Specialist Pipeline CP Surveys

Introduction: Cathodic Protection Specialist Pipeline Surveys

Corrpro Europe Site Services division provide Specialised Cathodic Protection pipeline surveys that may be required pre & post installation or as part of routine maintenance schedules. Surveys are undertaken by ICorr/ISO or AMPP certificated technicians and engineers with full project management support.

All surveys are carried out above ground and are non-intrusive.

- Close Interval Potential Surveys (CIPS)
- Direct Current Volage Surveys (DCVG)
- Pipeline Current Mapping Surveys (PCM)
- Soil Resistivity Surveys
- Current Drain Surveys (CDT)
- Test Post Monitoring / Structure to electrolyte surveys

Close Interval Potential Survey (CIPS)

CIP Surveys monitor and record pipe to soil 'ON' & IR error free (instant OFF) Potential values along the route of a buried pipeline to determine the levels of Cathodic Protection at sufficiently close intervals. The results recorded will determine how effective the CP system is at preventing external corrosion of the pipeline where coating defects may occur.

Surveys are conducted by connecting a trailing copper wire to a pipeline test facility & walking along the traced pipeline route, recording pipe to soil potential values with respect to calibrated Cu/CuSO4 reference electrodes at close intervals (1-2m). This survey data is recorded by specialised CIP data logging equipment and is compared to a static data logger set up to record the pipe to soil potentials at a single location simultaneously during the survey. This static potential data is used as a control, should interference be present. The data is downloaded at the end of each day and assessed for accuracy & validity.

Upon completion of the survey a detailed report is issued and includes a discussion, recommendations and graphical profiles plotting the pipe to soil potentials against distance / time.

The survey is typically undertaken by three technicians - Team leader, pipe locator and wire winder.

Direct Current Voltage Gradient (DCVG) Survey

As pipelines age the coating deteriorates and Cathodic Protection becomes increasingly significant in mitigating external corrosion. The DCVG technique is an indirect survey where the primary survey objective is to locate, identify and size coating anomalies along a buried pipeline. Prior to the survey commencing, a current interrupter is installed to interrupt the dc current flow along the pipeline. The survey technique utilises the voltage gradients caused by the flow of Cathodic Protection current towards a coating anomaly. The voltage gradient is identified using two probes and a high impedance voltmeter. The severity of a coating defect is identified as a percentage (%IR) and by definition, the larger the %IR at a given anomaly, the larger or more severe that anomaly is likely to be in terms of coating damage, area of steel exposed at that location. The survey data is assessed in detail such that recommendations can be made for excavation, including requirements for repair and possible corrosion assessment that could be prioritised according to coating defect location, size, severity and the levels of Cathodic Protection in the vicinity of a coating defect.

The DCVG survey has proven beneficial for pipelines buried under asphalt and concrete and where the pipeline runs under road and river crossings as the defects are indicated both upstream and downstream of the surveyors location. This survey can also be undertaken underneath overhead high voltage power lines.

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Pipeline Current Mapping (PCM) Survey

A Pipeline Current Mapping survey is used to locate coating defects and provide a comparative assessment of the coating quality. The survey utilises specialist equipment comprising of calibrated transmitters, receivers and A-Frames to record induced current values at close intervals directly above the pipeline route. The survey is conducted by walking along the traced buried pipeline route, recording mA and dB readings at intervals of five metres between measurements. The PCM Tx transmitter is installed at a CP test point local to the section of the pipeline to be surveyed. The transmitter is a constant current high power transmitter which allows long range signal detection along the pipeline route. The A-Frame component is used alongside the PCM receiver to precisely pin point coating defects and isolation faults.

Soil / Electrolyte Resistivity Surveys

Soil / Electrolyte resistivity measurements provide field data with respect to the corrosivity of the soil / electrolyte and the requirement for Cathodic Protection or other external corrosion control measures. Soil resistivity surveys are typically undertaken at selected locations along a pipeline route at varying depths. The survey utilises specialist equipment compromising of calibrated low resistance ohm meter eg Nilsson resistance meter, Megger DET/5 or similar, equipped with 4 x Steel electrodes (pins), flexible, stranded, insulated test cables fitted with suitable terminations, tape measure, hand tools and GPS unit. Four steel electrodes (pins) are inserted into the soil to be tested in a straight line, at equidistant locations equal to the depth of measurement required (e.g. 1 metre depth = electrode spacing of 1 metre).

The electrodes (pins) will be inserted to a depth not exceeding 1/20th of the electrode spacing (e.g if the spacing of the electrodes is 1 metre the maximum depth that the electrodes are driven into the soil is 0.05m). Suitable cable connections will be made between the electrodes (pins) and the low resistance ohm meter terminals. Aqueous electrolyte resistivity is undertaken using conductivity cells. All measurements will be recorded in ohms, representing soil / electrolyte resistance and the soil resistivity will be calculated by formula. For locations where soil resistivity values exceeding >10m depths are required (typically for deepwell vertical CP Groundbeds) then further specialist Syscal meter survey equipment will be utilised in line with a more detailed testing technique.

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Current Drain Survey (CDT)

The Current Drainage Survey is used to provide test data with respect to testing the operational effectiveness of structure continuity e.g. mechanical couplings, continuity bonding, isolation joints/ flanges, field joints, and provides an indication of possible coating damage, that has occurred during the crossing installation operation. The following equipment will be required for the survey, steel earthing rods/sheet Piling (temporary groundbed), suitably rated cables for connecting to groundbed, power supply, 2x Calibrated digital multi-meters, current Interrupter, portable DC power source, 2 x Cu/CuSO4 reference electrodes, pipe locator & hand tools. After undertaking all pre-tests, a temporary groundbed will be set up to provide temporary current onto the structure. The current output is adjusted and recorded once suitable 'instant OFF' potentials are achieved on the structure under test.

Test Post Monitoring / Structure to Electrolyte Surveys

Test Post Monitoring or Structure to electrolyte monitoring surveys can be carried out at most buried / submerged metallic structure (depending on access to the structure) to determine the status of any Cathodic Protection system applied. Surveys are typically carried out utilising calibrated digital multimeters, ref electrodes, current clamp meters, waveforms proving devices, current interrupters, data loggers etc. Contact with the structure will be made either via a negative cable terminated within a test facility or by a direct metal contact onto clean bright metal of the structure so that a continuous low resistance metallic circuit is maintained during the measurement period.

A portable reference electrode will be placed into the electrolyte as close as possible to the structure under test. Structure to soil dc/ac potential measurements will be recorded using a calibrated digital multimeter along with further testing depending on the CP system installed. This may include anode open circuit potentials, anode to structure current measurements, coupon potentials/current, ER probe measurements, Transformer rectifier outputs etc. Each survey will be undertaken as per client specific requirements and in line with industry guidelines.

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