

# Non-destructive testing of electrofusion joints

The road from laboratory to accepted practice.



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**Trust**  
**Quality**  
**Progress**

A photograph of a long, multi-arched concrete bridge spanning a body of water. The bridge is illuminated by warm, golden light, suggesting sunset or sunrise. The water reflects the bridge and the sky. The sky is a mix of blue and orange.

**Plastic Pipe**  
**Fittings & Joints**

2018



# Non-destructive testing of electrofusion joints

- Possible: Yes
- Acceptance: Takes time...

# Dutch practice gas pipe lines

- Joints: 5% to 10% taken out (appr. 3000 annually):
  - Visually inspected
  - Destructively tested (ISO 13954)





# Search for non-destructive testing

Expected benefits:

- Cost saving
- Time saving
- Joints still part of the network...

Expected side effect:

- Positive effect on quality



# All stakeholders involved

- DSO's
- Manufacturers
- Suppliers
- Contractors
- Supervisor

netbeheer  nederland

Westland   
energy solutions

liander

RENDO  
NETWERKEN

  
enexis

STEDIN<sup>NET</sup>

+GF+

COGAS

 enduris

wavin

  
**Bouwend Nederland**  
de vereniging van bouw- en infrabedrijven

advanced ultrasonics

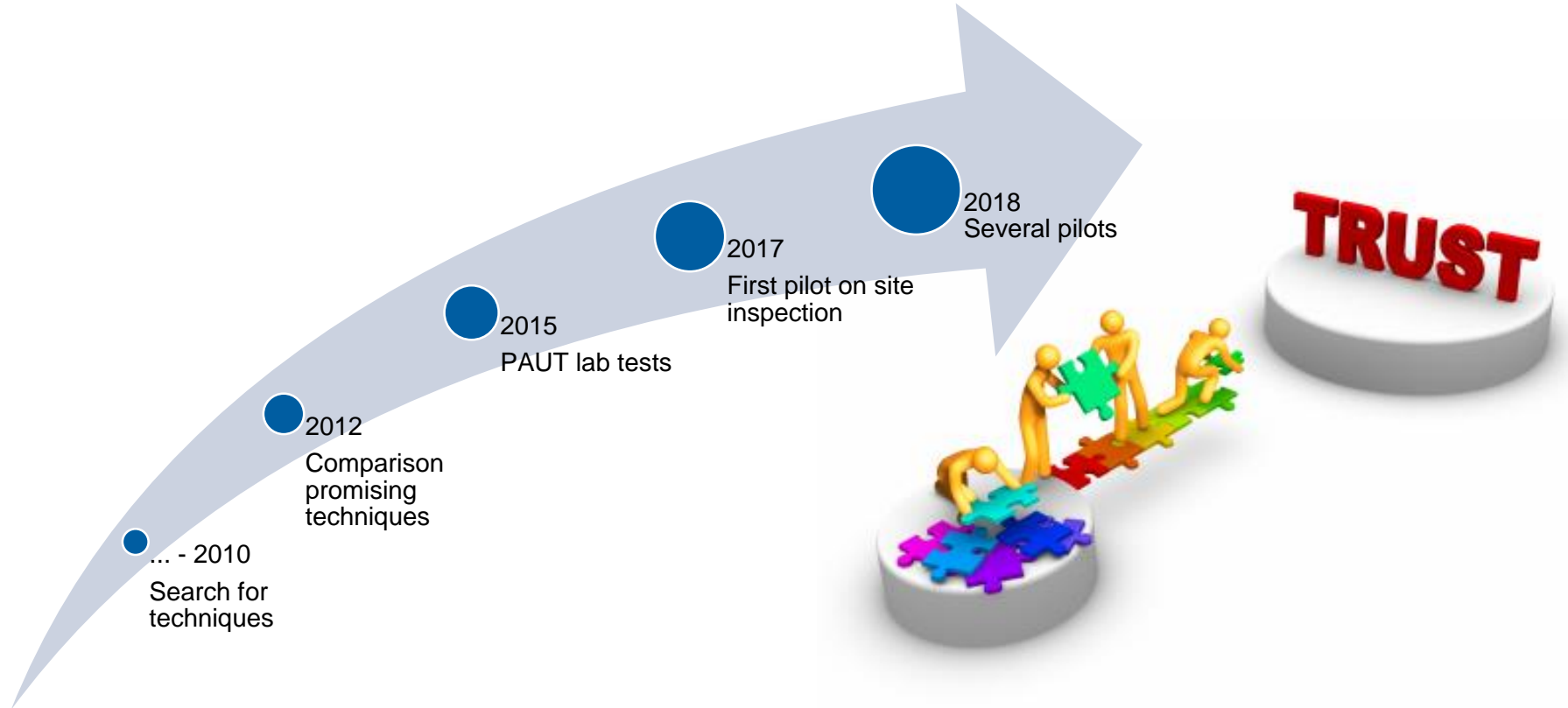
 akatherm

De   
Jongh  
PIPESYSTEMS B.V.



Staatstoezicht op de Mijnen  
Ministerie van Economische Zaken

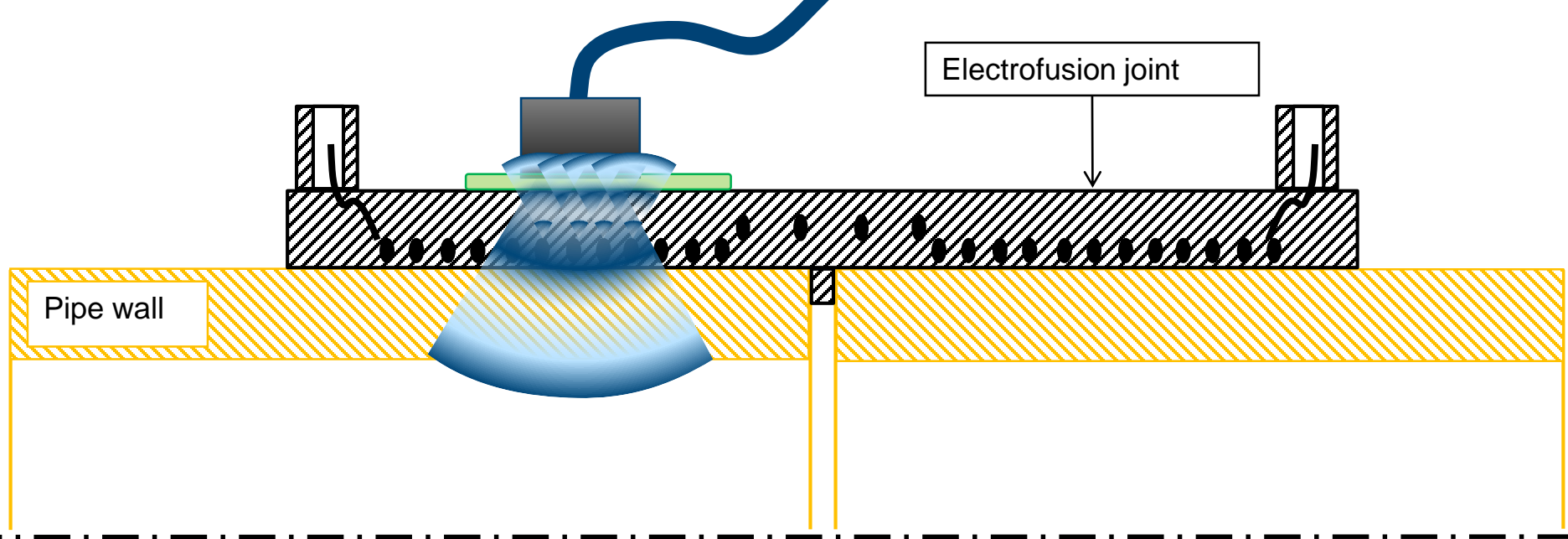
# NDT development in The Netherlands





# International development

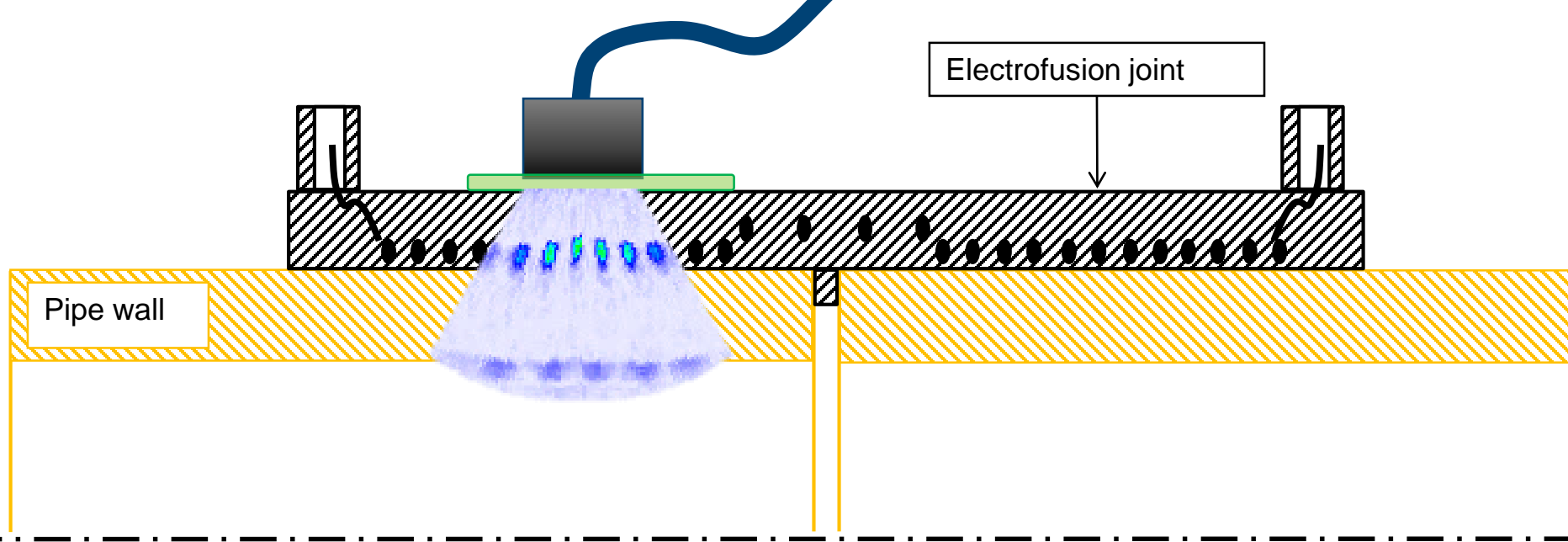
- ISO workgroup
- Different techniques:
  - PAUT
  - Microwave
  - CT-scan
  - TOFD
  - ...
- “Round Robin” different NDT companies



# The Technique

## ■ Phased Array Ultrasonic Testing (PAUT)

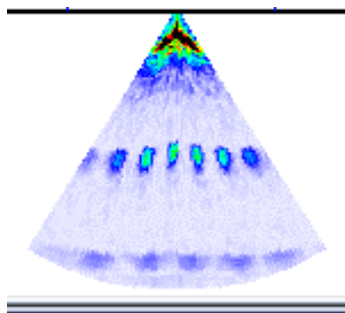




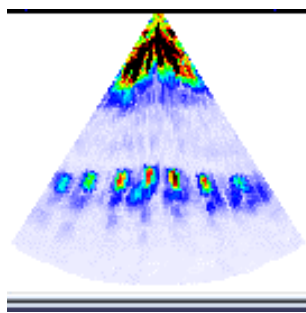
# The Technique

## ■ Phased Array Ultrasonic Testing

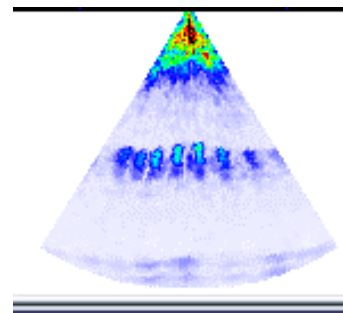
# Examples of different types of errors



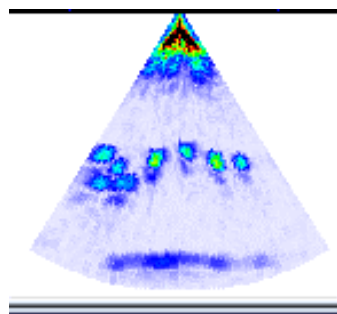
Good



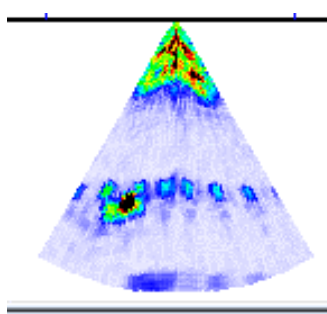
Sand



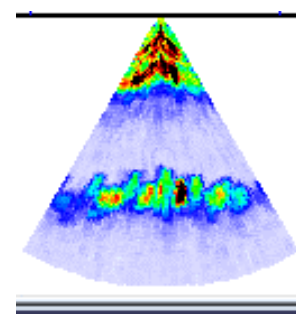
Silicon



Under penetration



Void



Big / many voids

# The Discussion

- Comparison with destructive testing
- Acceptance criteria
- What is the objective of inspection anyway?



# Compared to destructive testing

## Different tests

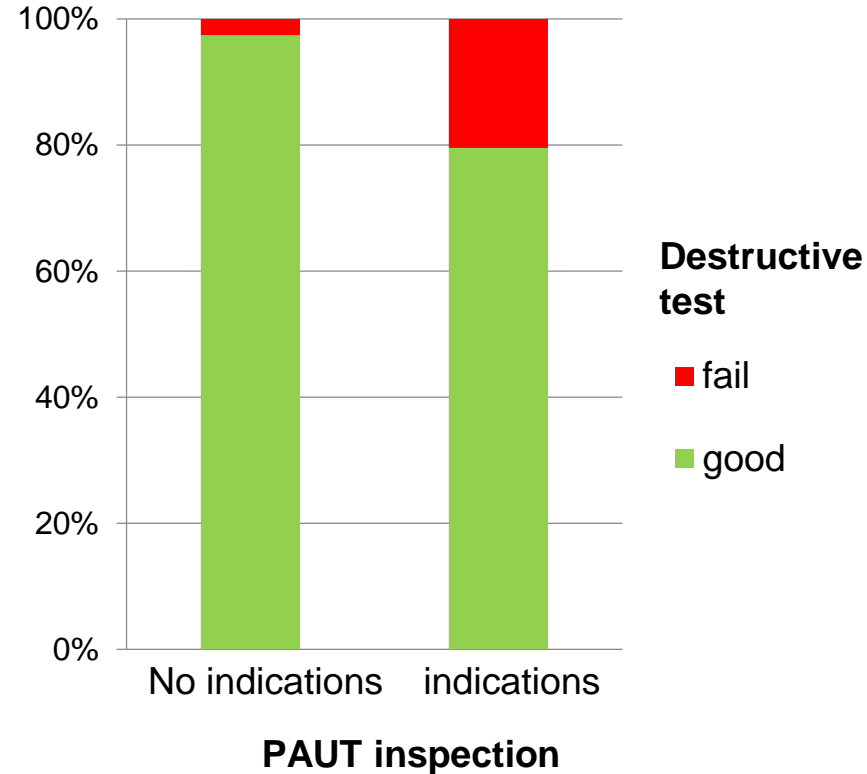
### ■ Different errors

- Peeltest: bonding
- PAUT: voids / pollution / dislocation

### ■ Different results

- Number of failures
- Bad bonding not always detected

## PAUT and destructive test results compared



# Acceptance criteria



- Size
- Location
- Shape
- Number of anomalies
- Type of anomaly
  
- What is acceptable?



# Acceptance criteria

## Dependencies:

- Diameter?
- Fitting brand?
- ...

*“... for small diameters, voids are not to be expected..”*

*“...shrinkage cavities for large diameters are quite normal...”*



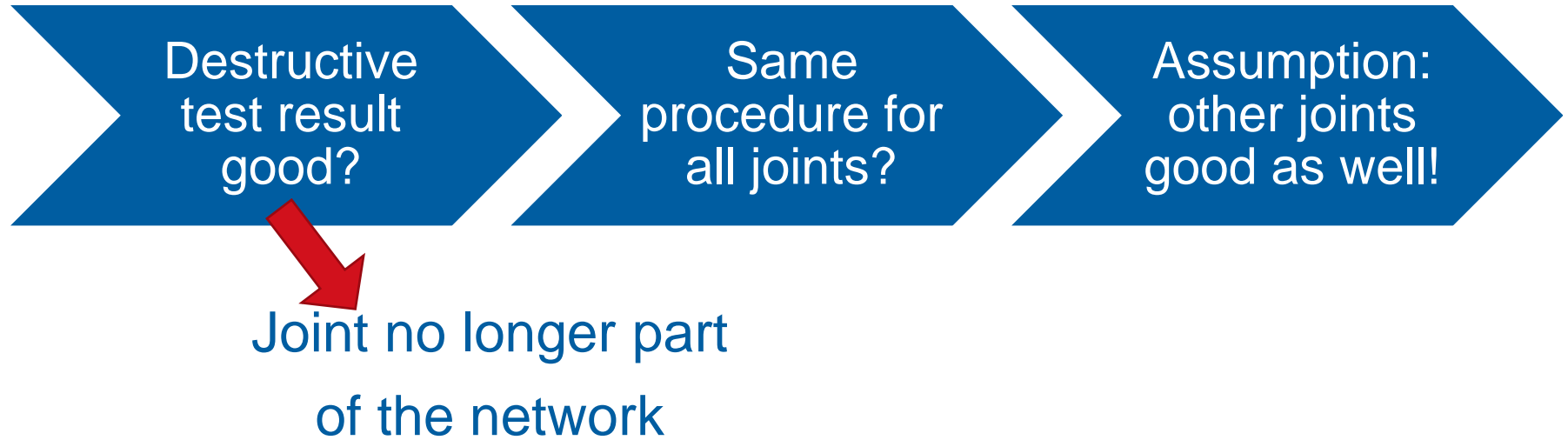
# Objective of inspection

## Quality of the joint?



# Objective of testing:

## Example destructive testing



# Objective of inspection

~~Quality of the  
joint?~~

Quality of the  
process!



**Correct procedure = only guarantee for good quality**

# Accepting non-destructive testing

- Accept it for what it is:
  - Extension to visual testing
  - Check on process
  - Different than destructive testing





# Conclusion

- Possible? Yes!
- Acceptance? Takes time...
  - Differences with destructive testing
  - Acceptance criteria
  - Standardization





Thank you for your attention!

Time for questions...

# Plastic Pipe Fittings & Joints 2018

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