Pipeline Watchdog

PIPELINE WATCHDOG REMOTE MONITORING SYSTEMS

Proactive AC Mitigation Monitoring Increases Safety and Pipeline Integrity

Watchdog P2S-AC Remote Monitor

"The Watchdog P2S-AC is an integral part of our AC mitigation solution. The ability to detect failures and continually measure voltage and current fluctuations is an essential part of our overall pipeline integrity strategy."

- Senior Corrosion Specialist with a major pipeline

In recent years the use of high performance fusion bond coatings has become widespread in the pipeline industry. These coatings provide pipelines with excellent isolative characteristics, but when pipelines are co-located along high voltage AC transmission corridors, the high dielectric effect of these coatings can result in dangerous AC voltages induced onto the pipeline. This induced voltage creates a safety hazard to operating personnel and the general public. Induced AC voltage is also known to cause corrosion when the AC current density on a buried pipeline exceeds 100A/m². To address these effects, AC mitigation grounding systems are typically installed to lower induced AC voltage to safe levels, and to ensure that AC current densities do not exceed the levels at which corrosion can occur. Over time, however, numerous conditions may change that could negatively impact the performance of the mitigation system including significant fluctuations in AC voltage levels due to daily and seasonal changes in electrical load, cable disconnection, soil conditions, ground faults, and failure of the systems.

Problem

Using Elecsys Pipeline Watchdog remote monitors, a major pipeline company has been continously verifying the operation of AC mitigation systems on pipelines throughout the Chicago, IL region for several years. While troubleshooting erratic readings at some of the test stations, it was discovered that the AC mitigation on the pipeline had failed and that excessive AC voltage was affecting the measurements at the stations. In addition, there was growing concern about corrosion due to AC current density levels.

Solution

To resolve the issue, the pipeline company requested that Elecsys add the capability to measure induced AC voltage to the remote monitoring equipment in the field.

Test sites were set up in locations known to have excessive induced AC voltage levels. Mitigation systems were already in place at the sites selected, and induced voltage levels were reduced to below 15 volts AC. The Elecsys P2S-AC monitoring/data-logger systems were installed along with dual coupon test stations to measure induced AC voltage potential and AC current density. Typical test point measurements, including DC coupon to soil potential, instant off potential, and native coupon potential were also measured. The monitoring systems were configured to log all test site values at one minute intervals. Data was stored on 2GB cards inside the devices. Every three hours readings were transmitted via GSM cellular telemetry to the secure Pipeline Watchdog web site. Additionally, any out-of-range alarm readings were transmitted to the website for immediate notification to the pipeline technician. The pipeline company requires mitigation to be below the NACE (National Association of Corrosion Engineers)15 volts safe touch standard, and AC current density below 20A/m². Using the graphing tool on the website, the technician was able to verify over time whether the mitigation was consistently reducing the AC voltage and current to acceptable levels.

To test a mitigation failure, the system was disconnected at one site location for a two day period. The graphs in Figures 1 and 2 are screen shots from the Pipeline Watchdog one-click graphing tool. These graphs clearly show the changes in induced voltage and current

elecsys corporation

Elecsys Corporation
846 N. Mart-Way Ct.
Olathe, KS 66061
United States
913.888.5222
sales@watchdogcp.com
www.elecsyscorp.com

Proactive AC Mitigation Monitoring Increases Safety and Pipeline Integrity, cont.

density resulting from this failure simulation. Of particular note is the daily fluctuation seen in the readings.

The unmitigated voltage readings shown in Figure 2 were often below the safe touch standard of 15 volts during the test period, yet were also frequently in the danger zone. Periodic measurements by field technicians, depending on the time of day made, may fail to detect frequent unsafe conditions. Additionally, AC current densities displayed in Figure 1 remained above the desired maximum level of 20A/m² even when the induced voltage level was in the safe range.

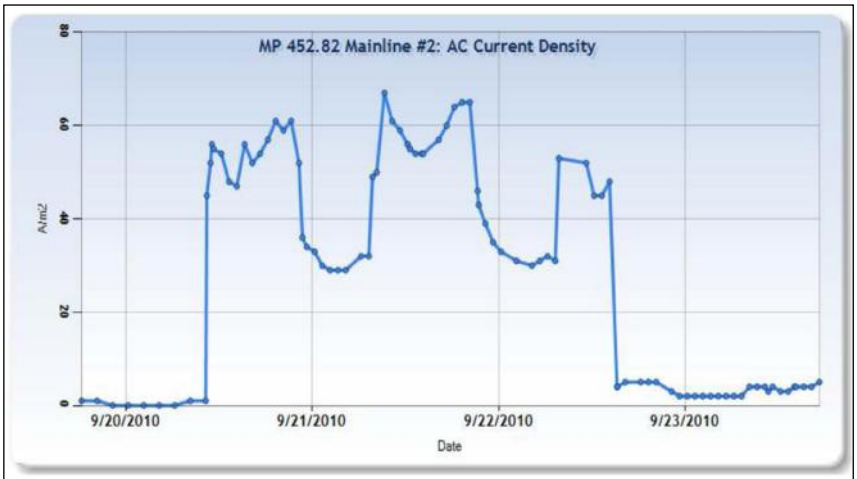

Figure 1. AC corrosion current level changes associated with disconnection of the AC mitigation system

Figure 2. Induced AC voltage level changes associated with disconnection of the AC mitigation system

Conclusions

A wide range of variables affect the AC voltage and current levels on pipelines co-located with high voltage transmission lines. This combined with the occasional failure of AC mitigation systems present significant challenges to the pipeline operator. The continual monitoring of induced AC voltage potential and AC corrosion current density in this field study provided an accurate view of the AC mitigation system effectiveness. Immediate notification of out-of-normal values provided the pipeline operator with the necessary information to respond quickly to system anomalies. The perpetual data record allows the operator to review and graph data to identify trends over time. The capability of the system to store all readings in memory for retrieval over the web gives the pipeline technician a complete profile of the induced AC at test locations. Data trends are easily produced so proactive responses to changes can be planned and instituted. Continual potentials and AC corrosion current density monitoring of both induced AC voltage should be an integral part of any comprehensive AC mitigation system design.

To learn more about the Elecsys Pipeline Watchdog P2S-AC Remote Monitoring System or other remote monitoring devices, contact us at 913-888-5222 or visit us on line at www.elecsyscorp.com.