

Case Study: Foreign Operator DC Interference on An Existing Pipeline System

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ABSTRACT

Close Interval pipe-to-soil Surveys (CIS), Alternating Current Voltage Gradient (ACVG), and In-Line Inspection (ILI) data suggested corrosion activity on a buried gas transmission pipeline. An analysis of the survey results and additional testing in the field determined a foreign operator was responsible for static DC interference on the pipeline. This paper is a case study for the testing, analysis, and design for the interference.

Key words: Protective Coatings, Corrosion Control (USE FOR: Corrosion Protection, Corrosion Effects, Corrosion Monitoring (USE FOR: Corrosion Measurement), Corrosion Tests

INTRODUCTION

EN Engineering (ENE) completed an AC interference study over 68 miles of an operator's transmission line. In addition, an ACFG survey of approximately one (1) mile of the pipeline was conducted at the take-off point of the 8" line. The first 5000' surveyed via ACFG can be seen in **Figure 1**.



Figure 1: Additional 5,000' segment surveyed

As a result of this AC interference study, evidence of elevated AC corrosion risk has not been found on the operator's pipeline. However, a review of the provided data shows evidence of DC interference due to a nearby foreign rectifier groundbed at the take-off point of the operator's line.

BACKGROUND

Previous annual test point surveys completed by the operator along the pipeline have shown AC potentials of up to 8 V_{AC}. These readings are located near powerline crossings. Mitigation measures were designed by a third-party and have been installed. These mitigation measures include galvanic anodes connected to the pipeline through solid-state decouplers (SSD). These locations can be seen in **Figure 2**.

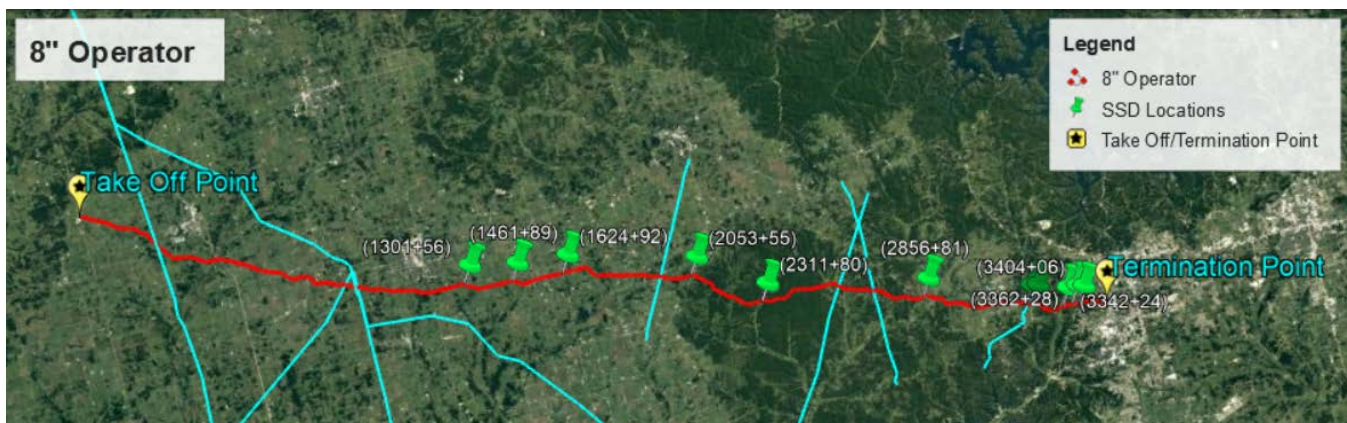


Figure 2: Solid-State Decoupler (SSD) locations and powerline crossing locations

Within operator's station at the take-off point of the 8" line, there are seven (7) foreign rectifiers with one (1) previously identified as influencing the operator's line. There are two (2) rectifiers which protect the foreign mainline; one (1) also protects the station piping. The groundbed for this rectifier was installed by HDD method as a conventional horizontal arrangement. It is located within 70-ft of the operator's pipeline. An aerial image of the foreign mainline, rectifier groundbed. An aerial image of the foreign mainline, rectifier groundbed, operator's line, and ILI metal loss locations can be seen in **Figure 3**.



Figure 3: Operator pipeline near take off showing metal loss areas

In June of 2019, an “ON” “OFF” Close Interval Survey (CIS) as well as a native potential (static) CIS survey was performed by a third-party. During the CIS, six (6) foreign rectifiers were turned off, and the one (1) identified as having influence was cycled. For the native survey, all foreign rectifiers and the operator’s rectifiers were powered off and the operator’s line was left to depolarize for two and a half weeks before the native survey commenced. Results of the 2019 ON/OFF survey for the 5000’ area of interest are shown in **Figure 4** and the native survey results are shown in **Figure 5**.

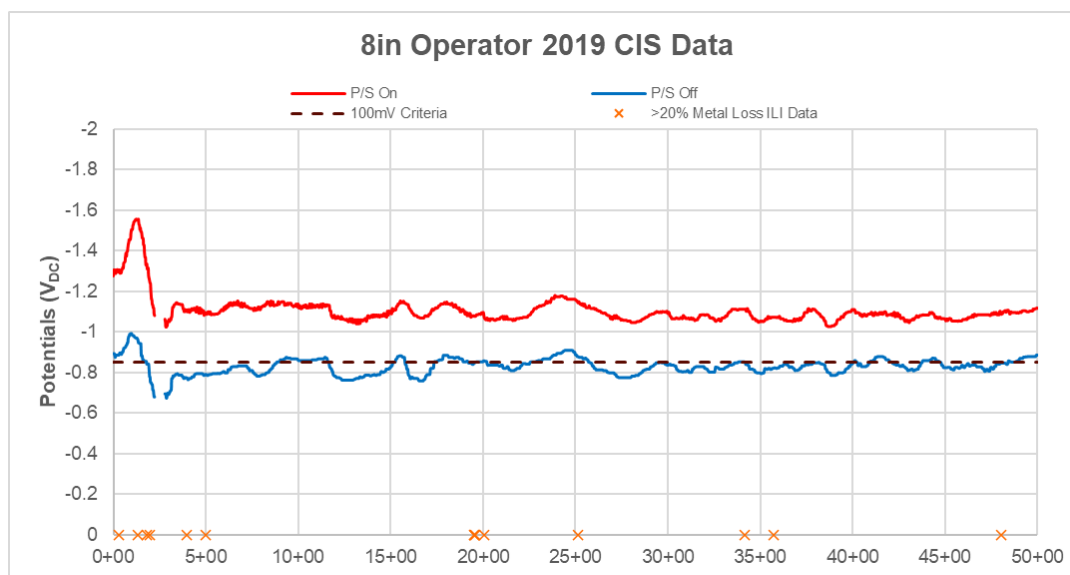


Figure 4: 5000’ area of interest from the ON/OFF 2019 CIS

The ON/OFF CIS plot shows the areas of ILI determined metal loss noted with “X” marks along with the “ON” and “OFF” potential reads. The “OFF” potentials dip below the -850mV requirement from stationing (0+00) to (20+00) and slowly move back into minimum requirement criteria beginning at stationing (20+00) to the end of the area at stationing (50+00). However, there are severely depressed areas noted at approximately (1+00), (37+50) and (45+00). These areas appear to have positive ON and OFF Readings.

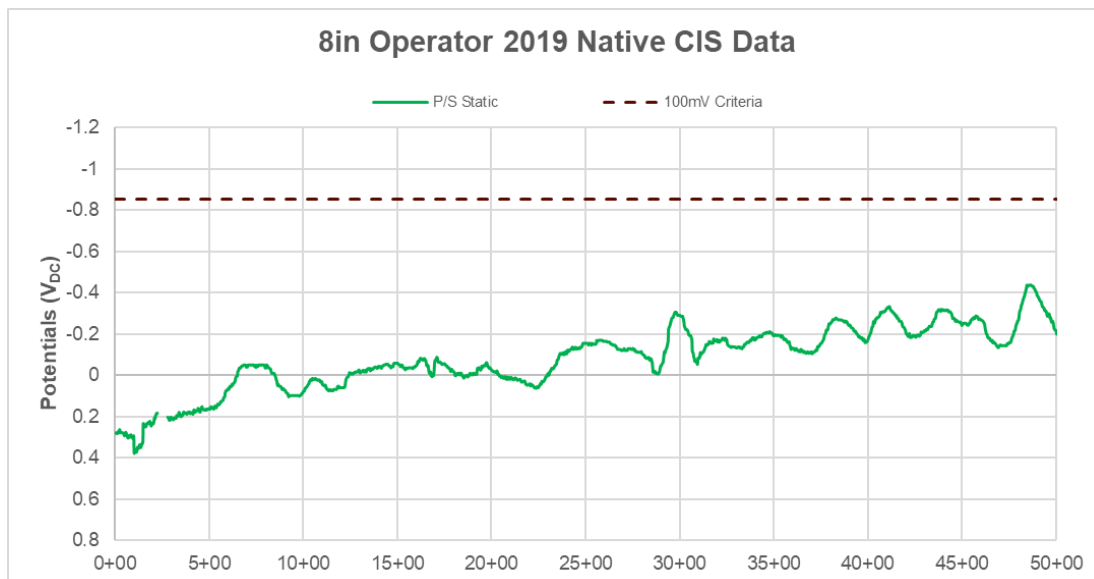


Figure 5: 5000' area of interest from the 2019 Native CIS

The native CIS graph shows the native potentials are positive from stationing (0+00) to (5+00) and slowly become more electronegative from stationing (5+00) to the end of the area of interest at stationing (50+00). From both the CIS and metal loss data provided, there is a strong suggestion of interference from the foreign operator; however, at the time, the cause was uncertain.

EXPERIMENTAL PROCEDURE

Data loggers measuring AC and DC potentials, were placed on the take off point of the pipeline in areas with the highest number of metal loss areas, foreign line crossings, and at powerline colocations. AC and DC current density and potential measurements were taken along the pipeline using a temporary AC coupon probe at various test stations. Soil resistivity measurements were taken in areas of foreign line crossings, powerline colocations, waterbody crossings, and areas where changes in topography occurred. Locations in which data loggers were placed, AC/DC current density and potential measurements were taken, and areas where soil resistivity was measured can be seen in **Figure 6**.

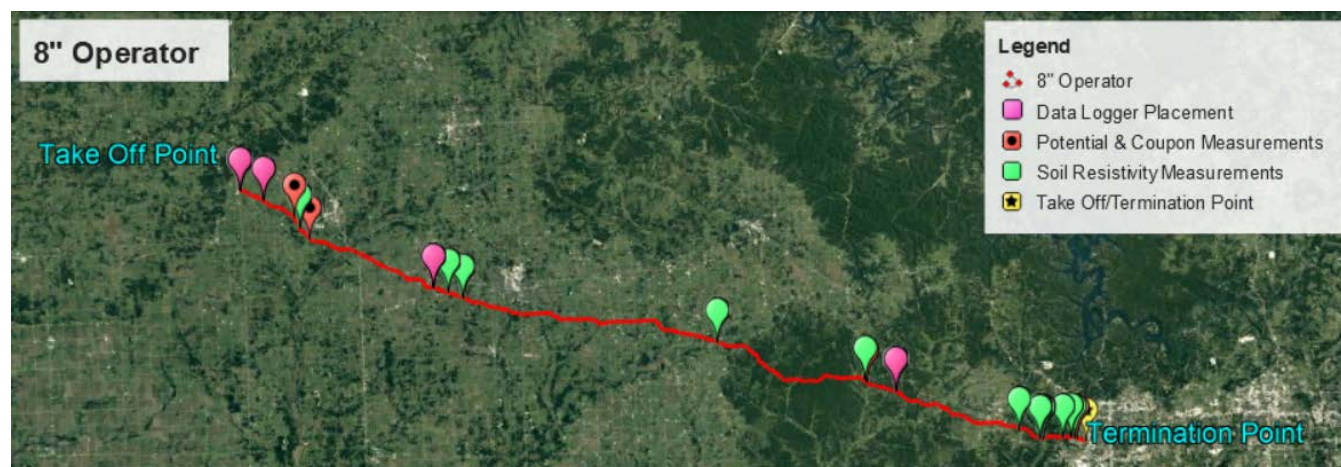


Figure 6: Field data measurement locations