



**C-Cube**

international bv

***Problem:  
Corrosion is unpredictable***



Quality unknown



Maintenance too early or too late



Unplanned downtime

***Unique Technology:*** 

***Degradation measurement***

***Corrosion prognoses***

Unique practical in-field methods 

Data analyses and modelling 

Independent and objective 

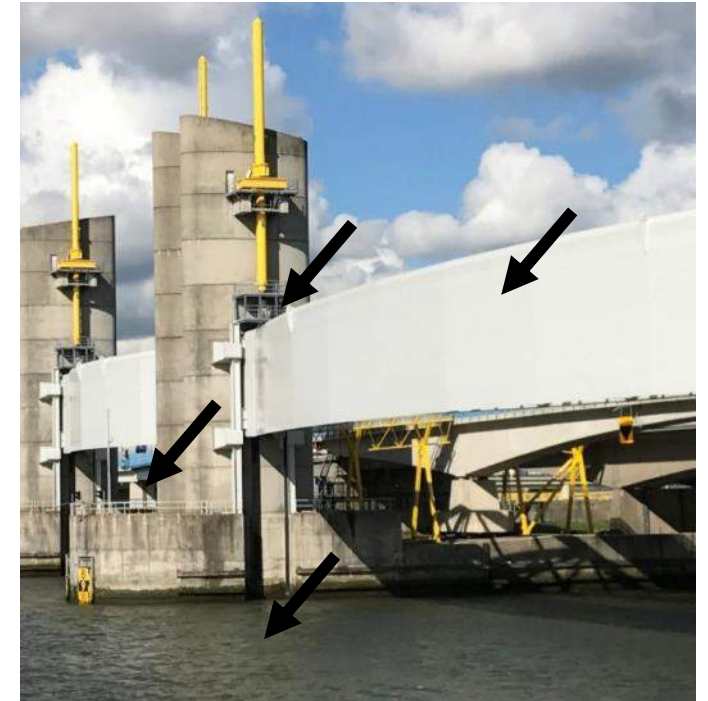
Paint Coating Quality Measurement: CQM

Hydraulic Cilinder Rod

- Coating Quality Measurement: EPQ
- Lifetime Extension: C-Shield

IoT Sensors

- Coating Quality Sensor CQS
- ICCP / Corrosion Monitoring CMS
- Electronics Lifetime Prediction ELP



## Paint Coating Quality Measurement (CQM) gives insight in:

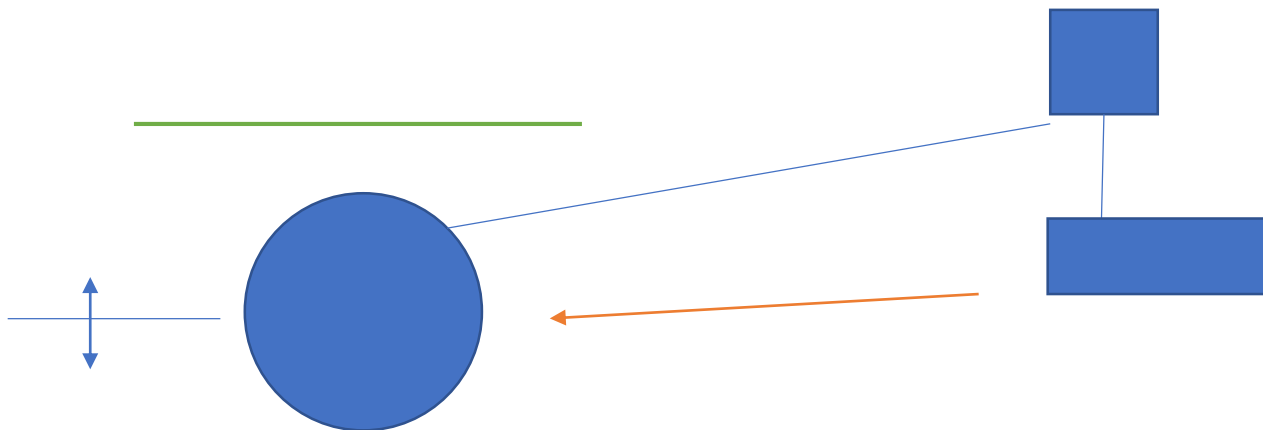
1. How good the visually intact coating protects: Barrier property
2. Coating Degradation over Time
3. Presence of corrosion underneath the coating
4. Prognoses when corrosion starts
5. Prognoses of % visible corrosion over time

**CQM complies to ISO standard**



## Kathodische bescherming

1. Bescherming tegen corrosie middels een negatieve stroom
2. Afhankelijk van coating, bodem, waterstand, etc...
3. Veranderd in de loop van de tijd



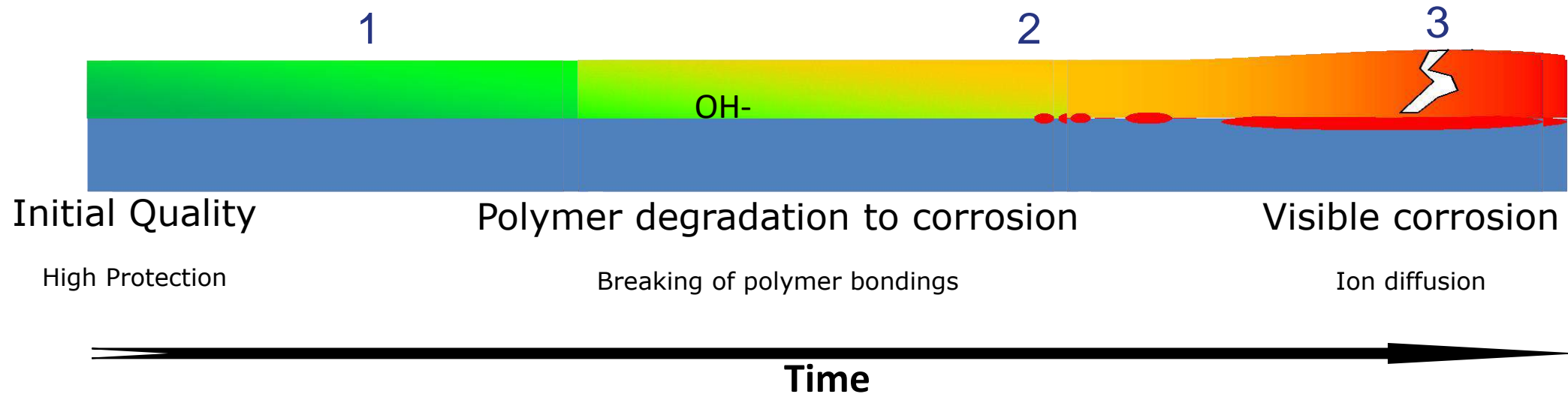
## Bij nieuwe coating/pijp

1. Bescherming tegen corrosie middels coating
2. Geen potentiaal (opgelost met coupon)



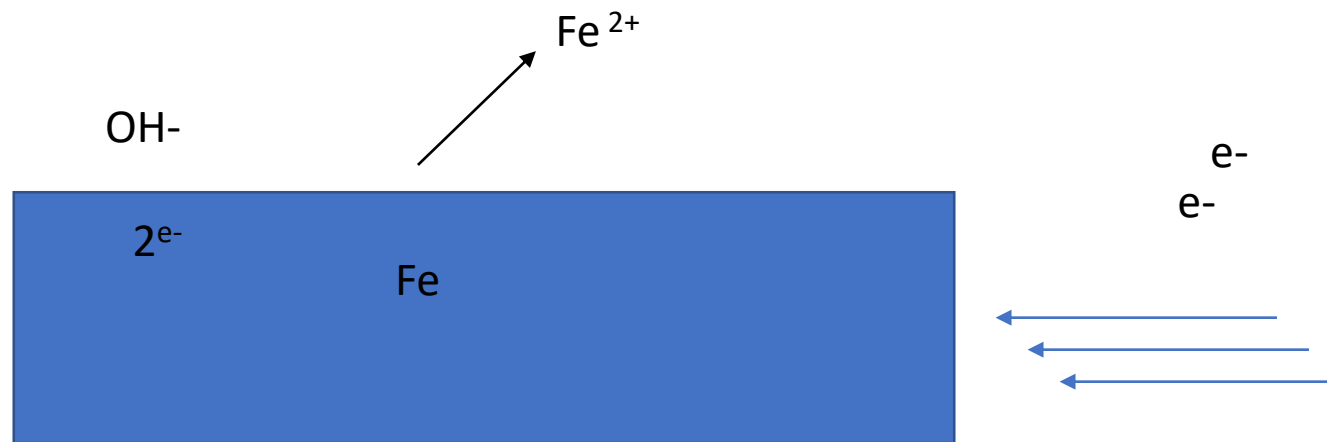
## Degradation of the paint coating:

1. Degradation of the polymer
2. Corrosion development underneath the coating, invisible
3. Visible corrosion



## Bij nieuwe coating/pijp

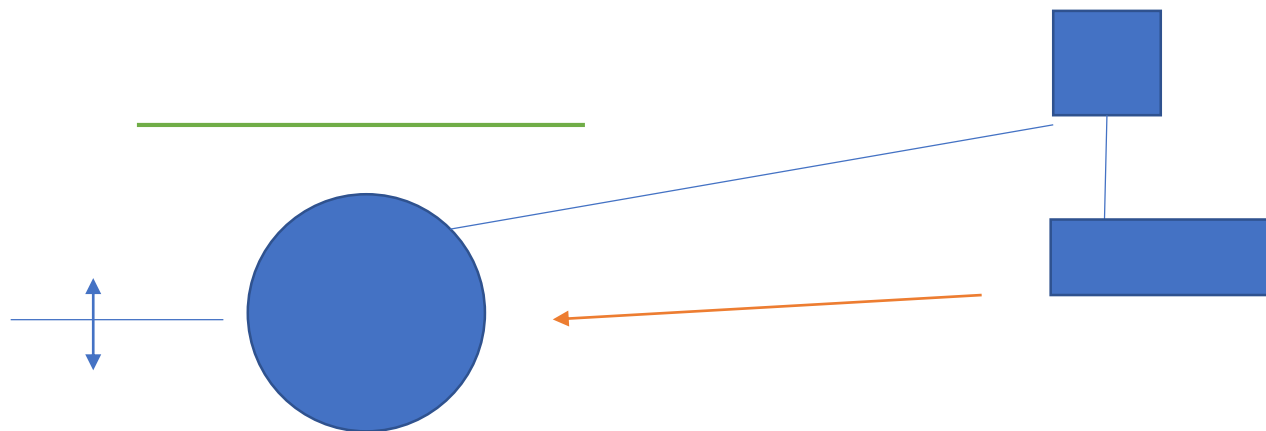
1. Bescherming tegen corrosie middels KB, ONDER WATER NIVEAU
2. Geen corrosie ver onder water





## Beperking Kathodische Bescherming

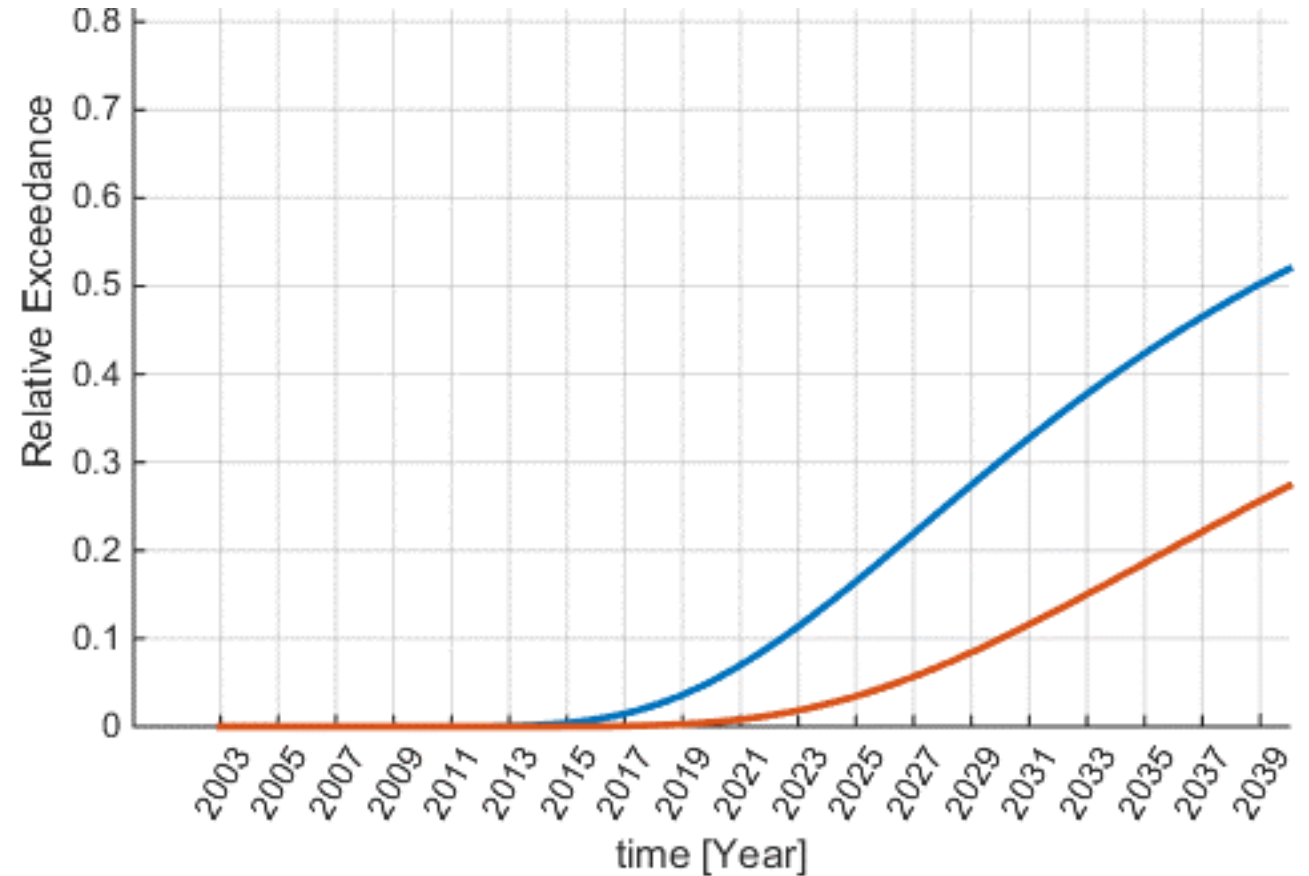
1. Rare potentialenmetingen bij goede coating, kan coating beschadigen
2. In de waterlijn afhankelijk van coating, bodem, waterstand
3. Niet nodig ver onder GWL



1. Potentiaalmetingen
  - Continue metingen voordelig bij fluctuerende GWL
2. DC metingen
  - Op kritische plaatsen
  - $V_{cor}$
  - Effectiviteit van de KB
3. CQM metingen
  - Coating kwaliteit
4. Data analyses

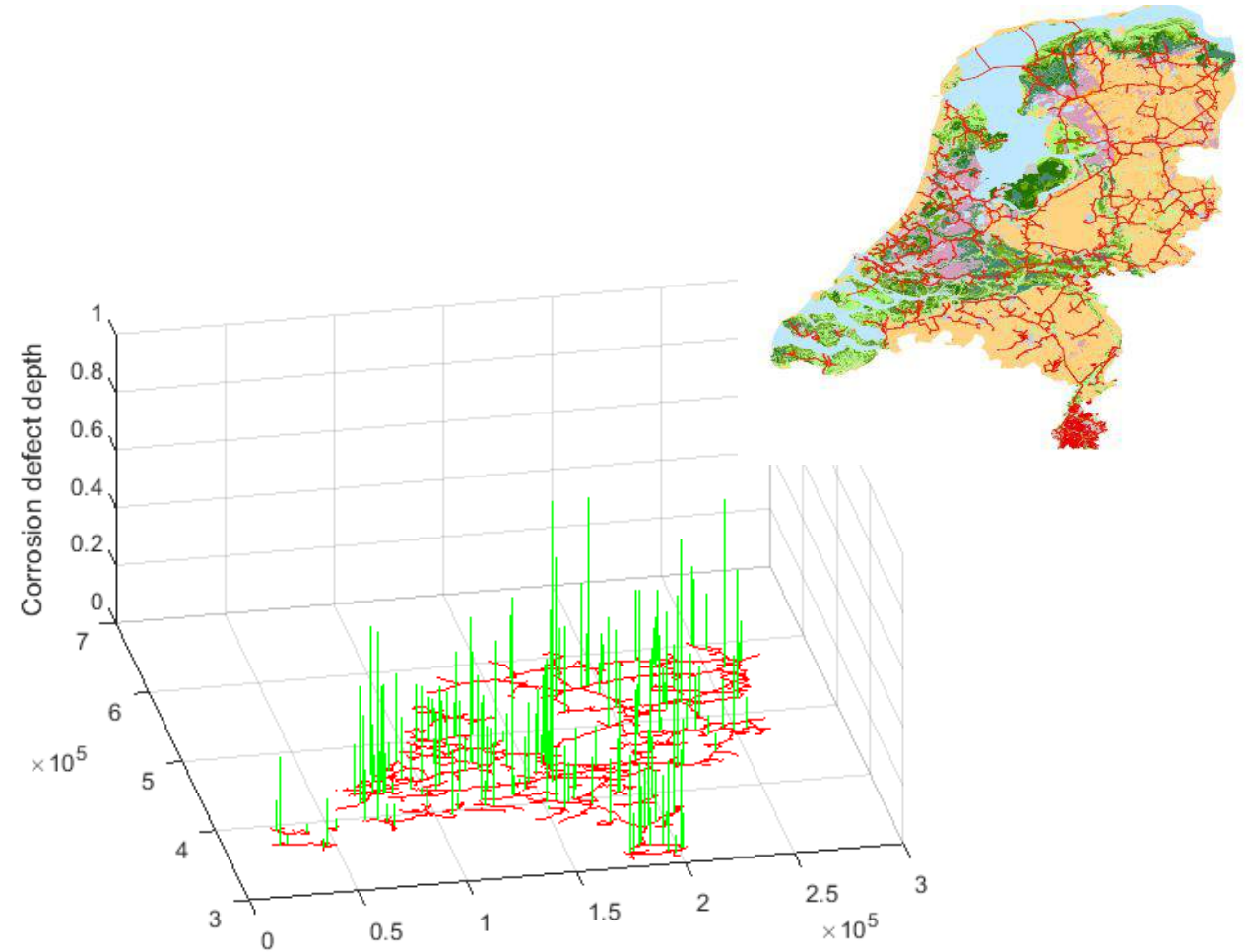
## Prognoses

- Corrosion underneath the coating (invisible) (blue)
- Visible Corrosion (red)



## Pipeline Integrity Study

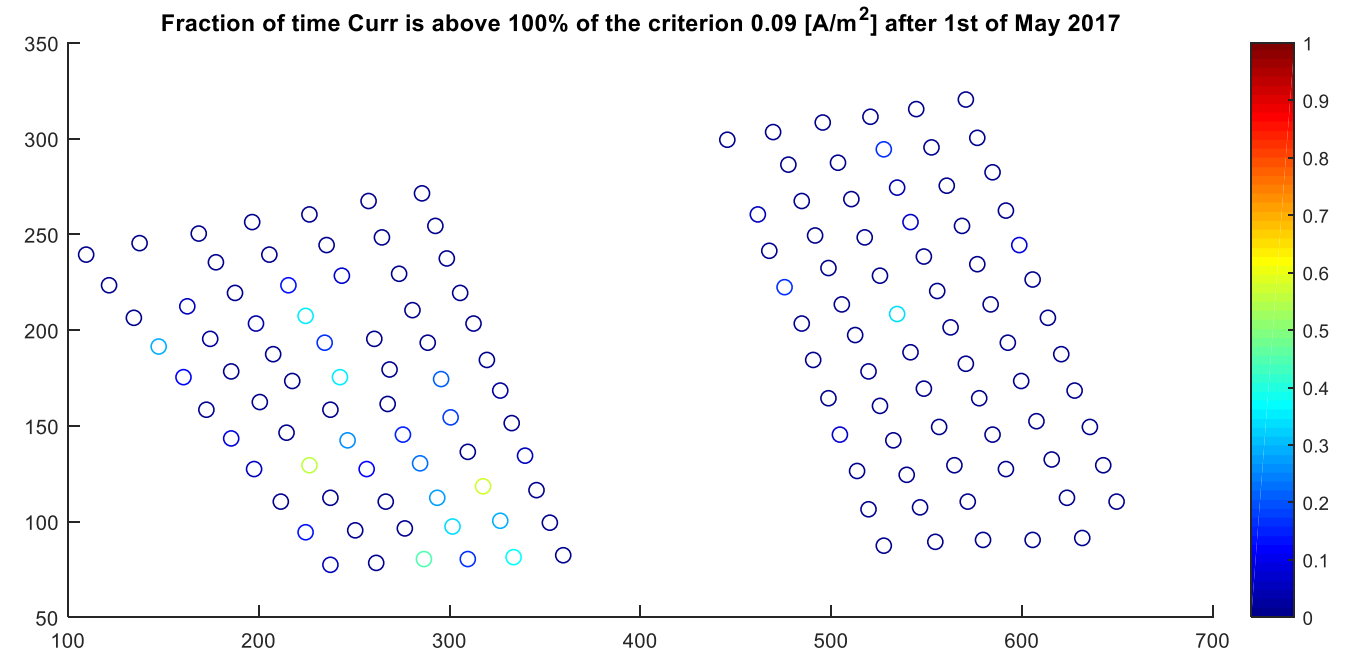
- ICCP Data
- Wall thickness, geodata
- Present integrity
- Main degradation parameters
- Main risk pipelines



*Simulated data*

## ICCP Data Analyses

- Anomaly analyses
- North Sea, 150 Wind turbines





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