DC VOLTAGE GRADIENT TECHNOLOGY & SUPPLY LTD

MARKET LEADERS IN ECDA SURVEY EQUIPMENT + SOFTWARE & CATHODIC PROTECTION RESEARCH

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Surveyors Accreditation Scheme

The Surveyors Accreditation Scheme is based on 4 levels of competence for the application of DC Voltage Gradient Survey Technology to Buried Pipelines.

Level 1: - Basic Training with 5 days theoretical and Practical course.

Level 2: - Intermediate - with a minimum of 1000 Km of survey work under supervision as part of a team. <u>Must have sat and passed the Level 1 exam.</u>

Level 3: - Advanced - as a Project Engineer leading a team and carrying out full project data analysis and reporting to the Client.

Level 4:- Expert - capable of training others and having extensive project Supervision etc - (typically 10,000 Km of survey).

Advancement to a higher level of Accreditation is based upon the appraisal by a panel of experts headed by Dr J. M. Leeds of the level of competence in D C Voltage Gradient Technology achieved, the overall contribution to the advancement of the technology and Client satisfaction rather than Km surveyed.

The client is usually expected to provide the following.

1. Classroom for Monday Tuesday and Friday.
2. Copying facilities for the DCVG Manual.
3. A pipeline for the practical demonstrations. The pipeline having a CP system where we can place the interrupter. Typical CP current 5 to 15 amps.
4. All onsite transport and access permits.
5. Projector (type to be advised).
6. Computer Screen

DCVG/CIPS TRAINING COURSE

LEVEL 1

Session 1. Course Introduction and Organisation. Fundamental Electrochemistry.

1. The requirements for Corrosion.
2. The Pourbaix Diagram.
3. Cathodic Electrochemical processes.
4. Cathodic Protection and Cathode Films.
5. Organic and Inorganic Coatings.

Session 2. Practical Electrochemistry

6. Pipe to Soil Potential- measurement and limitations
7. The relationship between Coatings and CP.
8. The limitations of CP.
9. Typical CP current demands for different coating quality.
10. Pipeline Failure through Metal Loss, Stress Corrosion Cracking etc.

Session 3. Coating Failure Mechanisms

11. General Discussion.
12. Tape Coatings.
13. Asphalt and Coal Tar.
14. Thin Film coatings (FBE).
15. Other Coating systems.

Session 4. The DC Voltage Gradient Technique

16. Fundamentals of the DCVG technique.
17. Detailed explanation of DC Voltage Gradient equipment
18. The DCVG Pulse (Meter Indications). Practical Class demo.
19. DCVG Signal electrical circuit
20. DCVG Coating Fault detection method

Session 5. DCVG Electrical Measurements.

21. Understanding the DCVG Signal Amplitude.
22. Taking Electrical Measurements to determine the Severity of Coating Defects
23. Defining the Coating Fault shape using iso-potential plots.
24. Determining the Corrosion Behaviour of Faults.
25. Determining where Faults get their CP from
26. DC Traction and other Interference effects.
27. Typical DCVG results

Session 6. Special uses for DCVG Technology.

28. Surveying parallel pipelines
29. Complex pipeline networks
30. Using DCVG to investigate CP systems
31. Test Posts, Insulating Flanges, Cased Crossings
32. The use of DCVG to control Cathodic Protection

Session 7. Other Survey Techniques

33. Pipe to Soil Potential measurement.
34. Close Interval Potential Survey technique.
35. Limitations of the CIPS technique.
36. Limitations of the DCVG technique.

Session 8. Organising a Field Survey.

37. What information do I need from Records?
38. Setting Up the Interrupter.
39. What Initial DCVG Signal Amplitudes to measure?
40. Starting the survey and how to locate
41. What data to record? How should data be recorded?
42. Distance measurement techniques to use and their limitations.
43. Preparing the data for analysis.

Session 9. Field Work. Locating Coating Faults

44. Setting up conditions for a DCVG Survey.
45. Measurement of the DCVG Signal Amplitude.
46. Location of Coating Faults.

Session 10. Electrical Measurements at Coating Faults.

47. Anodic/Cathodic Corrosion Behaviour.
48. Electrical measurements and Fault Severity.

Session 11. DCVG Data Analysis.

49. Calculation of Fault Severity.
50. Assessment of results obtained.
51. Effect of Depth of Burial and Soil Resistivity on Fault Severity.
52. What Faults to repair.
53. Computerised Data Analysis techniques using the DCVG's ECDA Software program.
54. General Discussion.
55. Revision and Question Time.

Session 12. Written Examination.

56. A 90 minute, 10 question written examination
57. General Discussion.
58. Assessment of the DCVG Training Seminar.

LEVEL 2

Session 1.

1. Review and Critique of any Student Survey Work Carried Out. Discussion of Student Problems.
2. Client Education and Contracts.
3. Preliminary look at ECDA Specifications.
4. Detailed DCVG Survey Specification. Client Education. What does the Client want.

Session 2.

5. Survey Team Composition.
6. Surveyor Selection and Education.
7. Equipment Required and Plans to Handle Field Work and Data Analysis.
8. Planning a Survey.
9. Managing your Survey Team. Multiple Teams.

Session 3.

10. Survey Set up and Methodology, Gathering Field Data. Auditing CP Hardware and ROW.
11. Discussion on Rectifiers and Temporary CP Systems, Problems and Limitations.
12. Surveying. Permits, Land Owner Co-operation, Client Co-operation.

Session 4.

13. Survey Problems. Fences, Electric Fences, Streams, Rivers, City Streets. No Test Posts.
14. Parallel Pipelines, Complex Pipeline Networks.
15. Client Reporting, Daily, Weekly, Monthly. Use of e-mail for Reporting.
16. Errors and Limitations of DCVG Surveys. Equipment Problems and Maintenance.

Session 5.

17. Review of Type of Data Collected During a Survey.
18. Distance Measurement Techniques Including GPS.
19. Data Transfer From Field to Office.
20. Error Correction and Avoidance.
21. Other Methods for Above Ground Surveys.

Session 6.

22. The CIPS Technique. Different types of CIPS Equipment and Methodology.
23. CIPS Set Up, Errors and Limitations of the Technique.
24. Combined Surveys, DCVG and CIPS. What Type of Data is Collected. ECDA Requirements.

Session 7.

25. Organisation of Combined Survey and Data Collection.
26. Co-ordination in Field of Different Types of Surveys including Soil Resistivity, Inline Inspection Pigs for Metal Loss, Guided Wave Ultrasonic Inspection, Acoustic Emission.
27. Importance of Soil Resistivity.

Session 8.

28. Matching Survey Data Sets. DCVG/CIPS/Soil Resistivity/Metal Loss etc. Correlation Points.
29. Coating Fault Specific and Non Specific Data. The Usefulness of Different Types of Data.

Session 9.

30. Data Analysis. What do you want from the Analysis to meet Client Requirements?

Session 10.

31. Current American External Corrosion Direct Assessment (ECDA) Techniques and its Limitations. A Close Look at Type of Data Input to the ECDA Process.
32. How Poor Data can Defeat the ECDA Process.

Session 11.

33. Data Analysis Programs and How they Work.
34. Advanced Applications of DCVG Technology. SCC Studies.
35. Detailed look at Sham DCVG Techniques.
36. DC vs AC Techniques. Errors and Limitations.

Session 12.

37. Converting ECDA Analysis into a Rehabilitation Program.
38. Defining Pipeline Rehabilitation Requirements, Metal Loss, Coating and Cathodic Protection.
39. Pipeline Rehabilitation Techniques including Relocation of Fault Areas.
40. Review of Course Contents, Discussions on Application of ECDA and Repeat Surveys.
41. Review of Student Critiques of Sample Survey Report - Limitation Report Problem Discussion