

## TECHNICAL BULLETIN ZR-01

### CONCERNS WITH ZINC RIBBON FOR AC MITIGATION

- 1) Formation of passive films on the surface of the zinc can cause a significant electropositive shift in the zinc potential over a period of time; this generally occurs over a period of days or weeks. The general rule of thumb is that the concentration of chlorides and sulfates must be measurably greater than the sum of the concentrations of bicarbonates, carbonates, nitrates and phosphates; otherwise with time the zinc corrosion potential will shift electropositive. Plattline's Web site notes that zinc ribbon is "generally used with gypsum backfill"; however, too often for AC Mitigation applications, no consideration is given to placing the zinc ribbon in a specially prepared backfill (this should be general practice).
- 2) Zinc faces high consumption/corrosion rates in the presence of AC. A.W. Peabody has noted that AC can "create an especially high corrosion rate with buried aluminum, magnesium and zinc". Testing of zinc electrodes at an AC Current density of 155 A/m<sup>2</sup> found a 15-20 fold increase in the consumption rate of zinc. R.A. Gummow, a corrosion engineer and a NACE International accredited Corrosion Specialist, notes that "accelerated corrosion of zinc ribbon AC mitigation facilities must be expected and needs to be accounted for in the cathodic protection design despite the lack of information on the magnitude of the accelerating effect".
- 3) The effect on existing impressed current CP systems: the use of zinc anodes directly connected to the pipeline for AC mitigation can interfere with existing impressed current CP systems in a way that is both difficult to model and to predict. In some cases, the zinc anodes can become an additional load, particularly if the zinc is not located in a prepared backfill and has shifted to a more electropositive potential. In other cases, the zinc anode may be providing and/or supplementing galvanic current to the CP system in which case it will be consumed over time – note that the presence of AC often increases significantly the consumption rate. This could result in premature consumption of the zinc ribbon as an AC Mitigation system.
- 4) The effect of the zinc ribbon on potential surveys when directly connected to the pipeline can be erratic and difficult to interpret, rendering these surveys inconclusive or invalid. Given the emphasis on integrity management and the additional risks posed by AC Induced Corrosion in collocated right-of-way (ROW) corridors, the negative impact that the zinc ribbon might have on survey data could make CIS surveys invalid and increase the need for and frequency of Inline Inspections (ILI).