CATHODIC PROTECTION (CP) SURVEYS FOR SUBSEA ASSETS

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BACKGROUND

- What is the aim of the Survey?
- What is the expected outcome?
- How are the Surveys performed?
- What are the options / alternatives?
- What are the pitfalls, common errors and misconceptions?
AIM OF THE SURVEY

- To assess the performance of the Cathodic Protection (CP) system
- Ensure the pipeline and structures are protected
- Determine remaining life of the CP system
- Plan for any re-lifing / intervention or other works that may be required
- Assess the performance of any coatings, design assumptions and other factors that will influence future designs
WHAT INFORMATION DO WE NEED?

- Pipeline / structure potential in the case of a structure
- Anode wastage
- Anode current output
How are the surveys performed?

- How is CP assessed?
  - Traditional CP monitoring

Diagram taken from Australasian Corrosion Association Cathodic Protection Monitoring Manual training course
**WHY IS OFFSHORE DIFFERENT?**

- On structures - not too much difference
- On pipelines – hmm
  - No test points
  - No possibility for isolating anodes
  - High integrity (and thick) coatings
  - May be concrete weight coated
  - Generally reliant on cameras, and skills of people we don’t have control over
  - Testing generally not performed by CP people
Basic Monitoring

Trailing wire

Method 2

Another measurement technique involves the use of a pair of CSE in leapfrog fashion, as illustrated in Figure 5.7.

Figure 5.7 Over-the-line potential surveys using two copper sulfate electrodes (Method 2).

Graphic taken from Peabody’s Control of Pipeline Corrosion – Published by NACE International
Gradients around anodes and bare steel
OFFSHORE EQUIVALENT
Offshore trailing wire
So what are the problems?

- Limits manoeuvrability of the vessel
- Potential for breaking the trailing wire
- Environmental concerns (?)
- Limits the ability to perform other tasks concurrently
- There are some limitations depending on the type of CP system
WHAT ARE THE OPTIONS / ALTERNATIVES?

- Gradients around anodes and bare steel
WHAT ARE THE OPTIONS / ALTERNATIVES?

- Most basic option
What are the options / alternatives?

- More advanced option
**FIELD GRADIENT**

- Voltage across the probe directly related to anode current

\[
\text{IR Drop (V) = } V_1 - V_2 \\
\text{FG = } \frac{V_1 - V_2}{d}
\]
What happens when it’s not at right angles?
What are the options / alternatives?

- And the Rolls Royce “FIGS” CP System
WHAT INFORMATION IS USELESS?

- The most common information that is presented
  - The anode potential! – anode stabs tell you the anode is an anode – we already know that.
TYPICAL ANODE ARRANGEMENT

TYPICAL PIPELINE ANODE DETAIL
WHAT ARE THE PITFALLS, ERRORS, MISCONCEPTIONS?

- Stabbing an anode and reporting that the CP works
- Subjective assessment of anode depletion / wastage
- Anode stabs on structures
- Not knowing the size of the anodes to start with
  - No guarantee that anodes were in fact flush with the pipe
- Assuming the corrosion product on the anode is part of the anode
- Trying to penetrate coating / calcareous deposits
WHAT ARE THE PITFALLS, ERRORS, MISCONCEPTIONS?

- Not setting the equipment up correctly or understanding the capabilities
  - Not understanding the concept of what you’re trying to measure
  - The importance of orientation of probes
  - The influence of other CP systems (eg ROV, vessel, proximity to pipeline CP, etc)
The aim of any Survey must be clearly understood before undertaking the Survey

The information to be collected must be clearly identified

All the details must be available during the Survey

- Anode details and sizes / dimensions
- Any variations in CWC or other factors influencing the survey must be available
- People performing the survey must know the basics
QUESTIONS

Thank You