



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Investigation into the co

Abi Price 1707799

Andrew Thorn

University of Wales Trinity Saint

BEng (Hons) Mechanical and M

Condition of The Cross Haven

David-School of Engineering
Manufacturing Engineering



Pipelines

Introduction

Reinstatement of historic Submarine pipelines between Valero Pembroke-shire Oil Terminal and Valero Pembroke Refinery.

5.7KM of above ground, submarine and underground pipework, previously used for the Transfer of Petrochemicals between sites.

Lines were intelligently pigged, and left water filled in 2002. 2018 saw the investigative works commence.



Aims

Investigate the condition of the pipelines with the view to bring them back into service

Bring the 12" line back into service for the transfer of Crude to Valero Pembroke Refinery

To import, store and transfer Crude at VPOT to obtain a reduction in Crude Demurrage costs



Method

- Visual inspection
- Line flow
- Pressure
- ASME
- design
- ters se
- Pigging
- Foam
- Gaug
- Intell

Intelligent
tion of the
where an

- Lines le
- approv
- Lines a

ology

inspection carried out as per API 570 to
basic understanding of the condition of
ground pipework.

ish to reduce impact on environment if a
containment were to occur.

re test carried out in accordance with
B31-4 for underground pipework-1.25% of
pressure for 4 hrs. Pressure test parame-
t by ASME B16.5.

g
n
ging
igent

t pigging in order to understand the condi-
e pipelines. This allowing us to determine
d the severity of the repairs needed.

eft filled with corrosion inhibitor—due to no
al for the rest of the project to go ahead
also left under 15 PSI to ensure no air in



12" Line Results

- . A total of 1513 metal loss anomalies were found
- . 655 external corrosion anomalies
- . 322 internal corrosion anomalies
- . 536 internal pipe mill anomalies

ROSEN reports state that there is 1 repair per an ERF over 1. However, using the Valero standard ERF of 0.95, 19 repairs are needed.

1	log dist. [m]	heighting [m]	Latitude [°]	Longitude [°]	Feature type	Feature identification	
2							
3	4.246	49.1683	51.702086	-4.98456729	Anomaly	Corrosion	C
4							
5	6.164	49.1782	51.702078	-4.9845432	Anomaly	Corrosion Cluster	C
6							
7	32.112	44.2039	51.701929	-4.98444716	Anomaly	Corrosion Cluster	C
8							
9	41.434	43.1794	51.701857	-4.98451277	Anomaly	Corrosion Cluster	C
10							
11	43.716	42.9381	51.701839	-4.98452686	Anomaly	Corrosion Cluster	C
12							
13	97.777	39.4395	51.701526	-4.98426916	Anomaly	Corrosion Cluster	C
14							
15	196.359	34.0812	51.701112	-4.98350156	Anomaly	Corrosion Cluster	C
16							
17	217.631	28.1719	51.700968	-4.98335434	Anomaly	Corrosion Cluster	C
18							



ere

ir with
o
eded.



lim_o	o'clock	length [mm]	width [mm]	wl [%]	avg wl [%]	Dens
GENE	10:33	64	277	33	10	
GENE	04:55	152	124	28	6	
GENE	03:00	246	405	17	3	
GENE	04:44	160	197	27	5	
GENE	01:20	513	471	12	2	
GENE	04:41	242	360	11	2	
GENE	02:59	98	233	24	5	
GENE	08:12	154	249	27	5	

Lines
lines

8" Line Re

A total of 273 m
ceeding the re
This included;

- 37 external c
- No internal c
- 229 internal
- 7 external p

Currently there
Cross haven li
will be left fille

Recommendations the lines

- Repair the 19 12

Results



metal loss anomalies were found ex-
porting threshold of 10%

corrosion anomalies

corrosion anomalies

pipe mill anomalies

pipe mill anomalies

There is no business needs for the 8"

lines to be returned to service— they

and with corrosion inhibitor

Conditions for recommissioning

8" line repairs with an ERF of over 0.95

19	253.823	24.9251	51.700698	-4.98308547	Anomaly	Corrosion Cluster	C
20							
21	254.832	24.5186	51.70069	-4.98308495	Anomaly	Corrosion Cluster	C
22							
23	254.972	24.4622	51.700689	-4.98308487	Anomaly	Corrosion Cluster	C
24							
25	320.349	2.1711	51.700139	-4.98304647	Anomaly	Corrosion Cluster	C
26							
27	2335.547	27.5756	51.687174	-4.99214725	Anomaly	Corrosion Cluster	C
28							
29	4902.672	57.7955	51.690574	-5.02372073	Anomaly	Corrosion Cluster	C
30							
31	4913.47	57.9284	51.690581	-5.02387708	Anomaly	Corrosion Cluster	C
32							
33	4913.786	57.9263	51.690581	-5.02388166	Anomaly	Corrosion Cluster	C
34							
35	4918.491	57.8666	51.690584	-5.02394975	Anomaly	Corrosion Cluster	C
36							
37	4923.922	57.2153	51.690582	-5.02402653	Anomaly	Corrosion Cluster	C
38							
39	5650.133	41.8045	51.692074	-5.0310877	Anomaly	Corrosion Cluster	C



GENE	08:53	94	274	32	7
GENE	12:00	132	1018	28	6
GENE	09:48	112	57	29	6
GENE	12:00	101	1018	29	6
GENE	09:55	133	102	21	4
GENE	05:44	98	458	24	5
GENE	08:24	228	407	37	7
GENE	06:41	279	450	12	2
GENE	08:53	254	58	24	4
GENE	11:37	106	61	23	5
GENE	07:24	241	284	12	2

- New above ground
- New above ground
- New pumps on V
- New valves
- New leak detection
- New Programm
- ry Control and D
- All new Power an
- Training for oper
- system

and dedicated 14" crude line at VPOT
and dedicated Crude line at Refinery
VPOT

on on both sites

Logic Controller (PLC) and Superviso-
Data Acquisition (SCADA)

and Cabling

ations as this would be a complete new