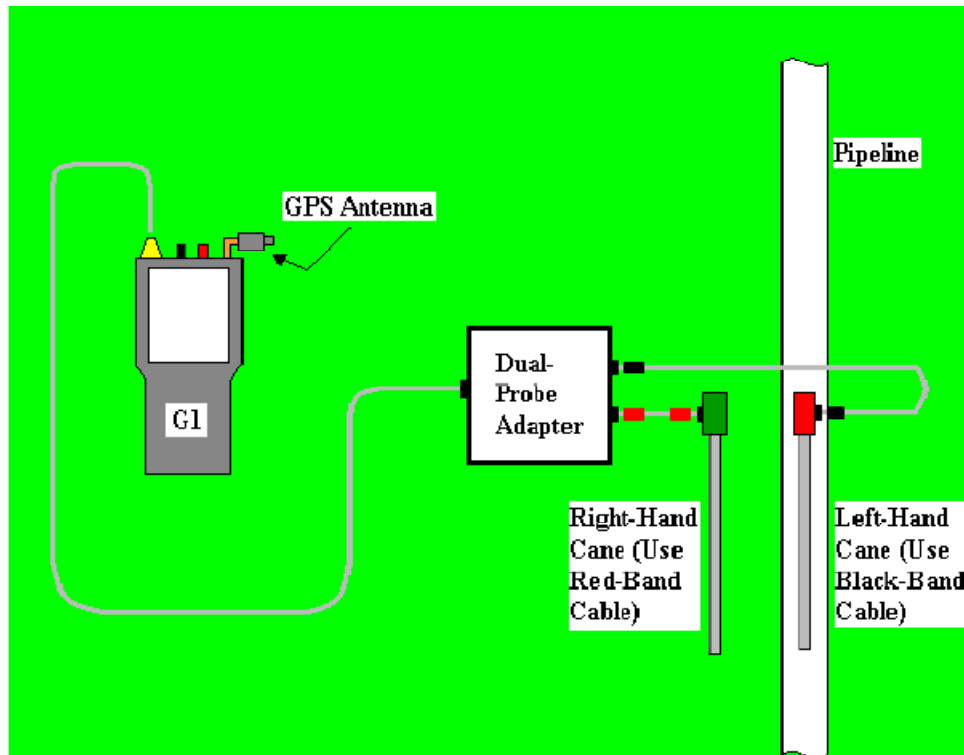


DCVG TECHNIQUE

- The DCVG is used for:
 1. GPS location of Exposed Holidays (Defects).
 2. Current Direction in the defects. This allow to know if the defect is being or not protected by CPS.
- Previous the performing of a DCVG survey the IR drop must be calibrated in order to have a value of at least 200 mV. If is possible to obtain this value of IR this technique will detect defects bigger than the 10% of IR .
- This technique is compatible with fail safe coatings as Fusion Bond Epoxy or the RD-6 of Polyguard.
- It is not possible to find defect where the coating has failed (Disbondment) and the system used shields the Cathodic protection current.
- During the DCVG survey the current going in or out from a defect causes a variation in the potential of the vicinity. These changes are observed by the evaluator. The higher value observed will be located over the defect location using the perpendicular technique.



DCVG SURVEYS



**ARRANGEMENT OF MCM
EQUIPMENT FOR DCVG SURVEYS**

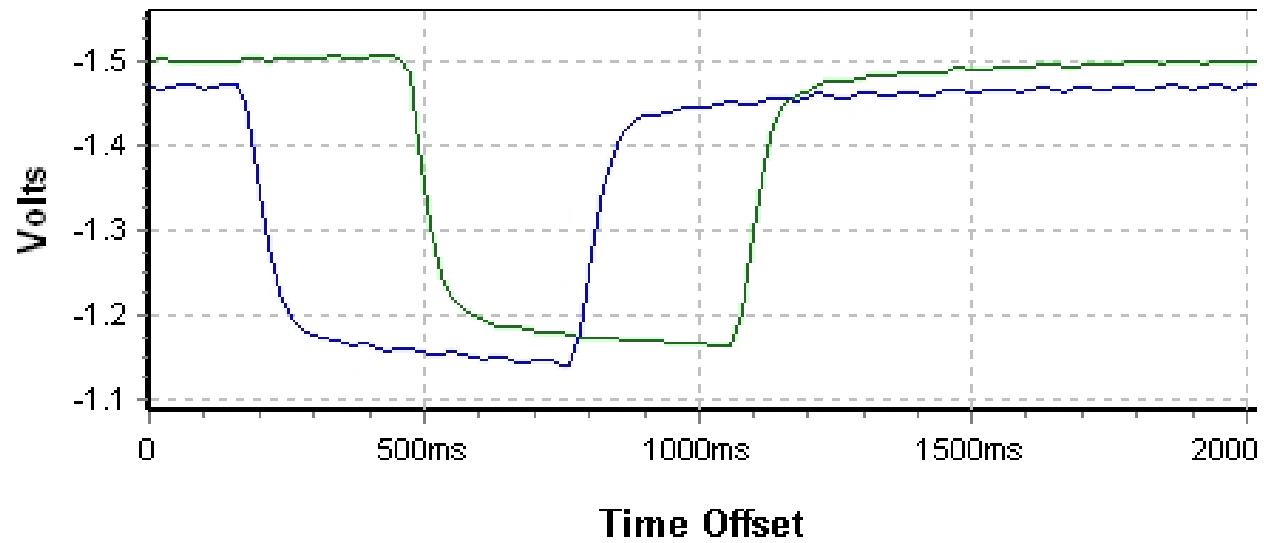


G1 DATALOGGER OF MCM



Engineering Universal Services Cia. Ltda

[70+00] Single Test Station [70+00]

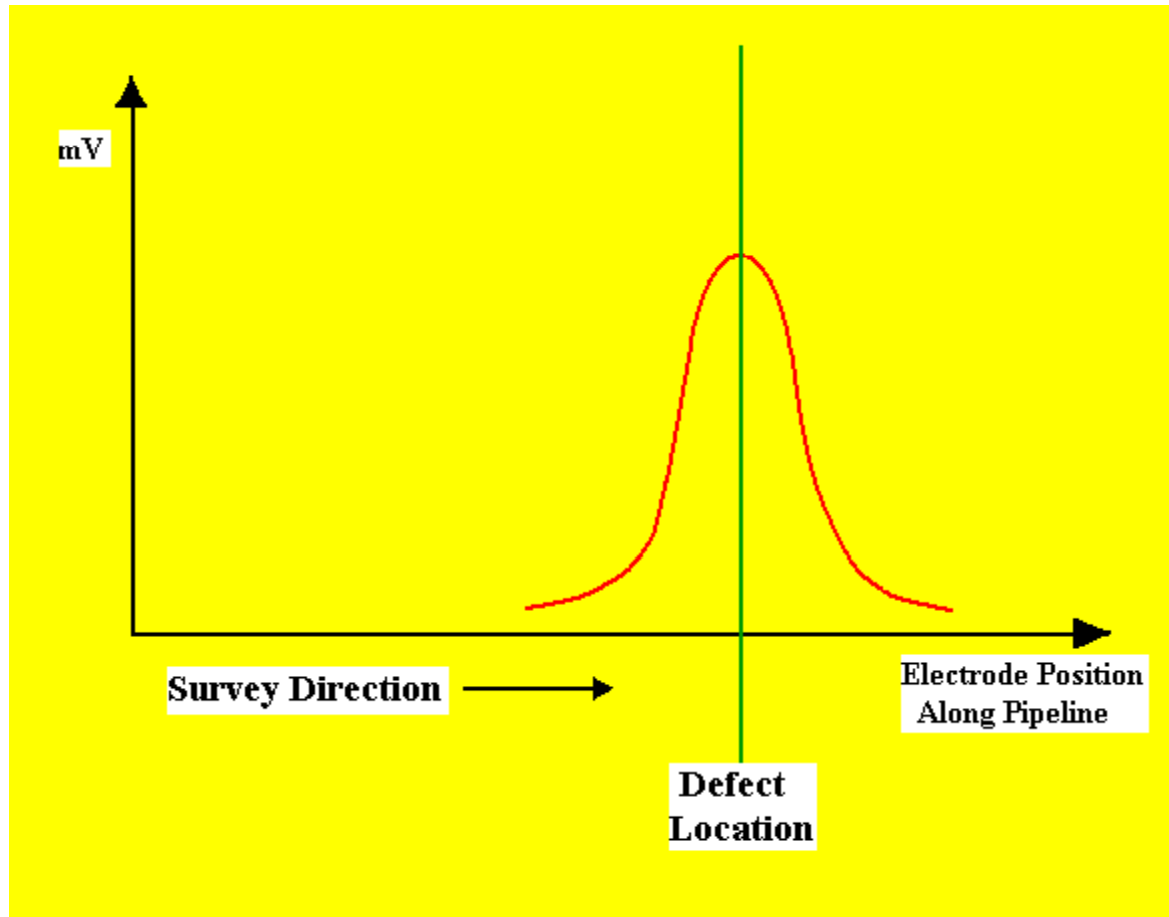


— ONDA CRUDO POSTE KM 7 : Chnl1
— ONDA AGUA POSTE KM 7 : Chnl1

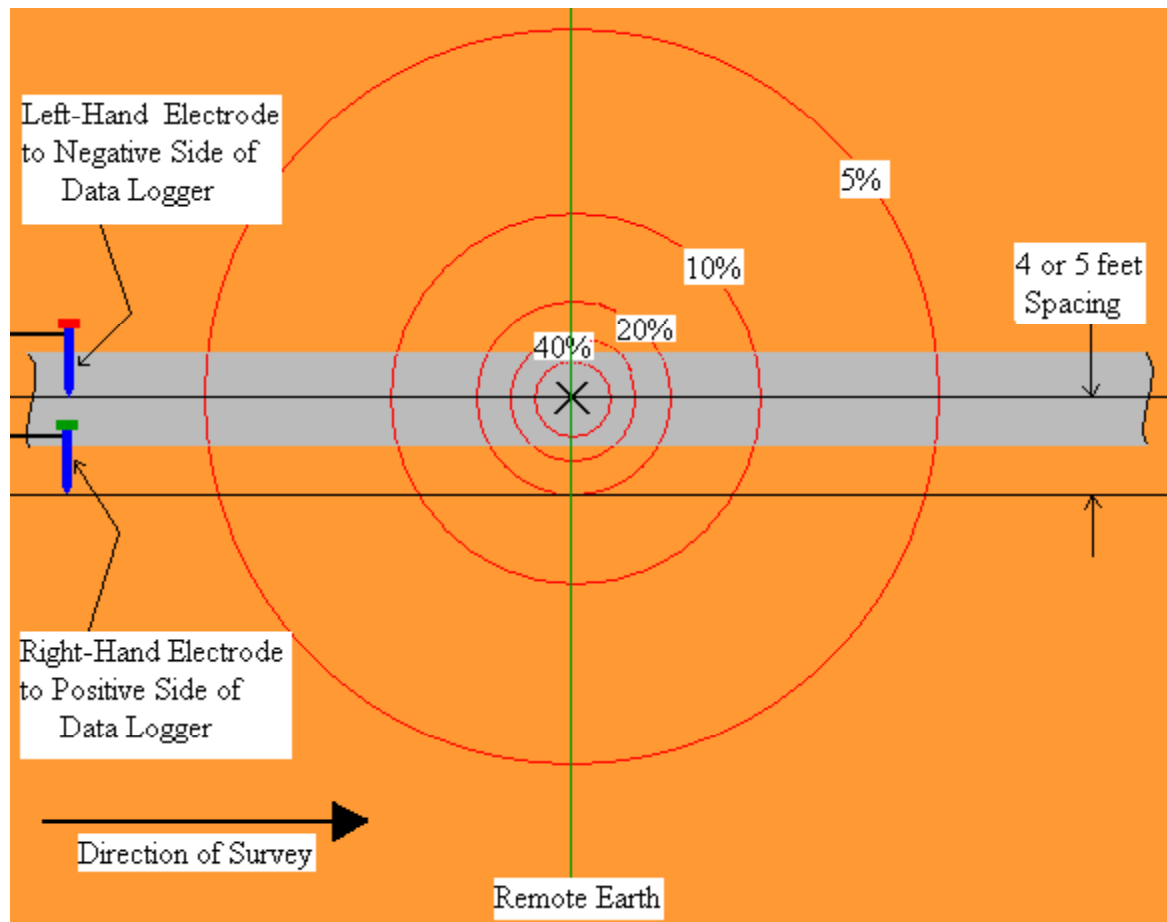
18/02/2007 20:22:55

Single Test Station WAVE Measurement In order to review the IR drop and possible interference





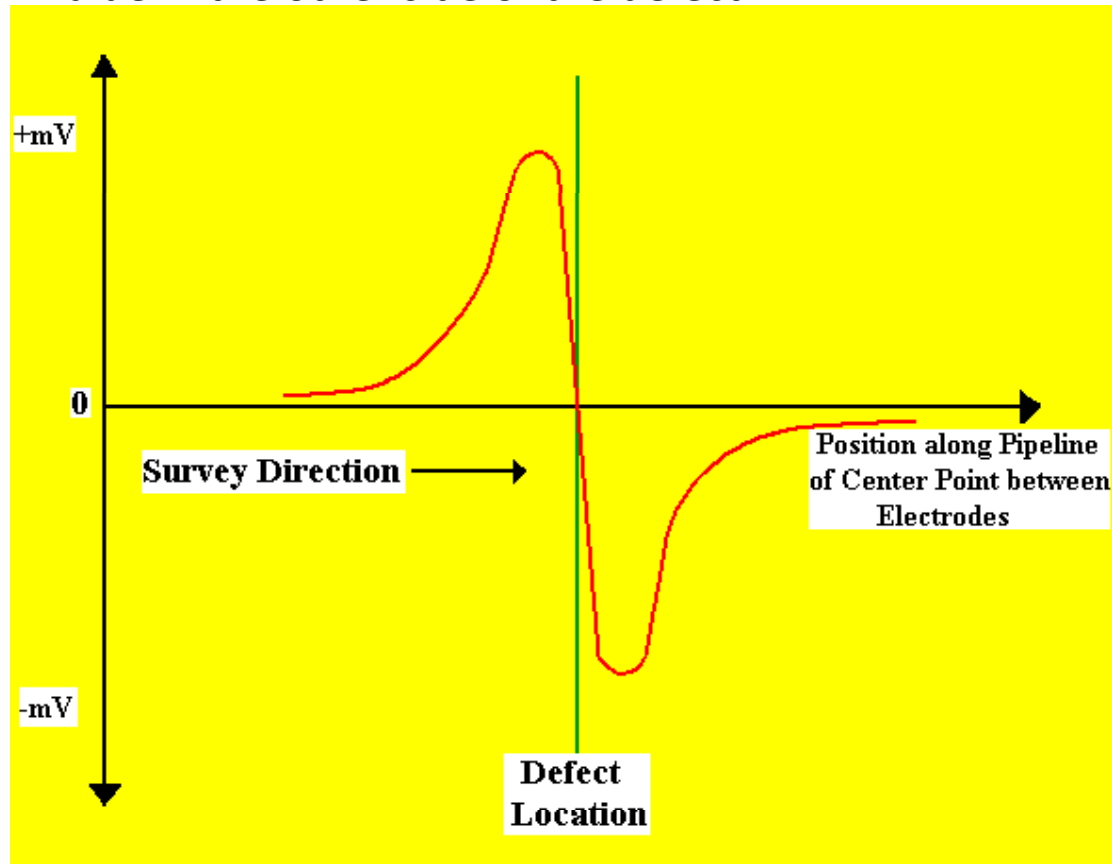
**DCVG Voltage as a Function of the Electrode Position along the Pipeline
in the vicinity of the Coating Defect as measured with electrodes in
perpendicular configuration**



**Reference Electrode Positioning for a Perpendicular DCVG Survey.
Potential difference measured at the green line will represent the
maximum voltage recorded (Defect Location)**

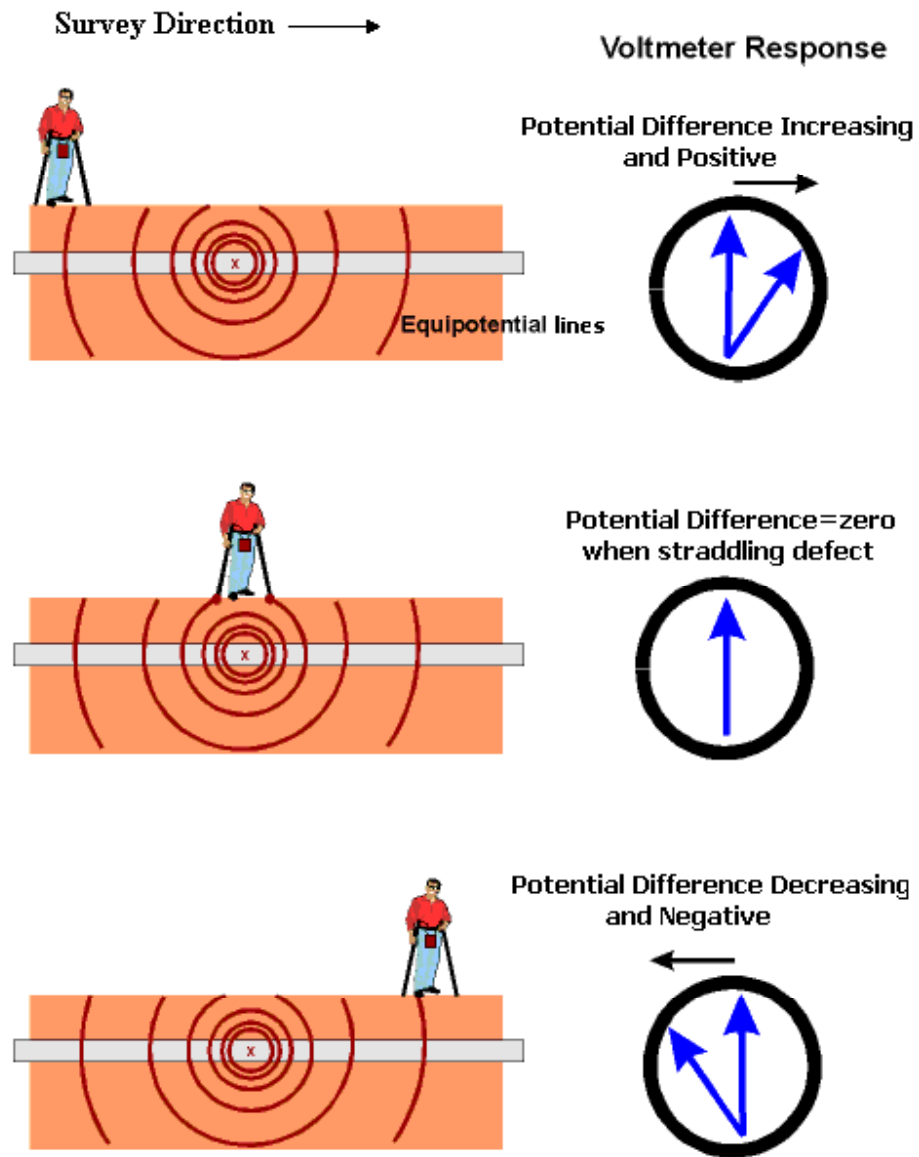


- During the In-Line (Parallel) Technique the evaluator will observe a positive value in one side of the defect, zero in the defect value and a negative value in the other side of the defect.



DCVG voltage in the vicinity of a coating defect as a function of the position along the pipeline of the center point between the electrodes with the electrodes configured in Parallel Technique

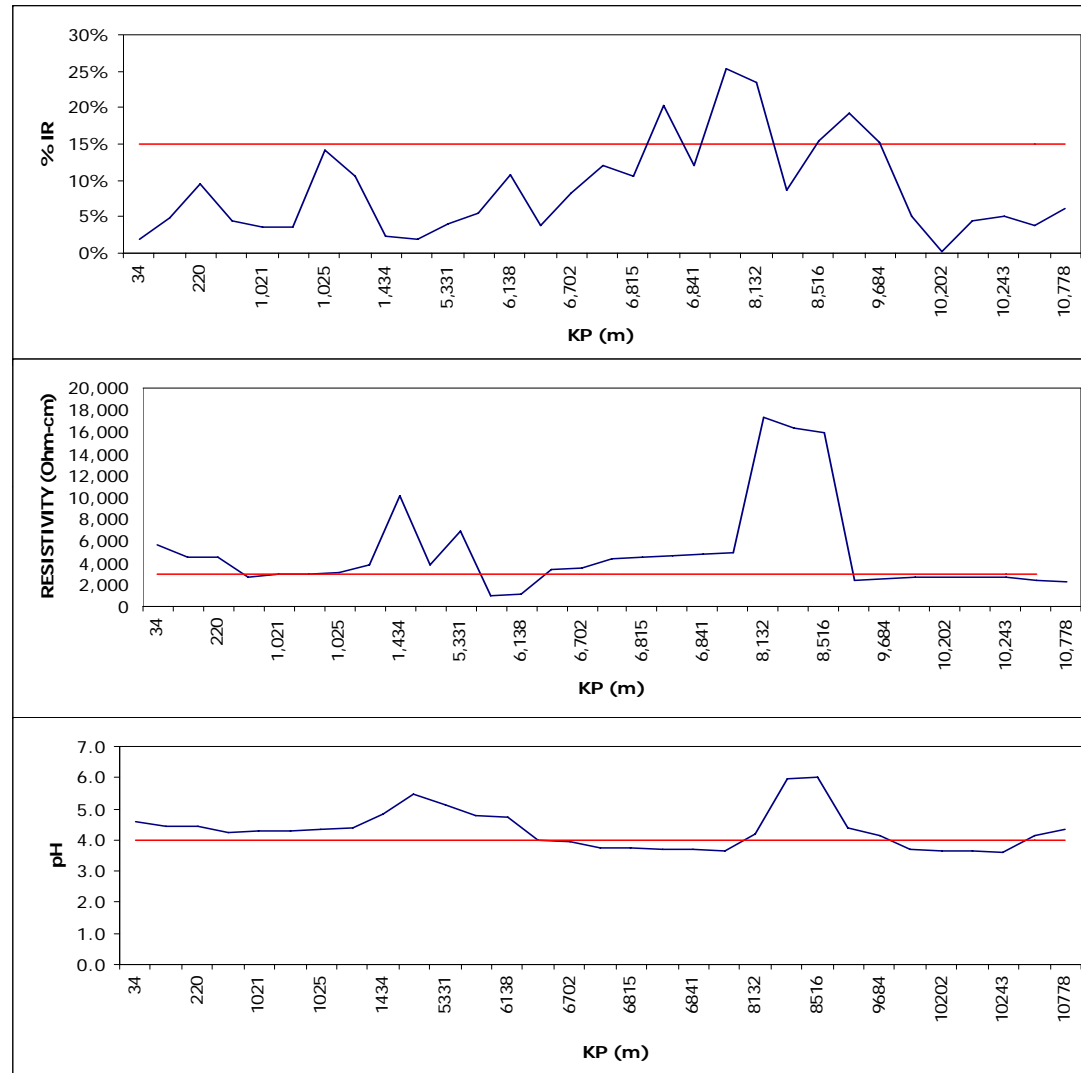




In Line DCVG Survey Technique



- The DCVG information can be used in conjunction with other surveys such as resistivity, pH, Smart Pig, among others.



DCVG, Resistivity, pH, Surveys in conjunction



- *After the DCVG Surveys it is possible to classify the defects as a function of their IR and influence of the CPS.*
- *The defect classification or categorization of the defects will allow to have a reparation program.*

