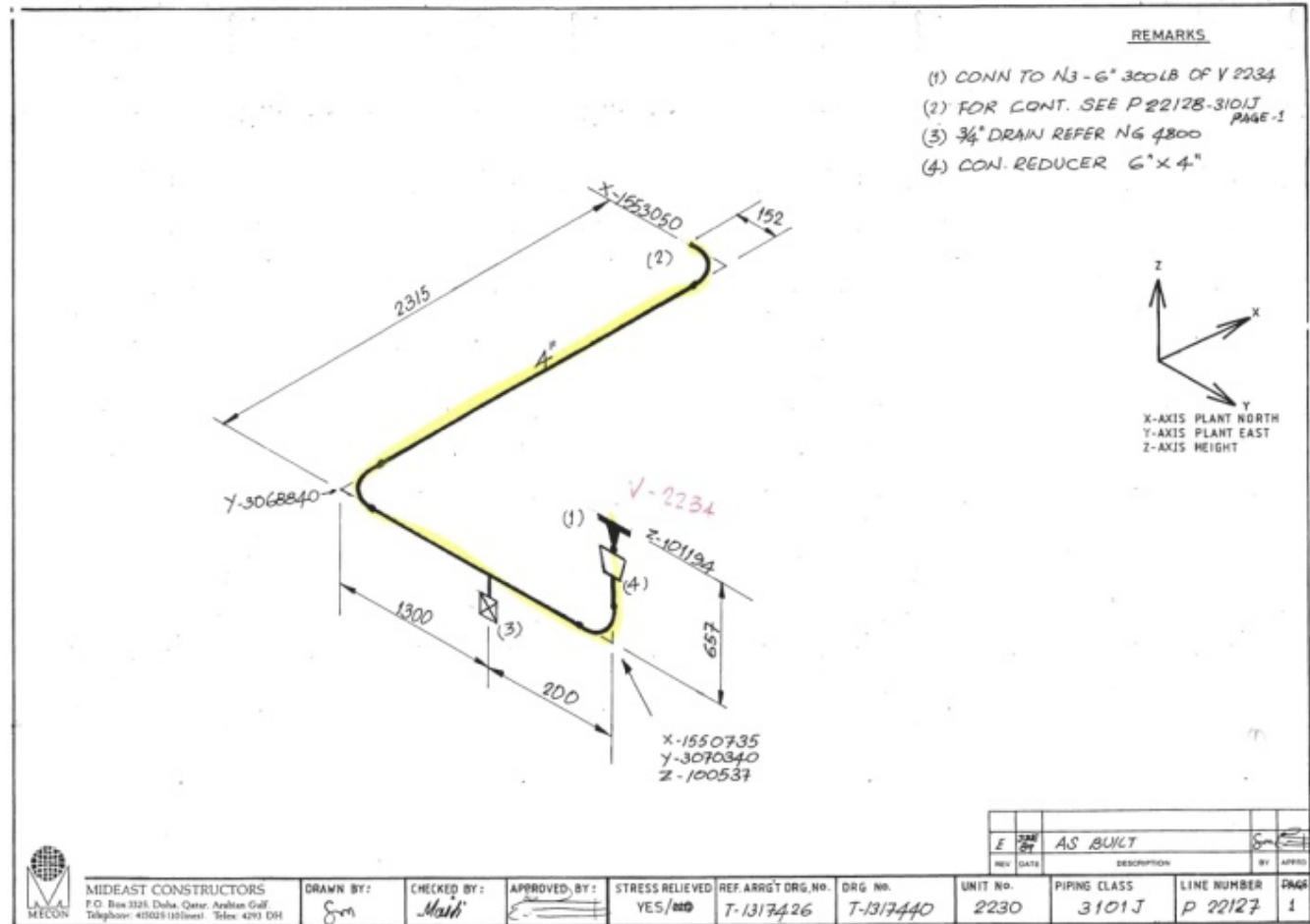
- To produce an asset corrosion management strategy document. Without such a document, there would be no systems in place to effectively manage corrosion.
- Conduct RBI study
- Develop Inspection electronic documents (PFDs, P&IDS, and ISO drawings for the RBI Software)



Marking-up PFDs and P&IDs



Get Construction Isometrics



Define Inspection Locations

Reliability Based Mechanical Integrity

File View Reports Help

Pipe Circuit: 22-265-00 : Messaieed : NGL2 : B/73

Previous Next Edit Save Cancel Print

Locations

Fixed Equipment Data

- 22-265-00 : Pipe Circuit
 - Circuit Data
 - Data
 - Corrosion Study
 - Env. Cracking
 - Items
 - Criticality
 - Drawings
 - Images
 - Documents
 - Inspection Summary
 - Inspection Planning
 - Non-MI Tasks
 - NDE Inspection
 - Locations**
 - Inspection Data
 - Evaluations
 - History
 - Graphs
 - Visual Inspection
 - Other Inspection
 - Non-Conformance
 - Coupons
 - Probes

Inspection Locations Defined

	Status	Inspec Loca	Line No	Loca Descr	Component	Size (mm)	Date Instal	Mat Spec	NomThk (mm)	Min (mm)
1	Active	265-01-01N	P 22127	north	Circuit	4.000	01/01/1989	API-5L	B	6.0000 2.5000
2	Active	265-01-01S	P 22127	south	Circuit	4.000	01/01/1989	API-5L	B	6.0000 2.5000
3	Active	265-01-02-N	P 22127	north	Circuit	4.000	01/01/1989	API-5L	B	6.0000 2.5000
4	Active	265-01-02-O	P 22127	outside	Circuit	4.000	01/01/1989	API-5L	B	6.0000 2.0000
5	Active	265-01-03-B	P 22127	bottom	Circuit	4.000	01/01/1989	API-5L	B	6.0000 2.5000
6	Active	265-01-03-T	P 22127	top	Circuit	4.000	01/01/1989	API-5L	B	6.0000 2.5000
7	Active	265-01-04-B	P 22127	bottom	Circuit	4.000	01/01/1989	API-5L	B	6.0000 2.5000
8	Active	265-01-04-O	P 22127	outside	Circuit	4.000	01/01/1989	API-5L	B	6.0000 2.5000

Right-Click to display the TMin Calculator.

Locations Inspection Data Evaluations History Graphs

Plant: Messaieed Unit: NGL2 EquipmentID: 22-265-00 Description: V-2234

Metrics : PSD - FE - Use Bars 20583 Oracle SysAdmin Server = RBMP.DB = Qatar Petroleum NUM CAPS INS 1:25 PM

Start Reliability Based Mec... 1:25 PM

Evaluation

Reliability Based Mechanical Integrity

File View Reports Help

Pipe Circuit: 22-265-00 : Messaieed : NGL2 : B/73

Previous Next Run Print

Evaluations

Fixed Equipment Data

- 22-265-00 : Pipe Circuit
 - Circuit Data
 - Data
 - Corrosion Study
 - Env. Cracking
 - Items
 - Critically
 - Drawings
 - Images
 - Documents
 - Inspection Summary
 - Inspection Planning
 - Non-MI Tasks
 - NDE Inspection
 - Locations
 - Inspection Data
 - Evaluations**
 - History
 - Graphs
 - Visual Inspection
 - Other Inspection
 - Non-Conformance
 - Coupons
 - Probes

Corrosion Rate Calc Date:

Notes*
07 - NomThck/Datelnst used
11 - Check CurRdg
12 - Check NomThck

Inspection Evaluation

Insp. Loc.	Nom. Thick.	Prev. Read	Prev. Date	Cur. Read	ST Cor. Rate	LT Cor. Rate	Rem. Life	Remarks
1 265-01-01N	6.0000	4.1000	04/04/2005	4.1000	0.00000	0.00000	40.00000	11:12
2 265-01-01S	6.0000	4.5000	04/04/2005	4.0000	0.48150	0.48150	3.11526	11:12
3 265-01-02-N	6.0000	6*.0000	01/01/1989	3.9000	0.12910	0.12910	10.84431	07:11:12
4 265-01-02-O	6.0000	6*.0000	01/01/1989	4.2000	0.11070	0.11070	19.87353	07:11:12
5 265-01-03-B	6.0000	6*.0000	01/01/1989	3.6000	0.14750	0.14750	7.45763	07:11:12
6 265-01-03-T	6.0000	6*.0000	01/01/1989	3.5000	0.15370	0.15370	6.50618	07:11:12
7 265-01-04-B	6.0000	6*.0000	01/01/1989	4.0000	0.12300	0.12300	12.19512	07:11:12
8 265-01-04-O	6.0000	6*.0000	01/01/1989	3.2000	0.17210	0.17210	4.06740	07:11:12

Component	ST Avg Corrosion Rate	LT Avg Corrosion Rate	Remaining Life
Circuit	0.188	0.188	3.115

Retirement Date: 31/05/2009 Remaining Half Life: 1.55763

This evaluation was for NDE readings through: 20/04/2006
To update the evaluation,
 Exclude readings indicating growth
 Show All Columns

Locations Inspection Data Evaluations History Graphs

Plant: Messaieed Unit: NGL2 EquipmentID: 22-265-00 Description: V-2234

Metrics - PSD - FE - Use Bars 20583 Oracle SysAdmin Server = RBMIP.DB = Qatar Petroleum NUM CAPS INS 10:55 A

Start Reliability Based Mec... 10:55 AM

Benefits of Asset Management system

- RBI will ensure that Inspectors will not miss critical areas that could ultimately develop into leaks or failures.
- Reduced Inspection Costs by focusing on the critical areas
- Reduced Repair Costs and Plant Downtime by prioritizing works
- Ensure reliability and availability of NGL Assets
- Moving from 2 yrs to 4 yrs Shutdown cycle.

Other long term actions :

Based on Engineering Consultancy Study the following were carried out:

- Upgrading to superior Materials (Vessels/heat Exchangers).
- Piping Modifications to introduce stand by positions for critical single PSVs.
- Replacement of all PSVs of size less than 1" instead of servicing them.
- Call Off contract for PSVs spares to reduce procurement lead time.

ORGANIZATIONAL CHANGES

Changed to an Asset Management based organization structure:

- Production and Maintenance under one department.
- Engineering Dept re-structured with focus on:
 - Engineering design changes.
 - Reliability section to review equipment failures & carry out root cause analysis.
 - Dedicated Shutdowns section

- Asset Integrity program has been extended to include our relatively new assets NGL-3 and NGL-4 facilities.
- Our Asset integrity program has increased our confidence in the safety of NGL Assets. And subsequently we have not experienced any piping failures.

Thank You