



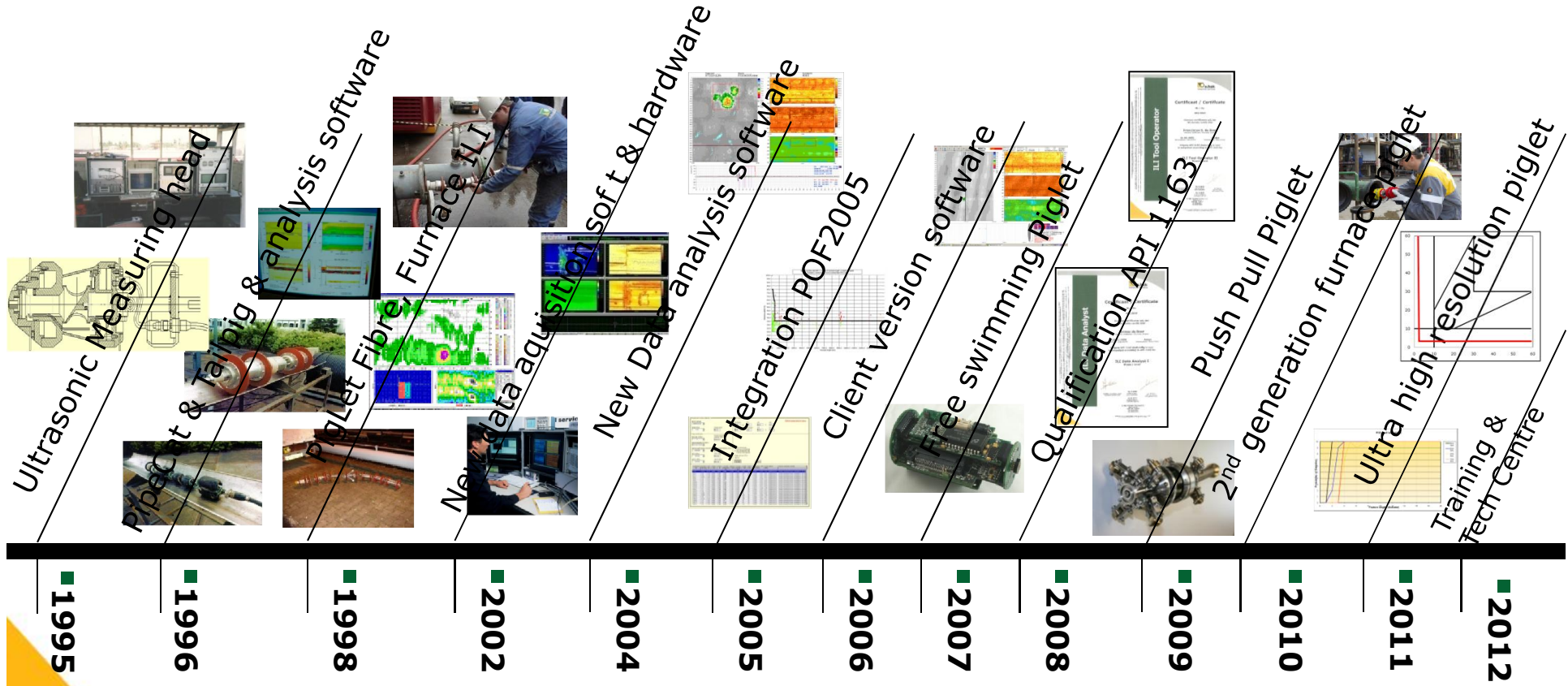
# Multidisciplinary Pipeline inspection project

# Agenda

- Development of the Piglet
- Principle Piglet UT ILI tool
  - Resolution Axial/Circumferential
- Challenging pipeline inspection project
  - engineering
  - re-design of tool
  - mock-up qualification test
  - execution of inspection



# DEVELOPMENT OF THE PIGLET INSPECTION SYSTEM



# Data Acquisition Unit



On-line inspection data

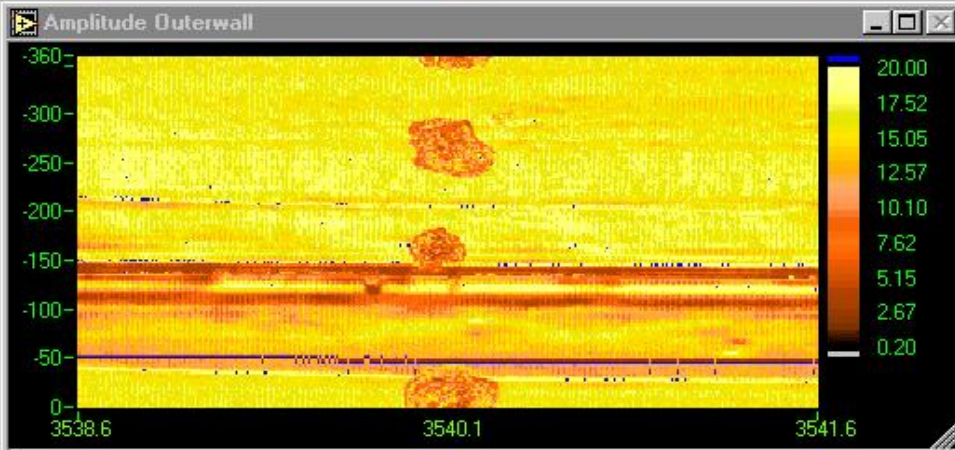
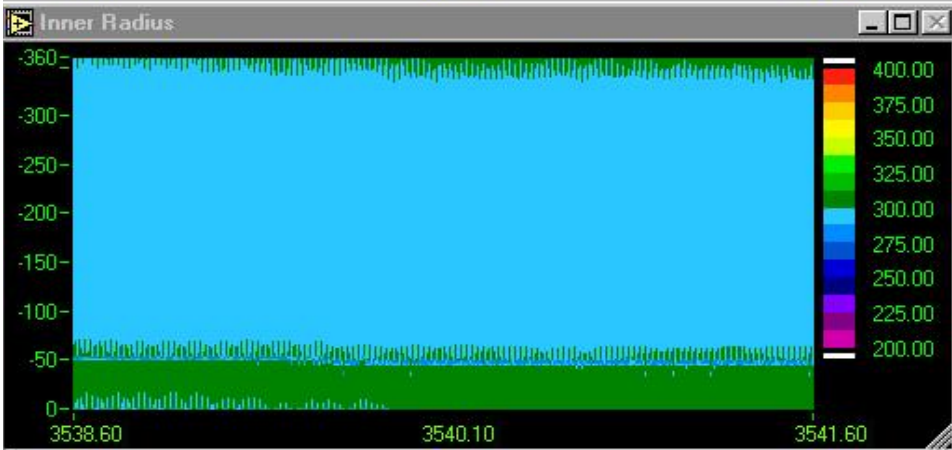
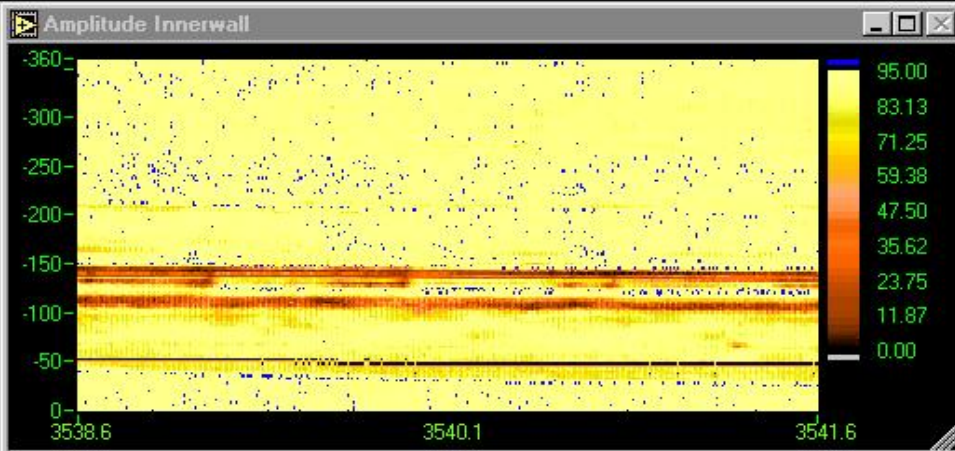
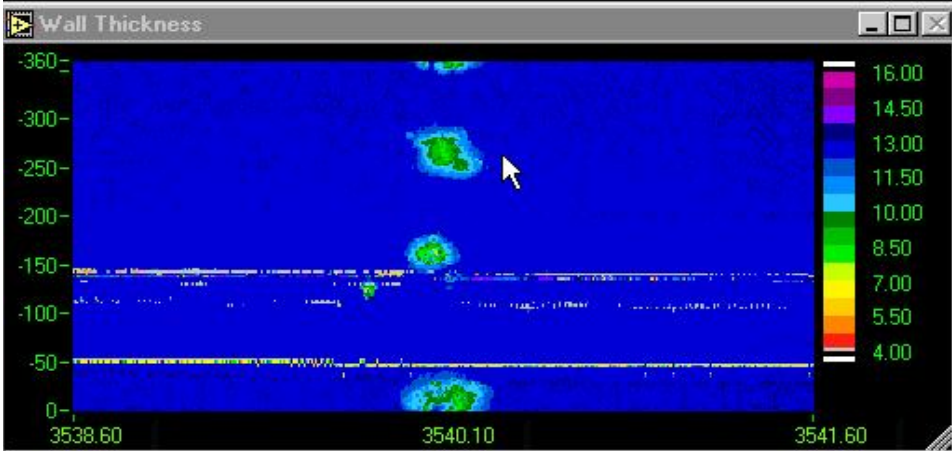
**Mr. Tube Inspector**

File Operate Settings Window Help

Use file settings
  Auto logging

Rep. Rate: **10000**

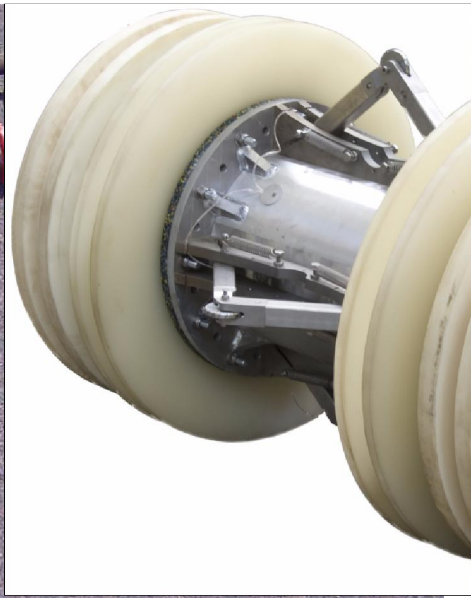
AVG. Coverage: **99**    AVG. Thickness: **13.0**    Distance: **3541.60**



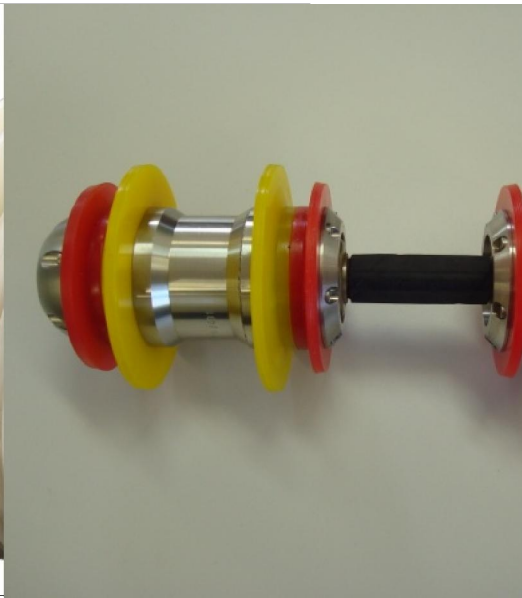
# Example Piglets



4-10" UT Piglet



>16" UT-Piglet



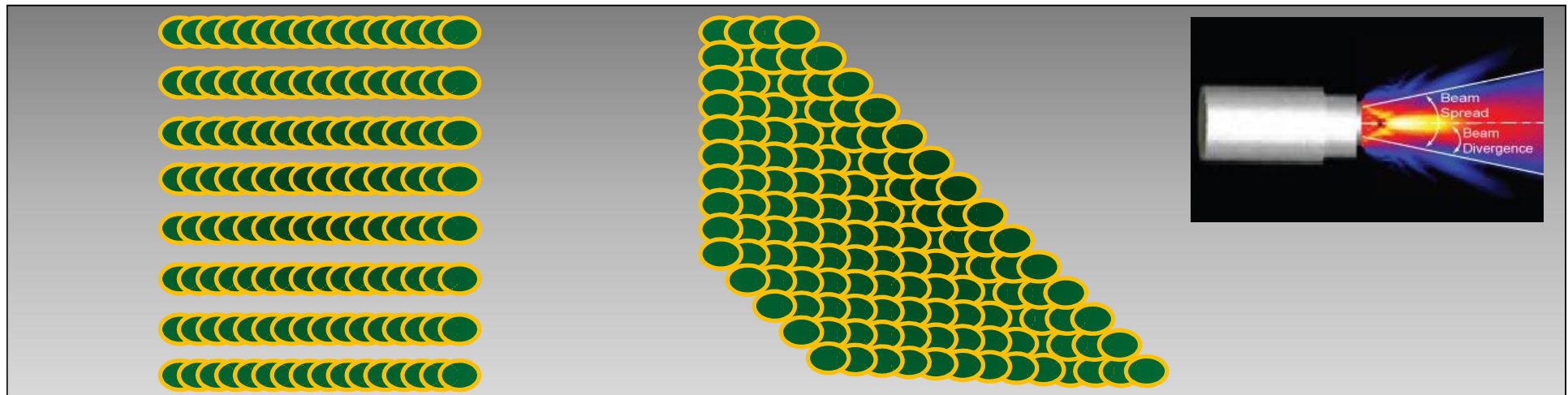
4" UT furnace Piglet



6" UT Push Pull Piglet

# Axial & circumferential resolution

Flow direction



Fixed transducers

Rotating transducer

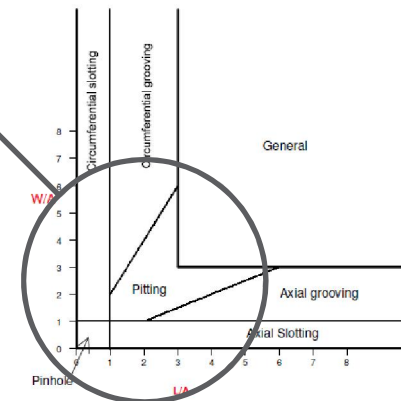
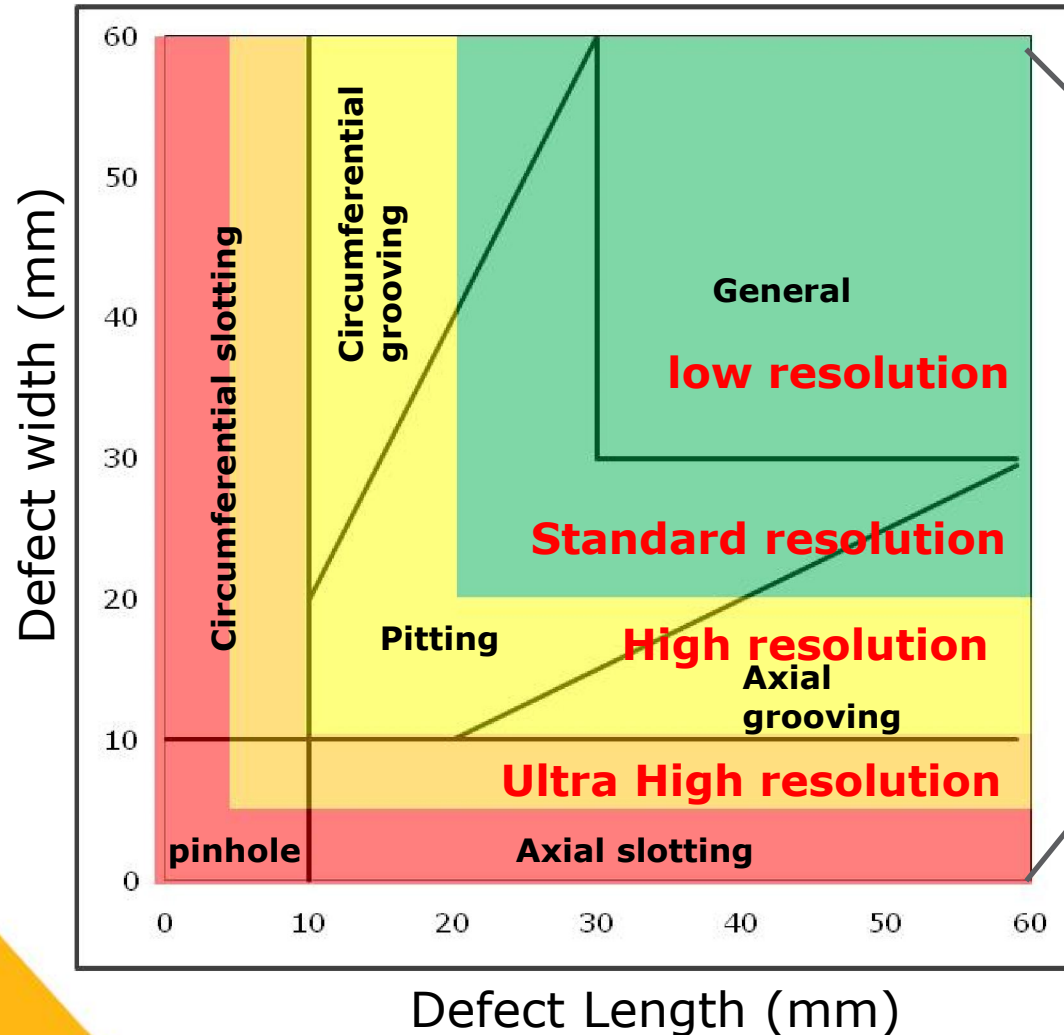
Axial direction , coverage depending on speed (Pulse repetition frequency)

Circumferential direction , coverage depending on:

- amount of transducers
- beam spread (depends of crystal diameter/frequency)

# Definition of Resolution

## Axial as circumferential direction



The geometrical parameter A is linked to the NDE methods in the following manner:

- If  $t < 10$  mm then  $A = 10$  mm
- If  $t \geq 10$  mm then  $A = t$

Figure 2. Graphical presentation of metal loss anomalies per dimension class.

Low resolution	3Tx3T
Standard resolution	2Tx2T
High resolution	1Tx1T
Ultra High resolution	0.5Tx0.5T



# Test facilities


## Test-Facilities:

- Test loop's +/- 200m: 4", 6", 12", Flanged
- Various Mock-up on clients demand
- Furnace 4",5", 6" & 8", multiple 1D bends




# Training





**TIRATSOO  
TECHNICAL**



**CLARION  
TECHNICAL CONFERENCE**

**TECHNICAL PIPELINE TRAINING**

**Register today and experience the practical application of pigging operations**

**Date change: Practical Pigging Training course, Tricht, The Netherlands, 27-31 May, 2013.**

Tiratsoo Technical and Clarion Technical Conferences are presenting the onshore practical pigging operations training course, the first of the Practical Pigging series for 2013, on 27-31 May.

This intensive and hands-on course will provide a wide-ranging overview of all aspects of pigging operations for onshore pipelines, and is suitable for all engineers and technical personnel involved in all types of onshore pipeline.

The course will be held at A.Hak Industrial Services' test loop facility at Tricht, in The Netherlands. The facility has a 200-m long, 4-in, 8-in, and 12-in diameter water-driven pipelines. During the five days of the course, the participants typically participate in up to nine different runs of various tools.


The syllabus of the course, which has been developed by Penspen of the UK, includes both hands-on exercises using the test loop(s), as well as classroom instruction, and full documentation. A. Hak will provide cleaning, geometry, and intelligent tools for use during the course, along with its expert technicians.


Among subjects that the syllabus will cover are:


- Pig trap doors: design, operation
- Types of utility tool
- Types of intelligent tool
- Launch/receive trap design
- Launching and receiving utility and intelligent tools
- How to assess a tool's performance
- Signalling and pig location
- Locating and reporting sample defects
- Site safety: procedures and performance


Register today to secure this rare opportunity to experience first-hand exactly what is required to complete a successful pig run


**ONSHORE PRACTICAL PIGGING**  
27-31 May 2013  
**TRICHT, THE NETHERLANDS**











**CONTACT US**

Elizabeth Foster  
Tiratsoo Technical  
PO Box 21  
Beaconsfield, HP9 1NS, UK  
Tel: +44 1494 675130  
Fax: +44 1494 670455

- Training & Certification
  - ILI - Operator Level I/II
  - ILI - Data Analyst Level I/II
- Practical pigging courses
  - For clients "pigging is my life"
  - Masterclass inspection technologies
  - Onshore practical pigging



# Inspection of 12" pipeline, never been inspected

- ❖ Sept– first discussion client
- ❖ Oct – proposal
- ❖ Nov-Feb – clarifications
- ❖ March – Order
- ❖ April – Mock-up test
- ❖ June – inspection
- ❖ July – final report

# Challenging project

Dear Mr,

We would like to know if you can inspect the following pipeline:

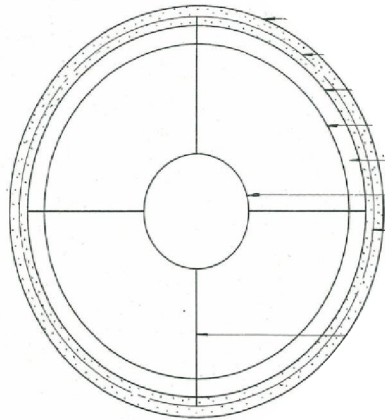
- (1) Size : OD=323.2 mm and 318.5 mm
- (2) Length : about 3.1 km
- (3) Wall thickness : 14.3 mm and 10.3 mm
- (4) Bend radius : Please refer to the attached drawing
- (5) Fluid transported : Crude oil or Sea water
- (6) Operating pressure : 0.5 - 0.6 MPa
- (7) Temperature : Ambient
- (8) **Pipeline structure Double pipes consisting of 12" inner pipe and 38" outer pipe**

As you can see in the attached drawing, there are bend restrictions such as **forged bends(<1.5D)** and **mitre bends(R=1448mm)**.

In this context, we firstly would like to confirm if your UT Piglet can negotiate this pipeline on the above condition.

# Drawing

[Standard Section View]



As you see, the pipeline is a triplex structure.

The one we need to inspect by pigging is the Pipe 1 only.



# Photograph location

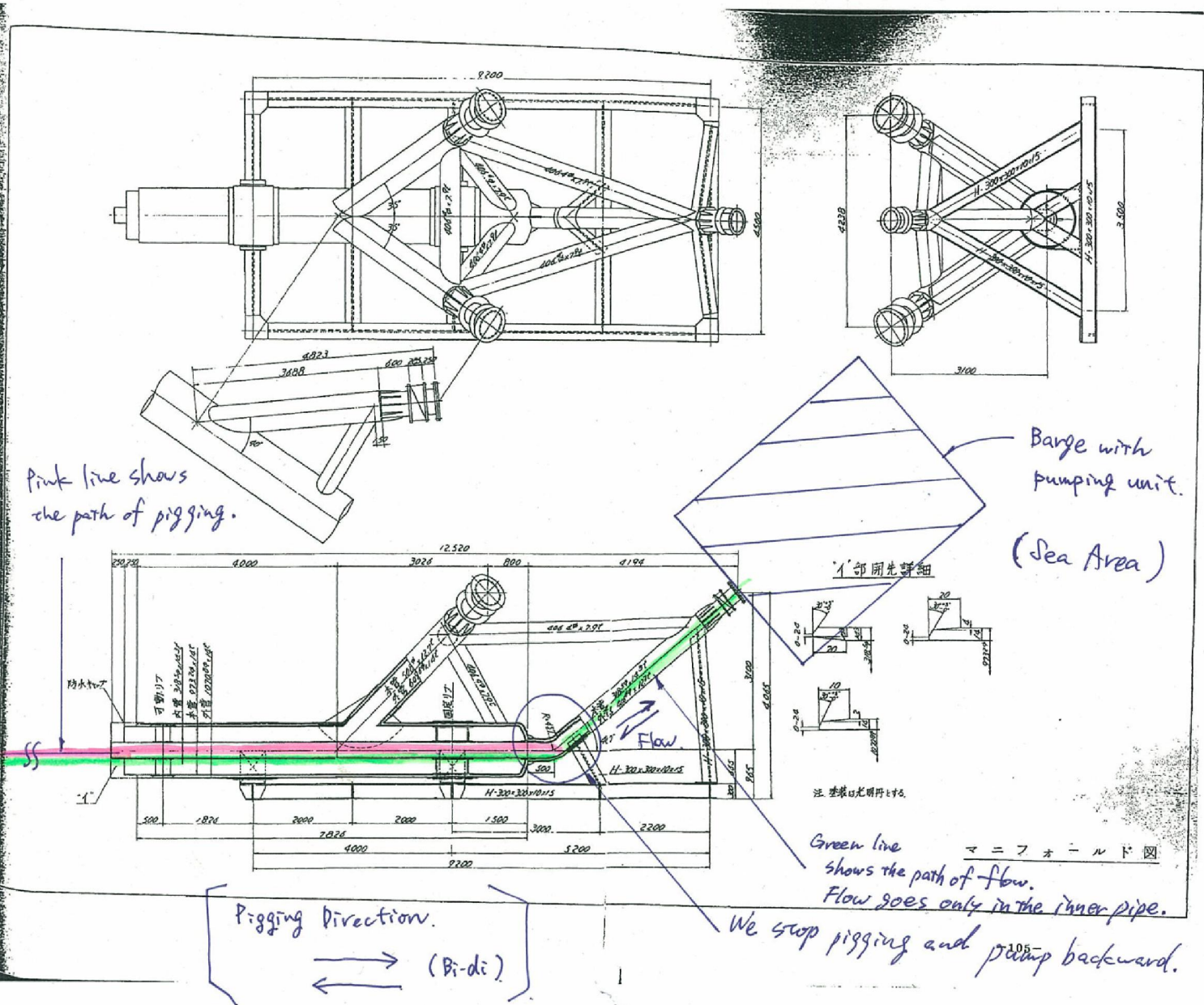


(Case 7)

Pink line shows the path of pigging.

Launcher/receiver in one.

(Land area)



# Pigging procedure

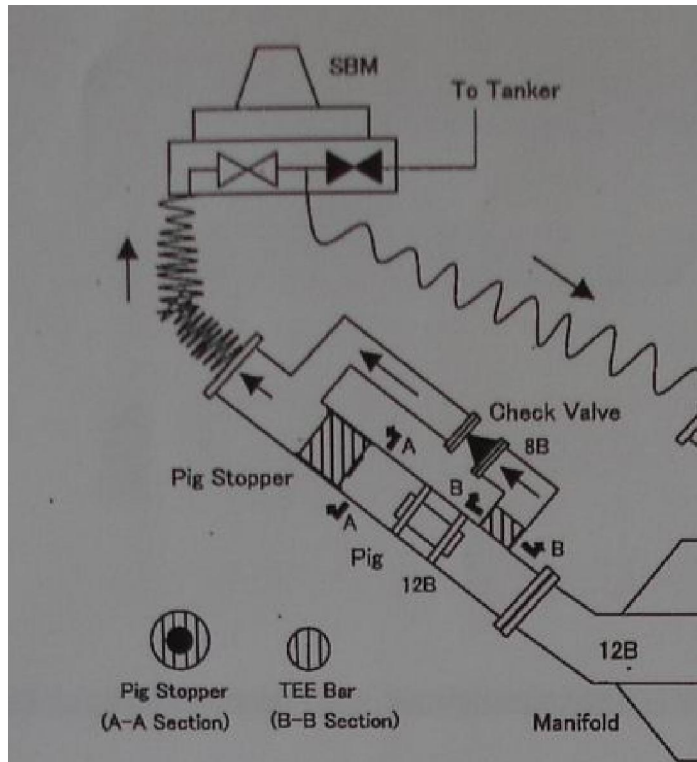


Fig 3. When Pig Is Stopped During Pigging

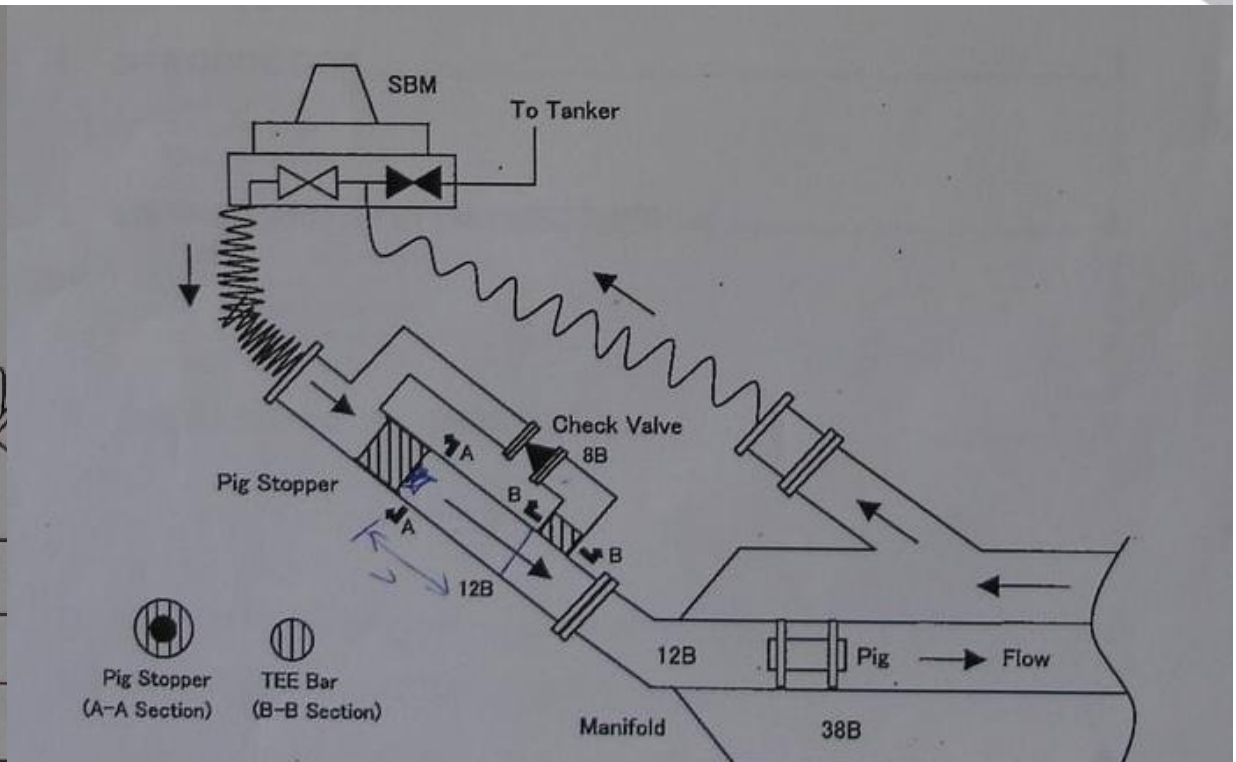
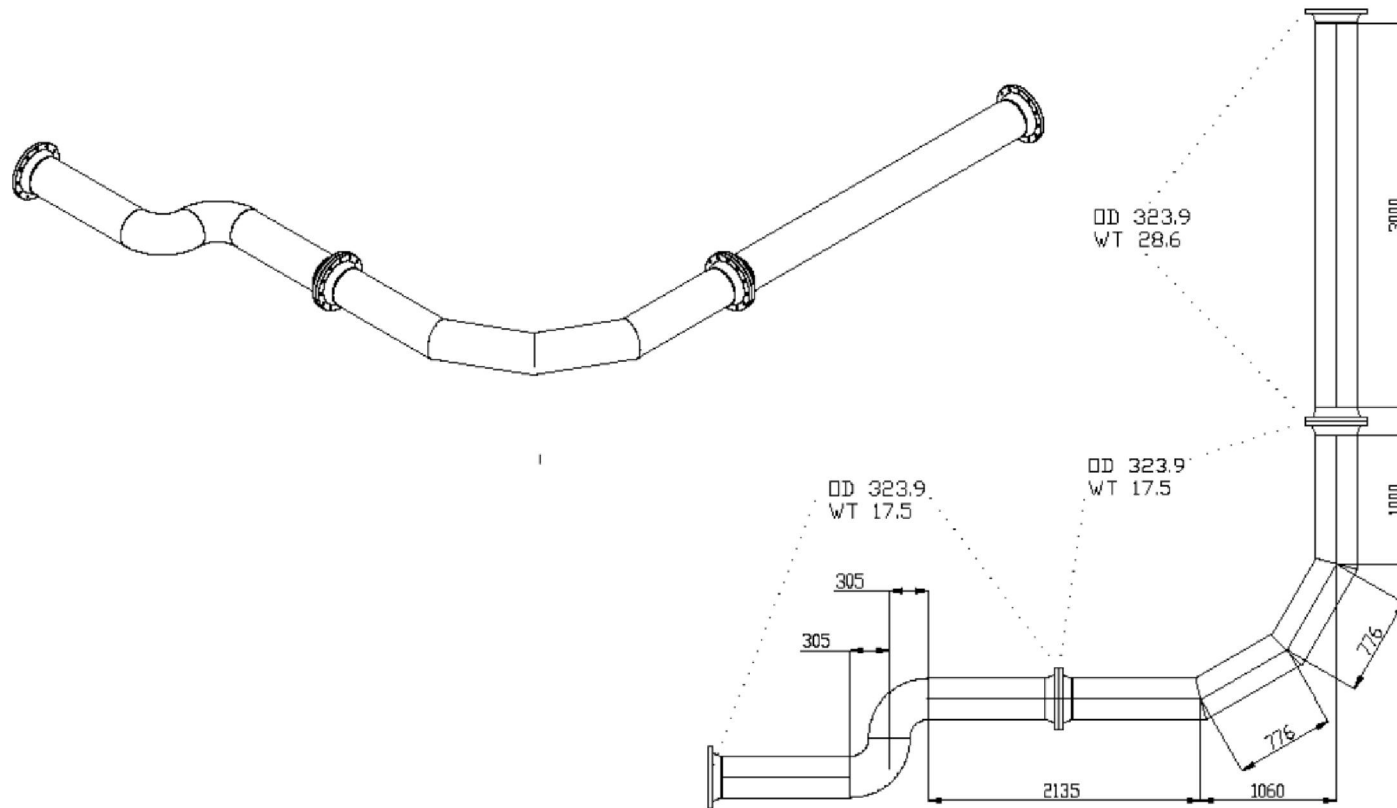


Fig 4. Pigging Operation in the Reverse Direction (from Sea to Land Area)



# Drawing Mock-up



a.hak industrial services  
INSPECTION DIVISION

po. box 151  
4196 CD Geldermalsen  
The Netherlands  
tel: +31-10345-579211  
fax: +31-10345-579379

This drawing and the information it contains is the property of A.H.A.K. Industrial Services B.V. It is not to be traced, copied or published without our written consent nor is the information therein to be disclosed in any way.

SCALE:	DATE:
NAME: JS	05-03-2012
CHECKED:	

SIZE: A3	
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DRAWING NR: Mock-up 12"

REVISION: b	
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DRAWING: Mock up 12" 1D

DESCRIPTION: Mock-up

REFERENCE DRAWING:

PART NUMBER:

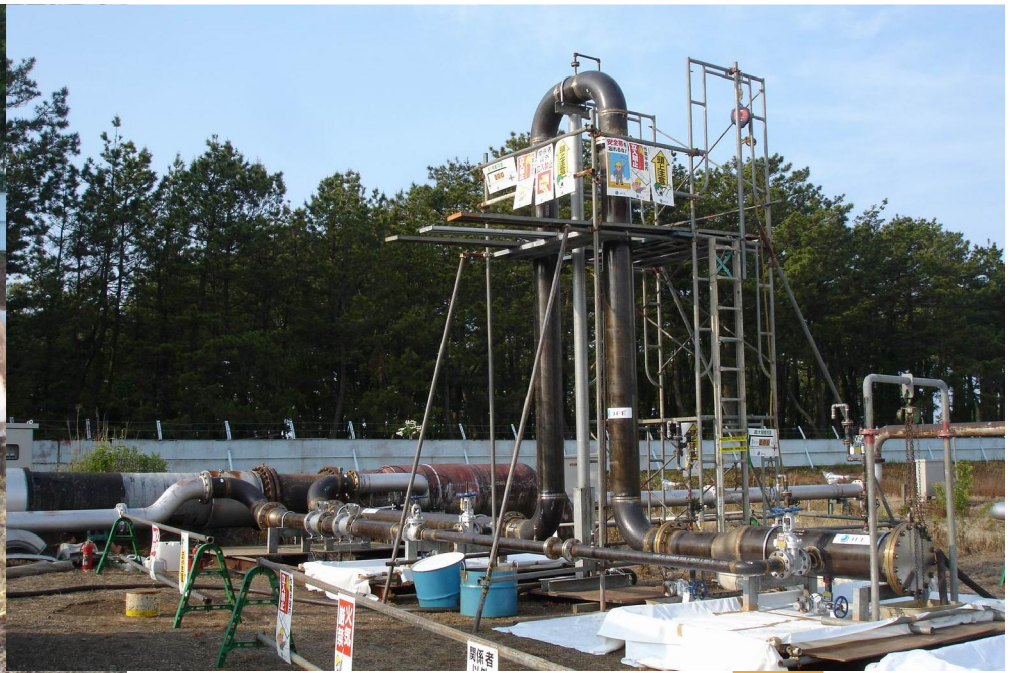
**hak**

INDUSTRIAL SERVICES

# Mock-up for testing and acceptance test by Client



# Situation on-site



# Controlling by measuring flow & pressure



# Cleaning using foam pigs



# BiDi cleaning – Gauge run



# Inspection



# Data recovery & cleaning tool





# Reporting spreadsheet

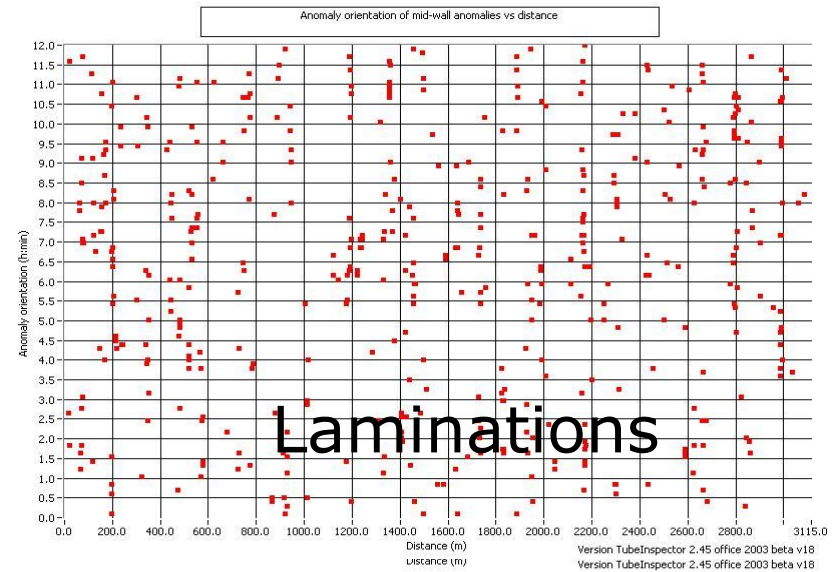
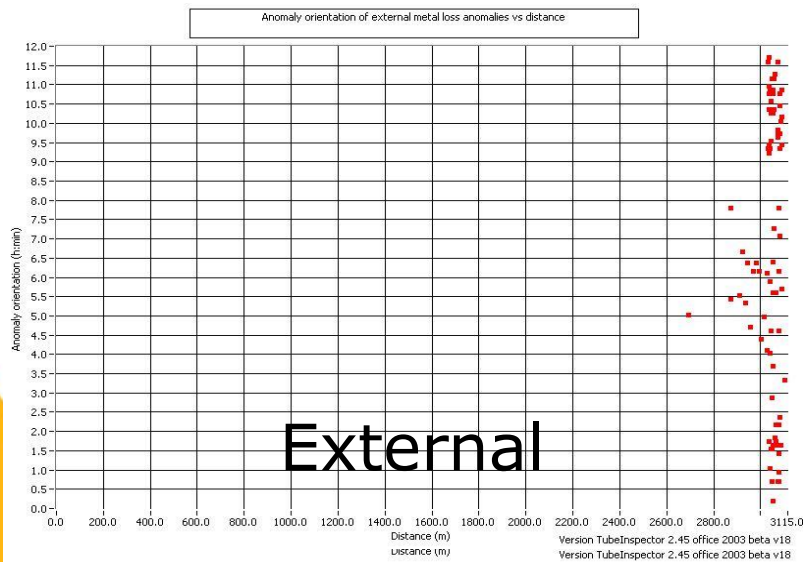
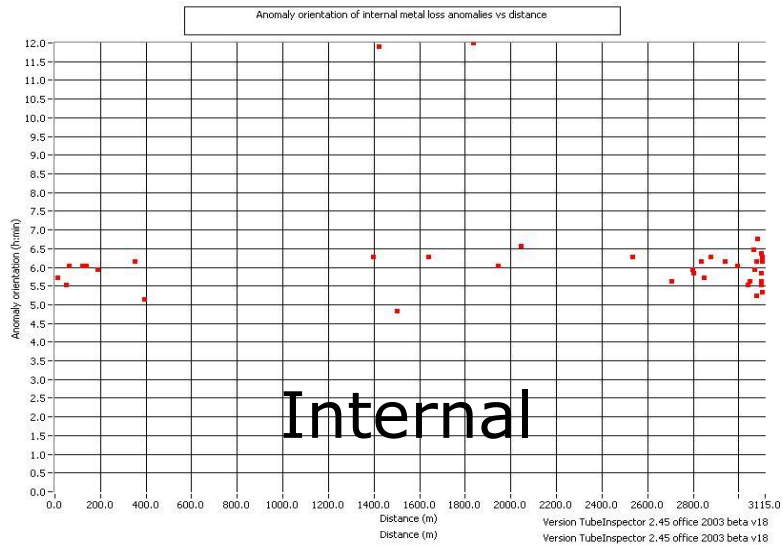
SUMMARY OF ANOMALIES	
Total number of anomalies	607
Number of metal loss anomalies	129
Number of geometry anomalies	0
Number of laminations and inclusions	478

SUMMARY OF METAL LOSS ANOMALIES	
Total number of metal loss anomalies	129
Number of internal anomalies	39
Number of external anomalies	90
Number of non applicable anomalies	0
Number of general anomalies	95
Number of pits	21
Number of pinholes	0
Number of axial and circumferential grooves	9
Number of axial and circumferential slottings	4
Number of anomalies with depth 0 - < 10 % t	0
Number of anomalies with depth 10 - < 20 % t	37
Number of anomalies with depth 20 - < 30 % t	79
Number of anomalies with depth 30 - < 40 % t	7
Number of anomalies with depth 40 - < 50 % t	3
Number of anomalies with depth 50 - < 60 % t	1
Number of anomalies with depth 60 - < 70 % t	2
Number of anomalies with depth 70 - < 80 % t	0

Number of anor  
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LIST WITH MOST SEVERE ANOMALIES											
Log distance (m)	Feature type	Feature identification	Anomaly dimension class	Clock position (h:min)	Length (mm)	Width (mm)	Remaining t (mm)	Surface location	ERF	Psafe (MPa)	Comments
3004.04	Anomaly	Corrosion	General	4:24	77	370	6.1	External	0.10	9.60	In combination with internal corrosion
3028.20	Anomaly	Corrosion	General	6:06	120	433	5.0	External	0.12	8.52	In combination with internal corrosion
3040.28	Anomaly	Corrosion	General	4:02	128	676	5.5	External	0.11	8.77	In combination with internal corrosion
3052.33	Anomaly	Corrosion	General	6:24	112	425	3.4	External	0.13	7.78	In combination with internal corrosion (Stand-off = 1.8 mm; remaining t = 5.2 - 1.8 = 3.4 mm)
3064.62	Anomaly	Corrosion	General	5:36	495	354	6.4	External	0.15	6.88	In combination with internal corrosion
3076.50	Anomaly	Corrosion	General	6:10	107	433	3.8	External	0.12	8.08	In combination with internal corrosion
3085.96	Anomaly	Area with corrosion	General	1:38	4943	173	8.2	External	0.11	8.89	
3086.16	Anomaly	Area with corrosion	General	10:02	4543	173	7.9	External	0.12	8.56	
3088.78	Anomaly	Corrosion	General	5:42	443	575	6.3	External	0.15	6.80	
3095.53	Anomaly	Area with corrosion	General	n.a.	12036	905	6.7	External	0.14	7.29	In HAZ

# Reported anomalies





## A Hak Industrial Services B.V.

Steenoven 2-6

Postbus 151

4190 CD Geldermalsen

Netherlands

■ T: +31 (0)345 579211

■ F: +31 (0)345 579379

■ E: [sales@a-hak-is.com](mailto:sales@a-hak-is.com)

■ I: [www.a-hak-is.com](http://www.a-hak-is.com)