AC Interference Study and Simulation

DEHN Services – Engineering Service Datasheet

Service	**AC Interference Study and Simulation in accordance with local and international standards***
Part no.	**E17401**
Description	Pipelines are considered the safest and most economical way to transport oil, gas and water. These pipelines can be several kilometres to thousands of kilometres long and run through farmland, villages, rivers, forests, etc. Along the route/corridor, the pipelines are connected to various supply facilities such as power lines (alternating current/direct current), substations, transformers, underground cables, etc. These are exposed to high-voltage interference, which can jeopardise the integrity of the pipelines and the safety of personnel. In order to understand the extent of these risks and reduce them to an acceptable level, a calculation of possible high-voltage interferences on the pipeline is carried out. High-voltage interferences on pipelines can endanger personnel, cause AC corrosion, melt pipe walls and damage insulation or connected systems. With such long pipelines, it can be complicated to identify the affected sections and design an effective system for attenuating alternating current. This calculation covers both normal operating conditions of electrical systems and fault scenarios in order to identify affected parts of the pipeline. High-voltage interference is a serious problem concerning long pipelines and multiple sources of interference in different soil conditions, where mutual induction and conductive phenomena simultaneously affect the pipeline. Computer modelling and simulation are proving to be important tools for understanding the status of high-voltage interference on the pipeline and designing solutions. Various software tools (CDGS or XGSLab) are used to model the pipeline and existing sources of interference. They enable an investigation of all high-voltage interferences under normal operating and fault conditions to be carried out and a system to reduce these interferences to safe levels to be designed.
Basis*	Local and international standards for cathodic protection and alternating current interference: NACE SP 0177: 2019 Mitigation of Alternating Current and Lightning Effects on Metallic Structures and Corrosion Control Systems (Intl) EN 50443: 2012 Effects of Electromagnetic Interference on Pipelines Caused by High Voltage (EU) NACE SP 21424: 2018 Alternating Current Corrosion on Cathodically Protected Pipelines: Risk Assessment, Mitigation and Monitoring (Intl) NACE SP 0169: 2013 Control of External Corrosion on Underground or Submerged Metallic Piping Systems (Intl) NACE TM 102: 2002 Measurement of Protective Coating Electrical Conductance on Underground Pipelines (Intl) NACE SP 0104: 2020 The use of Coupons for Cathodic Protection Monitoring Applications (Intl) CSA C22.3 No.6M 91 (2003) – Principles and practices of Electrical Coordination

	Between pipelines and Electric Power Lines (CAN) ISO 15589 Part I - Cathodic protection of Pipeline/ structure transportation systems-Part I – On land pipeline/ structure, issued by ISO (Intl) ISO 18086 – Corrosion of Metals and Alloys – Determination of AC Corrosion – Protection Criteria (Intl) ISO 22426 – Assessment of the effectiveness of cathodic protection based on coupon measurements (Intl) IEEE-80 standard (latest revision), "Guide for Safety in AC Substation Grounding" (Intl) IEEE-81 standard, "Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System" (Intl) Criteria for Pipelines Co-Existing with Electric Power Lines, prepared for The INGAA Foundation by DNV GL. CEOCOR Guidelines for Risk assessment and Mitigation Measures – AC Corrosion on Cathodically Protected Pipelines. (2001). Canadian Energy Pipeline Association (CEPA) – AC Interference Guideline (CA) DIN VDE 0845-6-1 (VDE 0845-6-1), "Influence of high-voltage systems on telecommunication systems – Part 1: General, limits, calculation and measurement methods", 2013. DIN VDE 0845-6-2 (VDE 0845-6-2), "Electromagnetic influence of electric power supply on telecommunication systems – Part 2: Influence by three phase ac systems", September 2014. DIN EN 50443:2012-08; VDE 0845-8:2012-08, "Effects of electromagnetic interference on pipelines caused by high-voltage a.c. electric traction systems and/or high voltage a.c. power supply systems; German version EN 50443:2011", August 2012. DVGW GW 28 (A), "Determination of AC corrosion risk of cathodically protected steel pipelines and protection measures", Feb. 2014. DVGW, "GW 22: Measures for the construction and operation of pipelines in the vicinity of high-voltage three-phase current systems and alternating current railway systems," DVGW Deutsche Vereinigung des Gas- und Wasserfaches e.V., Cologne, February 2014. AfK Recommendation No. 3, "Measures for the construction and operation of pipelines in the vicinity of high-voltage three-phase current systems and alternating current railway systems", Cologne: Arbeitsgemeinschaft DVGW/VDE für Korrosionsfragen (AfK), 2014. **Note: Unless clearly indicated by the customer, the service will be performed in accordance with the latest version of the standard applicable in the country in question. If the service is to be carried out according to a different standard/version, this must be defined before the order is created.**

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Outcome	○ Report on field activities carried out (if commissioned) ○ Results of the simulation ○ List of pipeline sections that pose a risk to the health and safety of personnel ○ Report on all findings and necessary measures to reduce high-voltage interference All documents created are provided in electronic form as .pdf documents.
Prerequisites	○ Geographical location of the pipeline route (drawing or .kmz) ○ Details on the construction, coating and cathodic protection of the pipeline ○ Objective for performing the high-voltage interference calculation
Optional Additional Services	Site inspection services and meeting (part no. E17101) for determining the details of the project. Soil resistivity testing/measurement (part no. E17102) Safety earthing grid design (part no. E17303) for devising earthing measures.