

SUT – SUBSEA IMR AND INTEGRITY MANAGEMENT

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

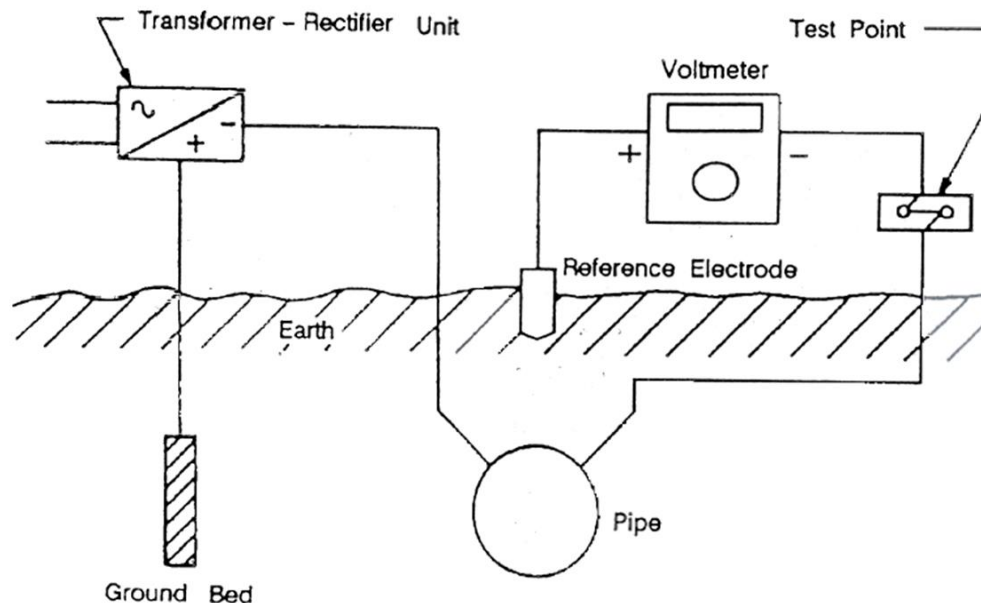


Diagram taken from Australasian Corrosion Association Cathodic Protection Monitoring Manual training course

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.

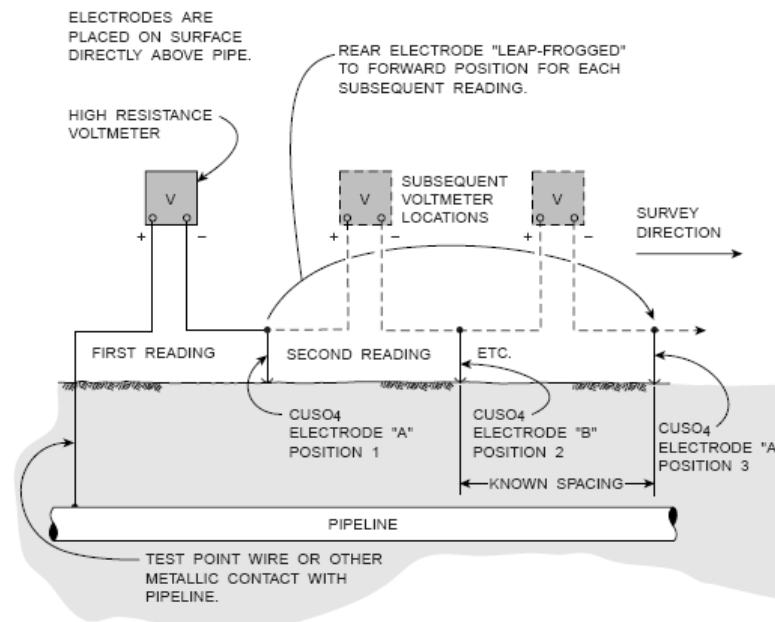
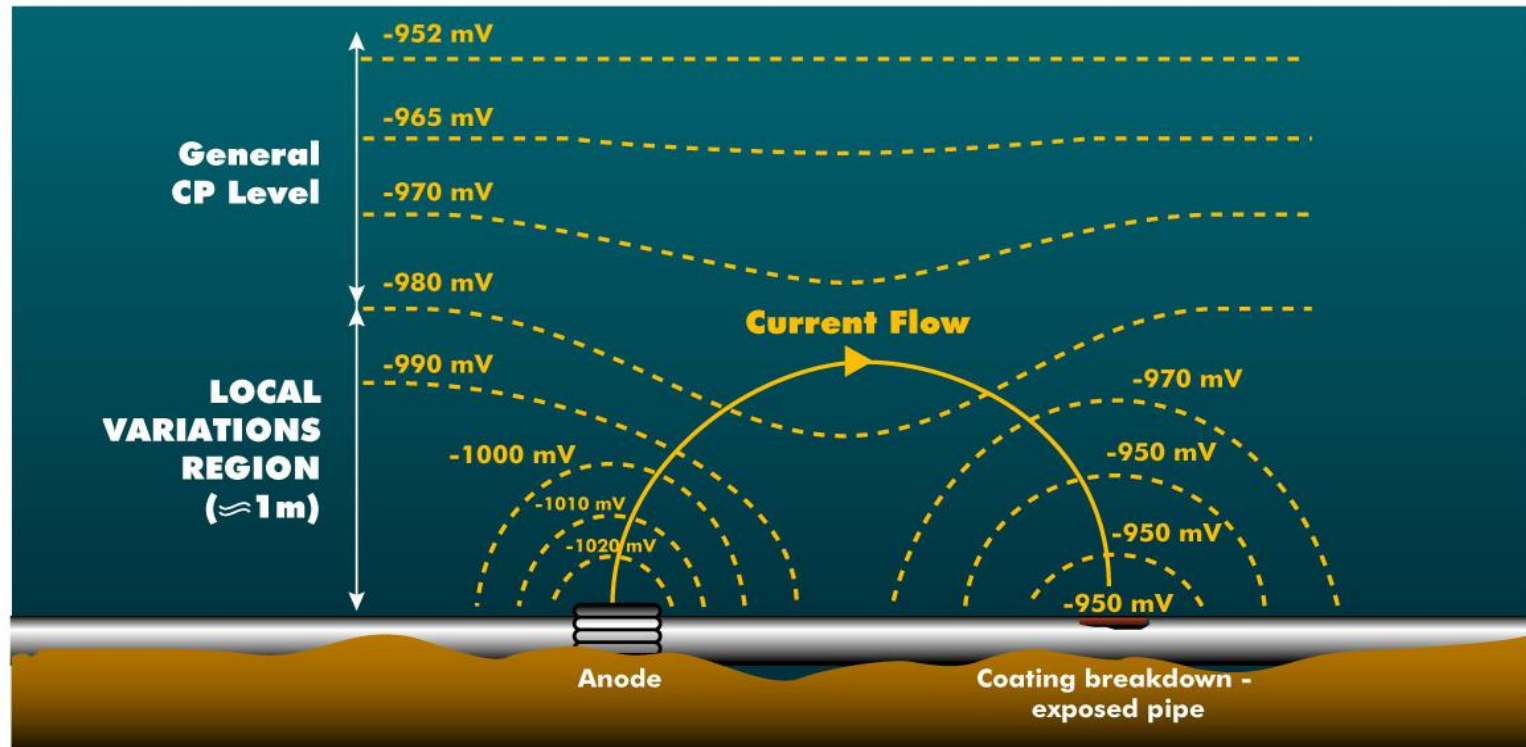


Figure 5.7 Over-the-line potential surveys using two copper sulfate electrodes (Method 2).

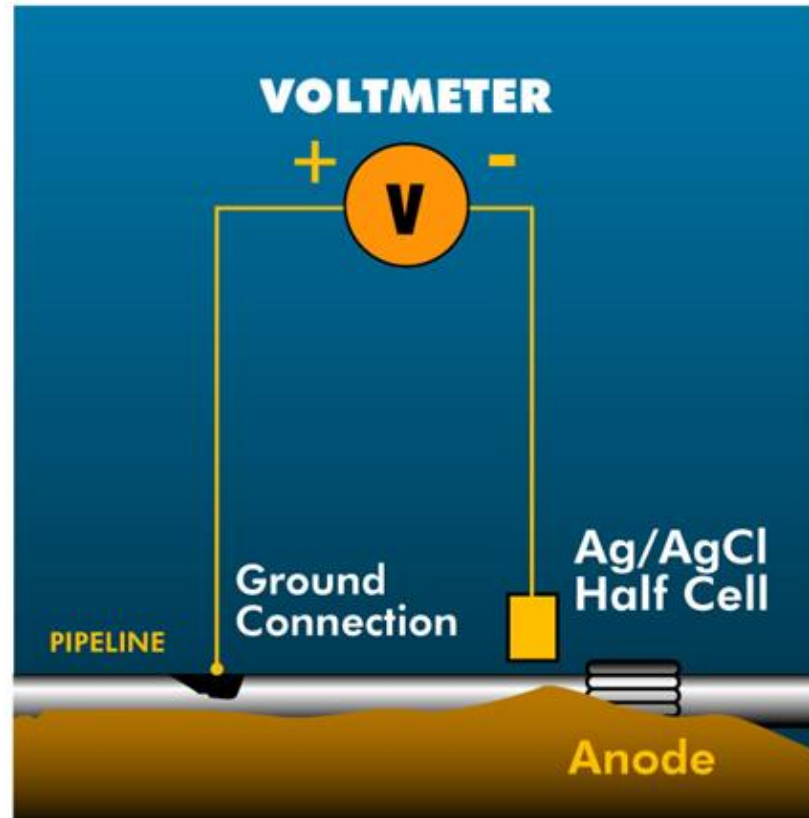
Graphic taken from Peabody's Control of Pipeline Corrosion – Published by NACE International

WHAT ARE WE MEASURING?

- Gradients around anodes and bare steel

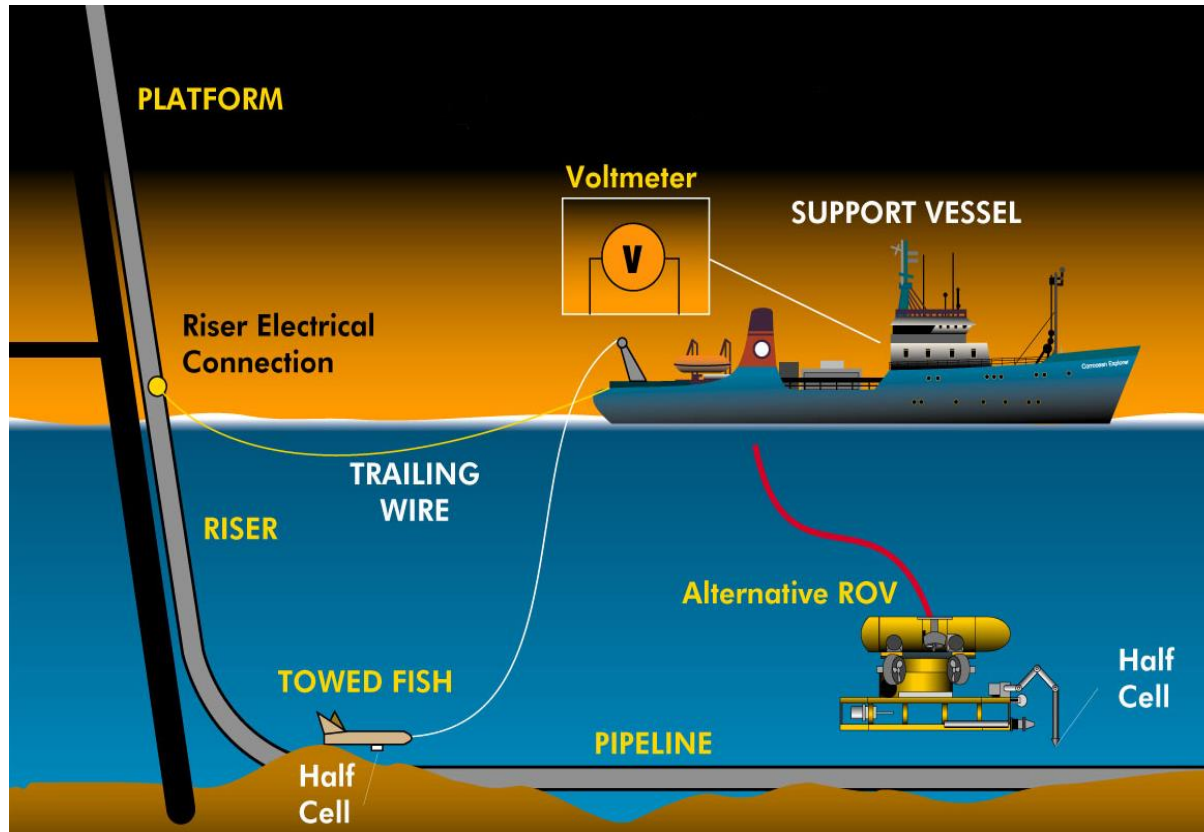


OFFSHORE EQUIVALENT



BASIC MONITORING

► Offshore trailing wire

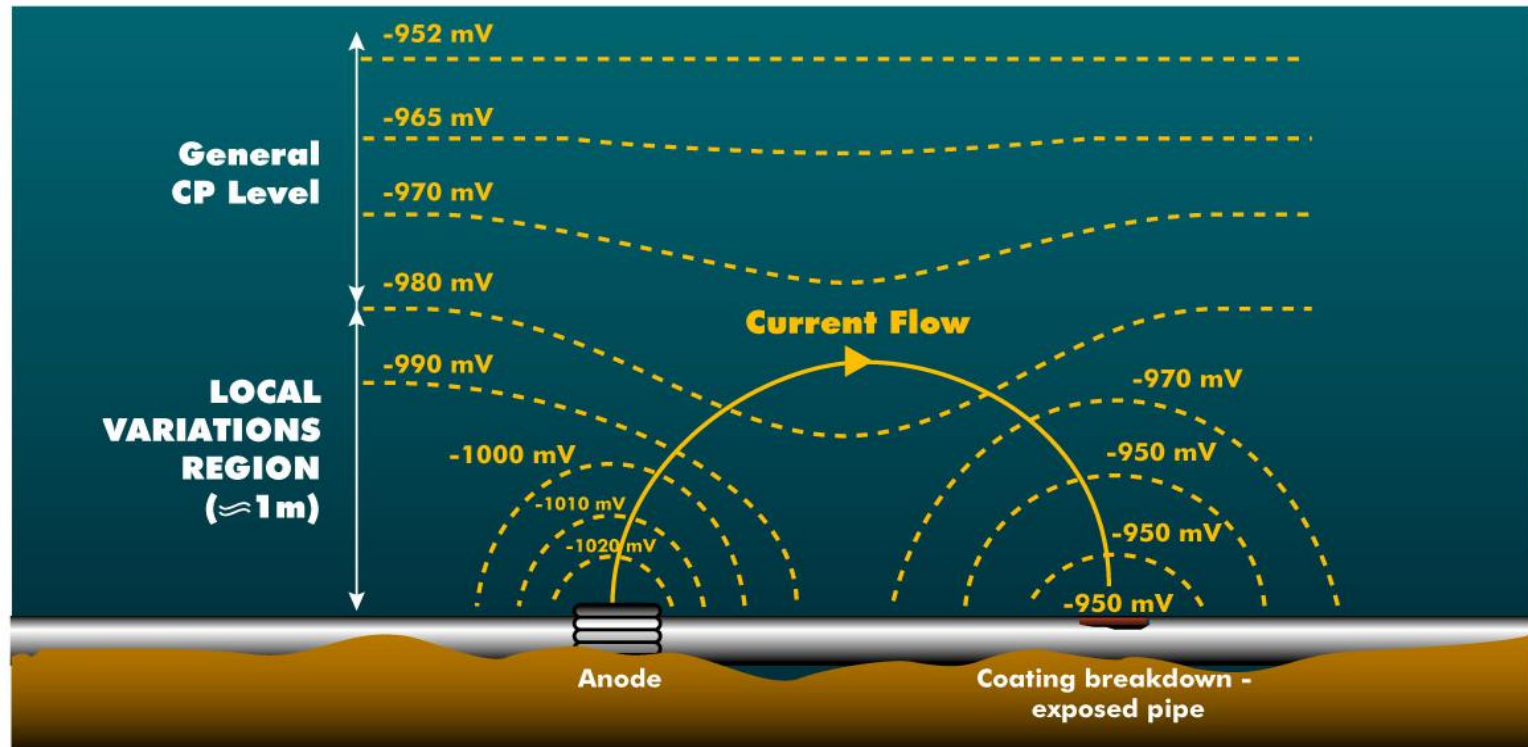


BASIC MONITORING

- ▶ 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

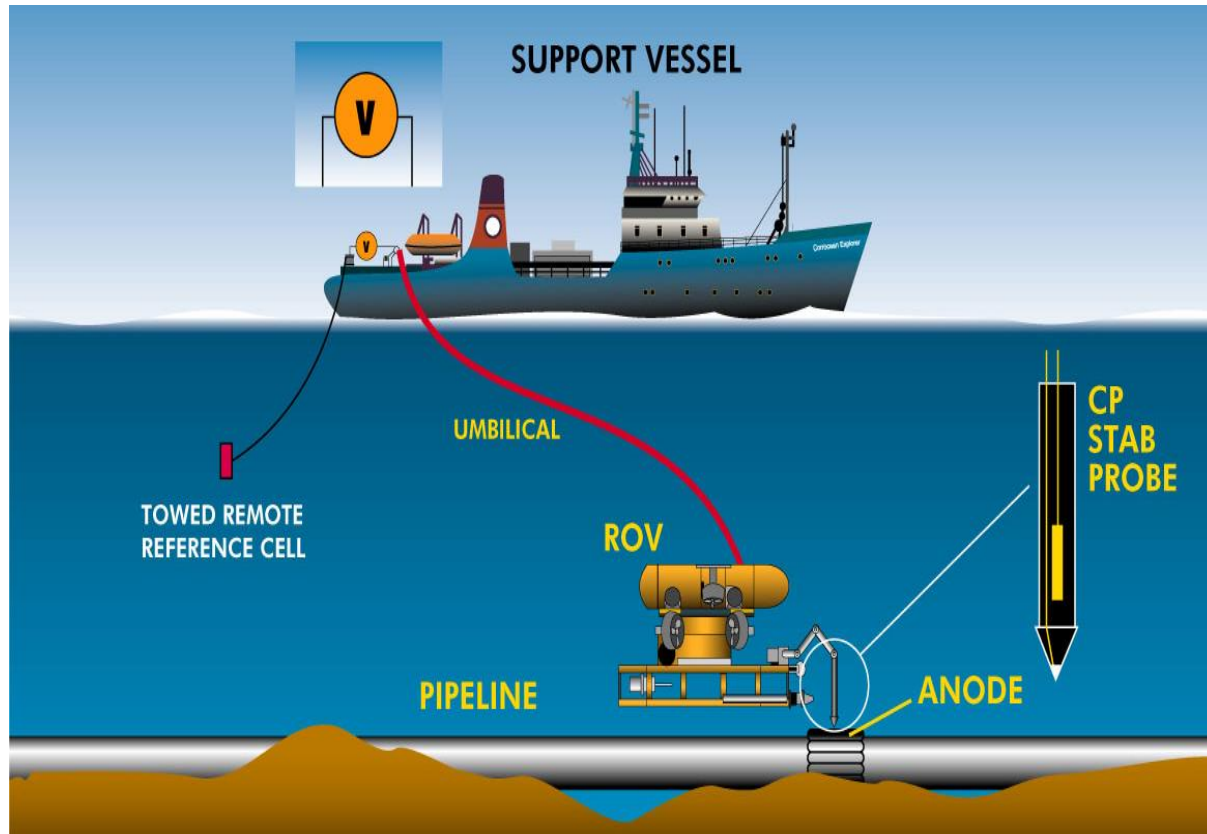
WHAT ARE THE OPTIONS / ALTERNATIVES?

► Gradients around anodes and bare steel



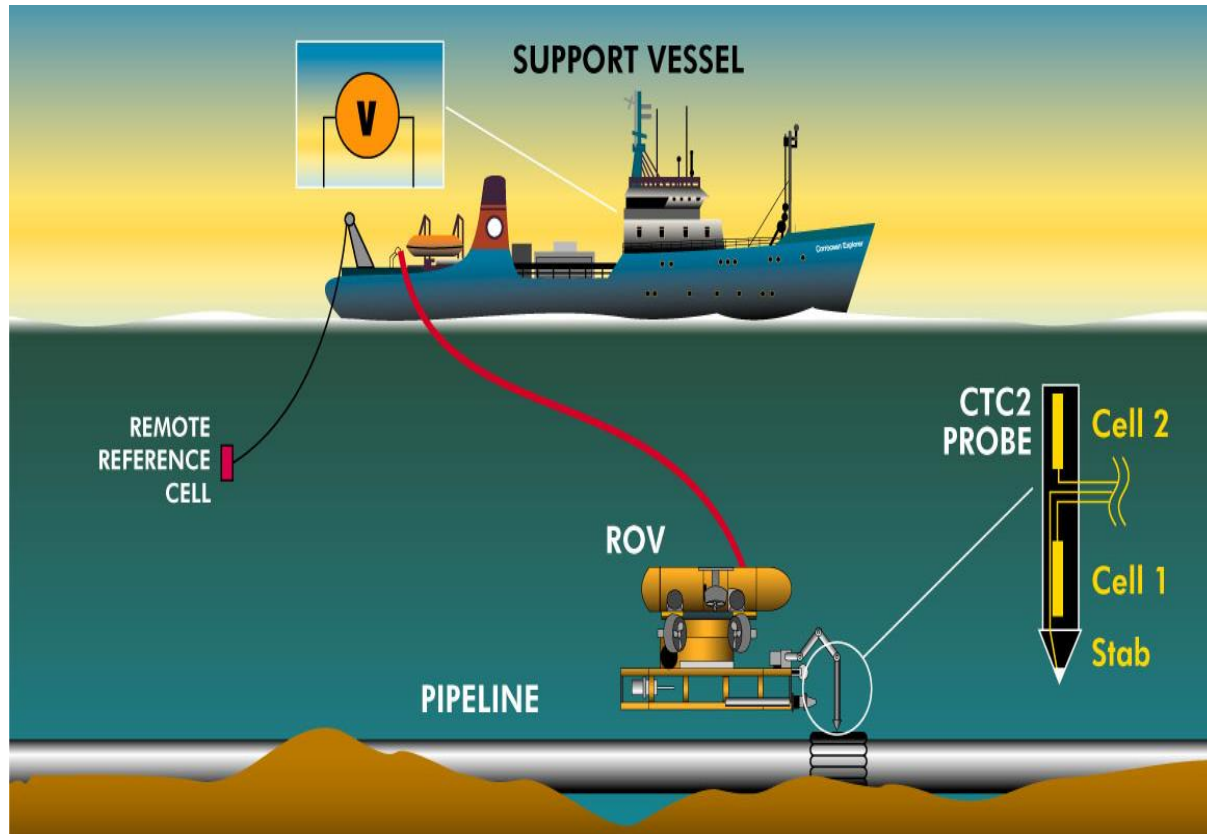
WHAT ARE THE OPTIONS / ALTERNATIVES?

► Most basic option



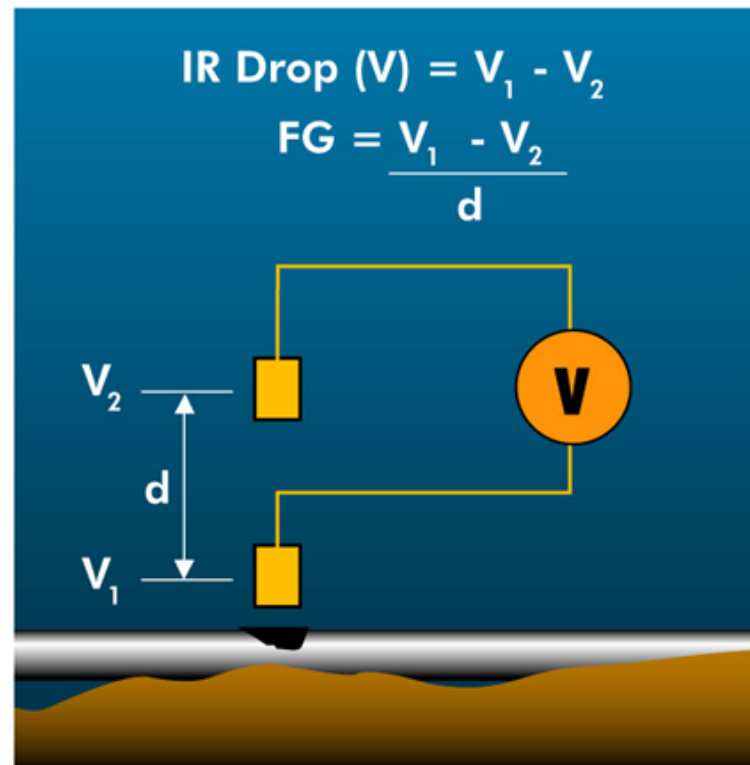
WHAT ARE THE OPTIONS / ALTERNATIVES?

► More advanced option



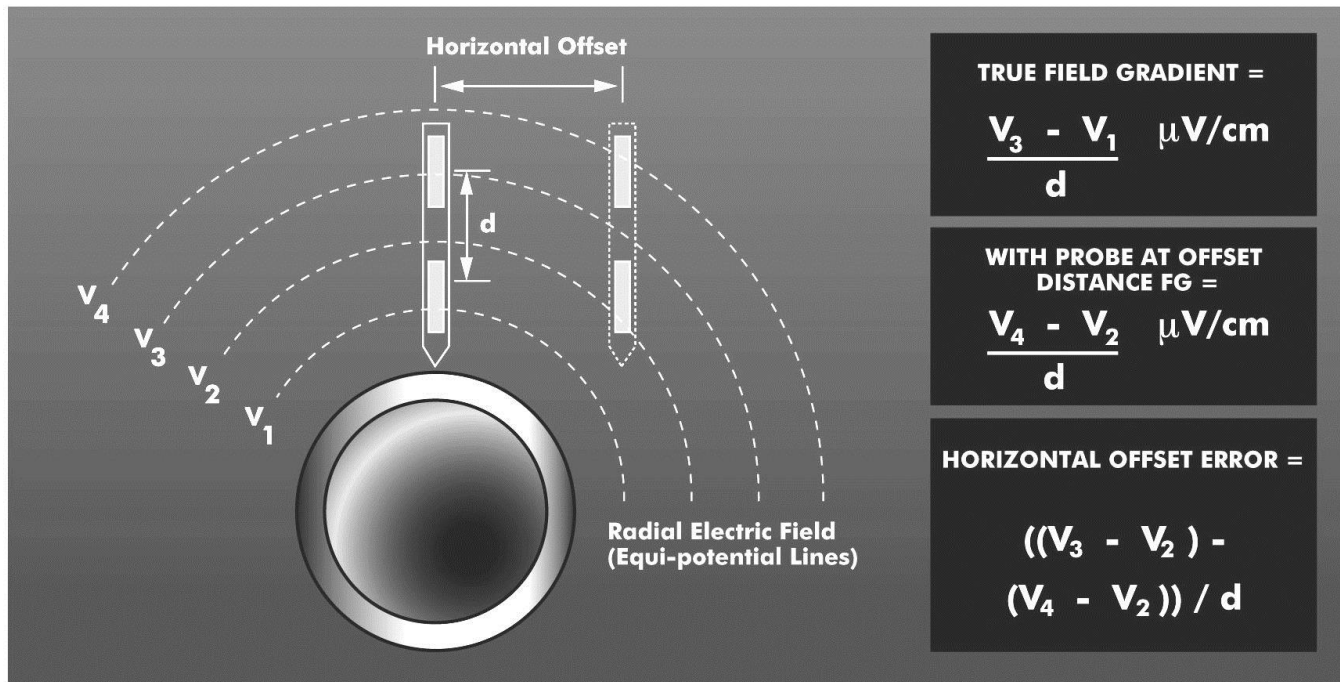
FIELD GRADIENT

- ▶ Voltage across the probe directly related to anode current



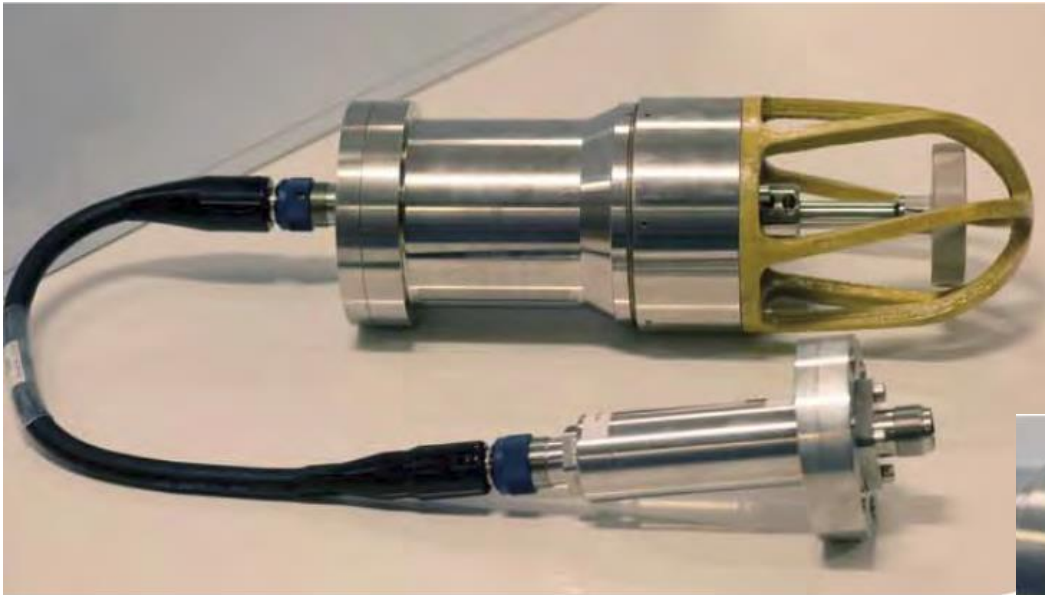
FIELD GRADIENT

- What happens when it's not at right angles?



WHAT ARE THE OPTIONS / ALTERNATIVES?

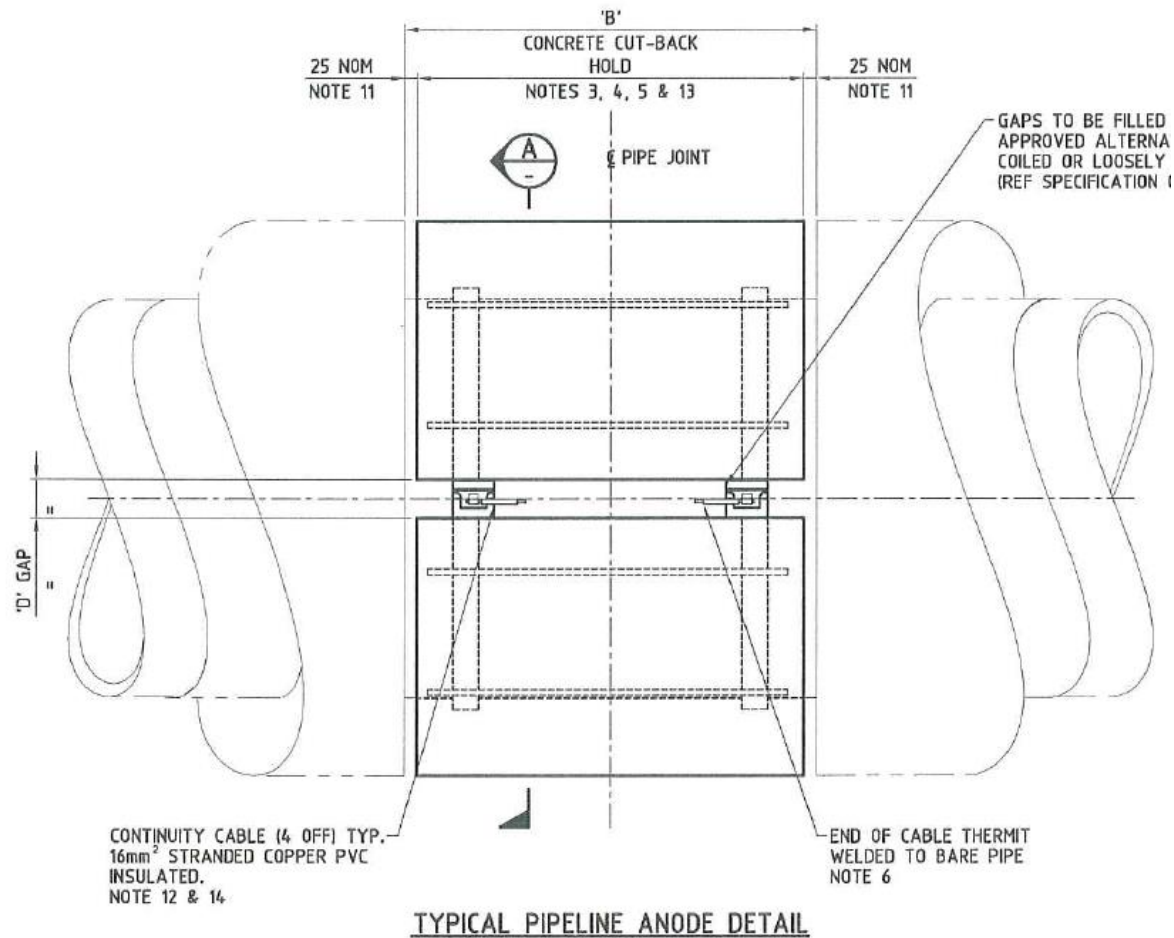
- ▶ And the Rolls Royce “FIGS” CP System



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



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)

SUMMARY

- ▶ 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

