Analysis of Material and Corrosion Damage Reports (MDCR’s) for an Ageing Asset.

Part. 1
A Year In The Life Of A Corrosion Engineer

CED – 26th May 2015
Stephen Tate
Mature Asset - 1

Operating Beyond Design Life

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Stephen Tate
Investigations and Failure Reports

A Visual History

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Corrosion Due To FM Postponement

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GLX-008 Area 1 :- Hole in deck plate - salt water falling through onto gas pipework below.
Accumulator Coating Failure
Control Box Corrosion
General Disintegration

6"-Y-1838-AX - Pitting 2-3mm deep at weld.
General Disintegration

Widespread corrosion on additional 2" line 'D' on 6"-Y-1836-AX.
General Disintegration

3"-Y-1865-AX - Pitting 2-3 mm deep.
Widespread General Deterioration + Severe External Corrosion

Diesel System

Diesel fuel line weld corrosion at West side of sackstore deck level.
Transformer External Corrosion
Hole in underside of dump valve box.
Typical corrosion on unprotected c/s sand wash supports.
Gas outlet nozzle N2 flange

Close up of bolt corrosion.
Close up of disintegrating/clogged vane pack
Typical category A/B corrosion of vessel nozzles/pipework
Category C corrosion on diesel line
B John Brown Exhaust West side
Holed area of Deck Plate, directly below the RO Water Maker.
500 x 100mm.
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Corrosion Due To CUI

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GLX-008 :- Heavy cat B corrosion - area 1 on isometric.
E-5026A: Showing corrosion after insulation removal.
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Corrosion Due To Internal Lining Failure

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T-105E Internal showing lining disintegration.
Corrosion Due To PWC

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Close up of hole adjacent to heat affected zone of weld.
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Titanium

C/S

Inlet to B De-oxy Tower leak

Close up of 8mmX3mm hole in weld
Corrosion Due To Bacterial Attack

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Bacterial Attack
Pinhole leak on 6"-P-1162 from proover loop

Poor quality photo due to adjacent light.
Proover Line Sectioning (Pinhole Leak)
Pinhole leak at 5 o'clock
Separator sandwash inlet line leak.
Erosion Effects

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A JB diesel starter c/w outlet

Pinhole leak in bend
Leak on B WI Pump C/W return spool
Leaking backflush bend on A Coarse Filter.
Old Style Threaded Connections

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PPI-11405 : 6”-P-1009 C09 Flowline 2” COSASCO fitting AW 5811B/2
Threaded unwelded drain connection.
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Flange Face Corrosion

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7mm deep pitting.

Close up view of corroded slip-on-flange face.
Close up view of corrosion to base of launcher door max depth = 3mm. The width of the area = 20mm wide x 350mm long max from end to end.
Severe pitting of flange into seal area approx 5mm loss.

RTJ seal area pitted/grooved
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Cracking / Vibration / Fatigue

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Through wall crack east side of tulip.
East ignitor

Damaged nozzle, bracket & ignitor and through wall crack to ignitor.
Flange not threaded

Underside of flange showing sheared tacks
Sheared smallbore pipe from degasser line
Crack on weld of support flat to ring.
Valve cracked above bottom flange.
Fig. 6 view of air instrument line fracture surface.
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HC Containing Leaks

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Pinhole leak @ 6 o'clock opposite 2" branch pipe.
Leak at top slip on flange backweld

Pinhole leak from bottom leg of slip on flange backweld
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Non HC Containing Leaks

Analysis of Material and Corrosion Damage Reports (MDCR’s).

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Several pinhole leaks at 6 o'clock
Fig 2. K-3210C Position of leak from S/W inlet cooling line.
V88 Disposal Pile - Leaking Bellows.
Pinhole leak on 90 degree bend on drain spool.

Close up of pinhole leak on 90 degree bend.
Pinhole leak on weld downstream from PV339/2
C39 WI line leaking at orifice tap-in.

Close up of leak from threads of tap-in point.
Leak and generally in poor condition throughout line

Temporary bandages applied to two leaks
Close up of hole in weld SW side.
Leaking C/S pup piece spool through penetration behind visible spool

Leak from A Firepump discharge line
Fig. 2. Fine Filter 'D', leak from manway attachment weld.
Leaks at welds on backflush header.

from Coarse Filters

6"-W-1455
5mm hole in inlet nozzle behind.
Close up of temp' patch on leak - 4"-W-1434
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Structural Damage

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Hole 5mm X 12mm on 8" Walkway Tubular on 30mm X 50mm scar area.
Caisson Failure
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Other Mechanical Damage

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Close-up of damaged area: -
Gouge 35mm long X 6mm wide X 3.5mm deep on underside of 6" X 2" reducer "T" on Gas Lift Manifold
Mechanical damage to seal area.
Image showing damage to tubing at interface with bolt on non-standard clamping arrangement.
General view of damaged 12" De-Oxy Tower Inlet Line due to part of Chemist Lab fouling pipe resulting in tapered groove with dimensions of 110mm long X 15mm wide X 6mm Deep.
# Summary of Findings

## System Type - Leaks

<table>
<thead>
<tr>
<th>System Type</th>
<th>No. of Failures</th>
<th>% Total</th>
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<tbody>
<tr>
<td>Water (Cooling)</td>
<td>11</td>
<td>39.29</td>
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<tr>
<td>Water (Injection)</td>
<td>4</td>
<td>14.29</td>
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<tr>
<td>Water (Sea / Source)</td>
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<td>Water (Fire)</td>
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<td>Water (Produced) - Min HC</td>
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<tr>
<td>Oil (Closed Drains) - HC</td>
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<tr>
<td>Oil (Produced) - HC</td>
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<td>7.14</td>
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</tbody>
</table>

**Total No. of Failures:** 28

**Total % of Failures:** 100%

### MCDR’s - Causal Effects

<table>
<thead>
<tr>
<th>Causal Effect</th>
<th>No. of Type</th>
<th>% Total</th>
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<tbody>
<tr>
<td>CUI</td>
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<tr>
<td>Lack of Fabric Maintenance</td>
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<tr>
<td>Internal Lining Failure</td>
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<tr>
<td>General Mech. Damage</td>
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<tr>
<td>Cracking / Fatigue</td>
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<td>Pref. Weld Corrosion</td>
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<td>Erosion (Bends)</td>
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<td>Galvanic</td>
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<td>Bacterial</td>
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<tr>
<td>Other Structural Issues / Concerns</td>
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<td>5.13</td>
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</tbody>
</table>

**Total No. of MCDR’s:** 78

**Total % of MCDR’s:** 100%
Presentation

End Part 1.