2021 Award Nomination

Title of Innovation:
Watchdog Tracker CR Monitoring System

Nominee(s)
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Category:
(select one below)

Coatings and Linings	Instrumentation
Cathodic Protection	Testing
Materials Design	Modeling/Risk Assessment
Chemical Treatment	Other— Corrosion Management (Electrical Interference and Corrosion Rate Monitoring)

Dates of Innovation Development:
From July, 2018 to November, 2019

Web site: TrackerCR.com

Summary Description: The Tracker CR system consists of a multi-channel remote monitoring unit and a dedicated ground probe assembly. It is designed to continuously measure: DC pipe to soil potential, DC "coupon disconnect" off potential, free-corroding coupon potential, AC voltage potential, AC current density, DC current density, and AC drain to ground from mitigation equipment. All measurements are stored in internal memory and periodically (based on a user-defined schedule) measurements are sent to the web interface. Alarm conditions are sent to the web upon detection.

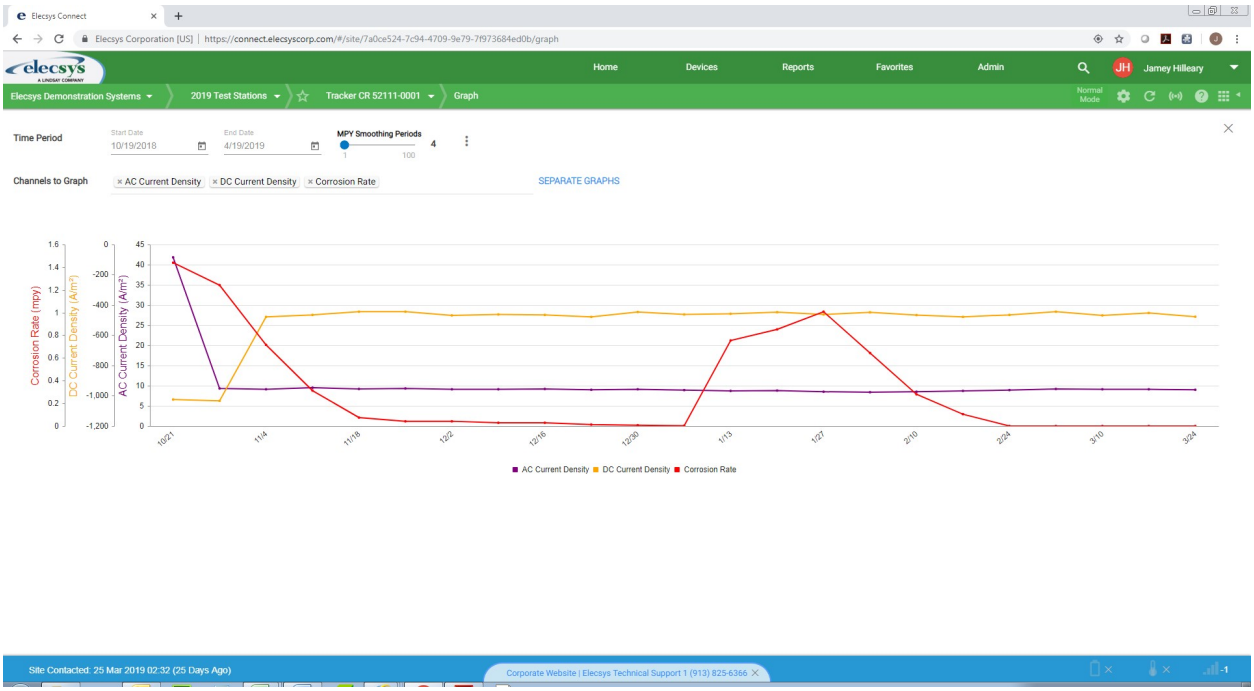
Full Description:

(Please provide complete answers to the questions below. Graphs, charts, and photos can be inserted to support the answers.)

1. **What is the innovation?**

   There are several innovations incorporated into this system. First, including all of the cathodic protection test station measurements (pipe to soil, etc.) with all the AC interference measurements (AC voltage, AC and DC current density, AC drain to ground) and corrosion rate measurement capabilities into a full-feature remote monitoring system. Second, the web-based user interface provides a one click "multi-graphing" tool, enabling the user to select any or all of the measured parameters to graph, overlaying using unique y-axis scaling (see below). Parameters can be easily selected and deselected for view and the data can be overlayed or displayed on individual graphs. Third, this is the first system to combine all of these measurements critical to ongoing evaluation of AC interference into a full-featured web-based remote monitoring system.

   Some of these capabilities have been available using data logging devices and earlier generation remote monitoring systems, but this is the first truly comprehensive turn-key system providing all of these capabilities.



2. How does the innovation work?

The custom-designed ground probe assembly is installed in the ground at pipe depth in the same manner as any "triple coupon test station" probe. The wiring from the probe assembly corresponds with input terminals on the monitoring unit which is installed at an above ground test station riser or post. The monitoring system includes input terminals for: the protected pipeline, a copper/copper sulfate reference electrode (included in the probe assembly), a 1cm² coupon (for AC density measurement), a 1in² "protected" coupon (for instant disconnect and DC density measurements), a second 1in² coupon for free-corroding coupon measurement, and a pair of inputs for measuring drain to ground using a CT coil, or to measure a metallic bond shunt if present. The monitoring system is configured to take measurements a user-set intervals ranging from once every 24 hours to once every 15 seconds. In a typical application the unit is set to take measurements hourly, forwarding data to the web weekly or when an alarm condition is detected. The data on the website can easily be viewed, graphed, compiled into reports, and combined with data from other sites, providing the user with the ability to perform deep-dive analysis into all of the interacting factors that may be contributing to corrosion risk in high voltage AC corridors. The system provides a comprehensive view of all risk parameters, enabling the user to continually evaluate and manage all of the risk factors.

3. Describe the corrosion problem or technological gap that sparked the development of the innovation. How does the innovation improve upon existing methods/technologies to address this corrosion problem or provide a new solution to bridge the technology gap?

Corrosion due to AC interference in areas where pipelines and high voltage power transmission lines are located in close proximity to one another is an issue that has emerged as one of the

top concerns in corrosion management. The science, and corresponding evaluation and mitigation practices have evolved over the past 15 to 20 years as this issue has come to the forefront. One of the "best practices" that is now codified in the NACE SP21424 AC Interference standard is frequently monitoring the critical values for an indeterminate period of time in order to validate the effectiveness of the mitigation efforts. Corrosion rate, along with AC and DC current density and AC voltage on the pipeline are the most critical components of this validation. The induced AC interference that is of concern regarding AC corrosion is subject to wide fluctuations in magnitude, requiring frequent and ongoing measurements to be taken. Some data-logging systems and remote monitoring systems developed over the years providing some of the critical data, but no system has combined all of the critical data, along with cathodic protection data and AC drain data and incorporated this expansive data set into a reliable, web-based monitoring system. The ability for the users within a pipeline organization to review, compare and analyze all of the factors contributing to AC corrosion risk on a single shared platform provides the organization with an unprecedented toolset for comprehensive validation and assurance of AC mitigation efforts. All of the data pertaining to the NACE standard plus additional relevant data pertaining to the effectiveness of the cathodic protection system and the mitigating system are provided continuously.

4. Has the innovation been tested in the laboratory or in the field? If so, please describe any tests or field demonstrations and the results that support the capability and feasibility of the innovation.

This system has undergone in house validation testing as well as several months of field testing beginning in September of 2019 and ongoing.

5. How can the innovation be incorporated into existing corrosion prevention and control activities and how does it benefit the industry/industries it serves (i.e., does it provide a cost and/or time savings; improve an inspection, testing, or data collection process; help to extend the service life of assets or corrosion-control systems, etc.)?

This innovation eliminates the need for frequent site visits to obtain measurements and consolidates all of the critical measurements into a single system. It provides a comprehensive, perpetual validation of the cathodic protection system and AC mitigation system effectiveness at every monitored location. It provides the operator with all of the data required for compliance to the NACE SP21424 standard as well as additional data indicative of sufficient corrosion control at affected sites.

6. Is the innovation commercially available? If yes, how long has it been utilized? If not, what is the next step in making the innovation commercially available? What are the challenges, if any, that may affect further development or use of this innovation and how could they be overcome?

The system has been available for widespread commercial use since the spring of 2020. It was

originally planned for commercial launching at Corrosion 2020 and the marketing plan required revision following the cancellation of that event. The system is currently operating on several transmission and distribution pipeline systems and demand is steadily increasing. At the present time no system enhancements or modifications are anticipated.

7. Are there any patents related to this work? If yes, please provide the patent title, number, and inventor.

There are no patents associated with the new technology incorporated in this system.