APPLICATION NOTE - INDUSTRIAL

PIPELINE CATHODIC PROTECTION

APPLICATION BACKGROUND

Cathodic protection has been known about and applied to metal structures since last century.

Cathodic protection is a method for protecting metal structures from corrosion by making the structure, that needs protection, the "cathode" of an electrochemical cell. This can be achieved in two ways:

Passive Galvanic Cathodic Protection involves connecting a metal structure to a more electropositive "sacrificial" metal. Sacrificial metal acts as an anode of an electrochemical cell and corrodes instead of protected metal. Selection of "sacrificial material" will depend on the type of material that we are trying to protect. This method doesn't require outside power source since materials themselves cause current to flow. The sacrificial material will eventually become totally corroded and will need replacement as the structure ages.

Small vessels use this approach to protect propellers from corrosion.

For larger structures like pipelines, the galvanic anode can't deliver enough current to provide full protection so an additional current from an alternative source is needed to keep "electrochemical cell" process going. Impressed Current Cathodic Protection (ICCP) systems consist of anodes that are connected to a DC power source that provides a permanent source of electrical flow. ICCP systems constantly monitor the electrical potential at the pipe to soil interface and carefully adjusts the output to the anodes in relation to this. Therefore, the system is much more effective and reliable than the sacrificial anode systems where the level of protection is uncontrollable.

APPLICATION DETAIL

Many oil and gas pipelines traverse very remote regions and there is a need to make sure the cathodic protection systems remain in operation to maintain pipeline integrity. These systems typically have rectifier stations at various points along the pipeline which take primary alternating current power, perhaps from a local power supply of a local generator, and rectify it to provide a low voltage and high current to apply to an anode buried in the ground.

Through this method the pipeline is protected from corrosion, however there is a need to monitor the performance of these systems as follows:

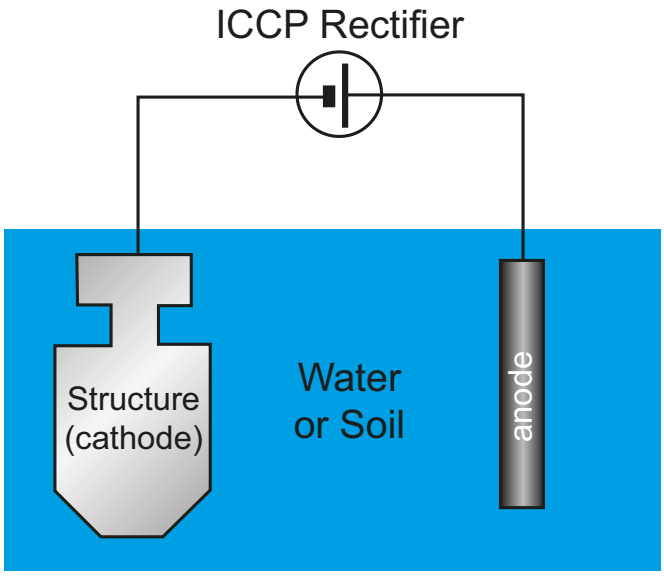
- the rectifier station status needs to be monitored, to ensure the voltage and current applied is correct
- the pipeline / structure needs to be monitored at many points to ensure the small potential is correct along the pipeline to the next rectifier station

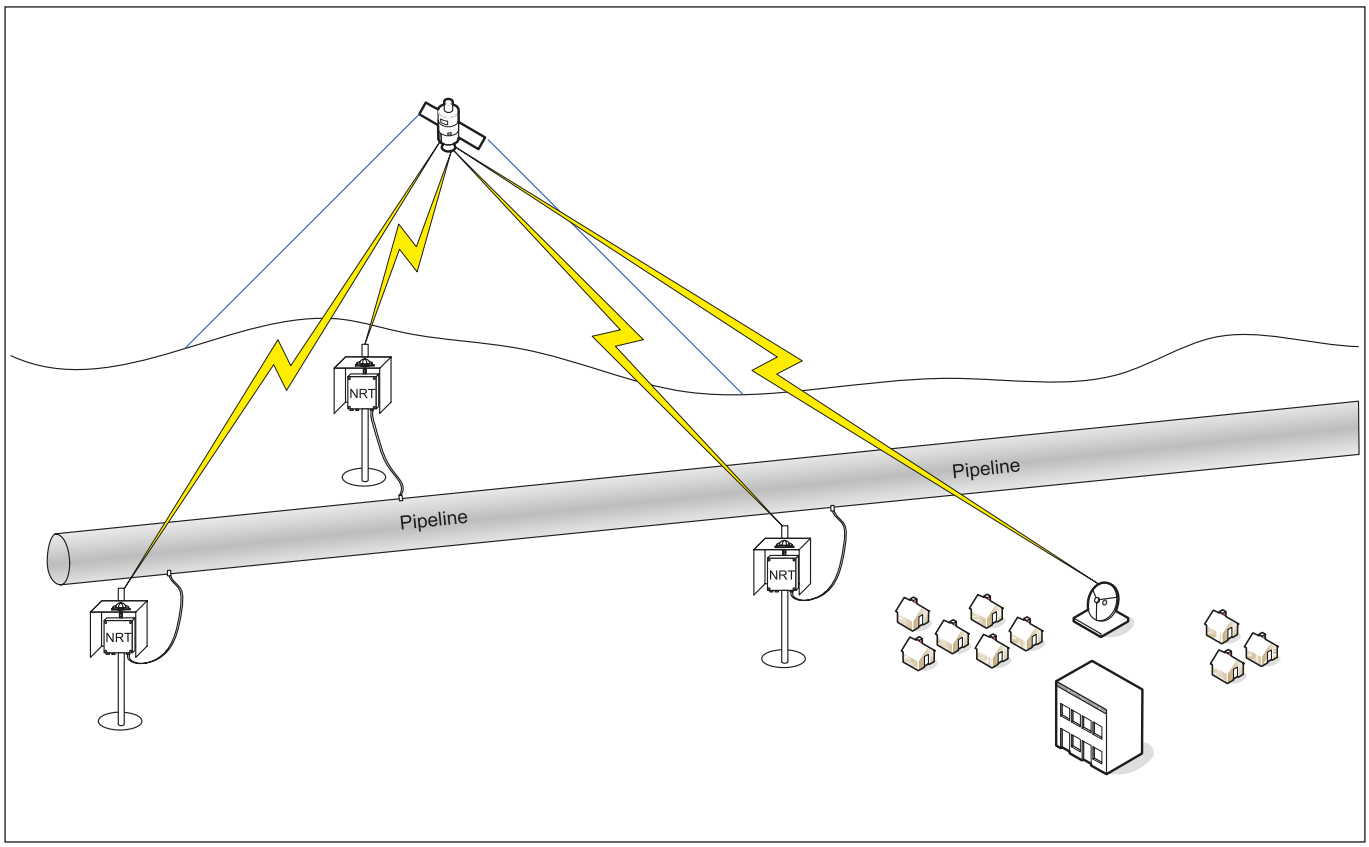
The rectifier station may have a small RTU with a Modbus interface to allow it to be controlled and monitored by a central SCADA system. The Rectifier system might have additional sensors, analog or digital, for monitoring the status of the rectifier.

This is a common approach when the power supply and communication infrastructure are readily available.

For the rectifier station a Neon Remote Logger can monitor either Modbus channels and / or individual analog and digital inputs and outputs. There may be a need to make adjustments to the applied voltage / current and these can be enabled to be remotely managed.

This system would typically be housed in a metal enclosure with a solar recharge system acting as a power supply. The Solar power system consists of a rechargeable lead acid sealed battery, a solar panel and a solar controller. Solar power systems should be properly rated for the instruments used and as such will provide long-term power solutions.





Telemetry would be needed to provide the rectifier station status in real time and possible control from the pipeline operations centre. This could be cell phone based or satellite modem based, more likely satellite based as the pipeline is likely to traverse very remote areas. Perhaps the rectifier station would need to communicate with the central Neon Server every 15 minutes to communicate readings to be displayed on a Central Neon Server and also report out status to a central pipeline SCADA or other management system.

The other parameters along the pipeline also need to be measured, and this can be a very simple occasional measurement of a very low voltage level of the pipeline structure when compared to earth.

The cathode protection telemetry systems can be very power hungry. Unidata can build large skids that can house the CP unit, Telemetry Inmarsat Satellite unit as well as large solar panels (4 x 205W) and securely store high capacity reachable batteries (12 x 2V 915Ah).

Telemetry would be needed to provide the occasional voltage readings from the measurement points, but quite infrequently, perhaps read the voltage hourly, store it locally, and then transmit the data to the central neon server daily, to minimise the power consumption and satellite airtime charges.

TYPICAL CONFIGURATION

APPLICATION SPECIFIC INSTRUMENTS / INPUTS

Options	Unidata Part Number	Description
Low Voltage Sensors	Custom Part	Low Voltage Sensors

NEON TELEMETRY - NRL / RTU / FIELD UNITS

Options	Unidata Part Number	Description
Ethernet	3016A-000 / 3008A-000	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Ethernet & 3G / 4G	3016A-C00 / 3008A-C00	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Ethernet & 3G / 4G and LoRa	3016A-CL0 / 3008A-CL0	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Equatorial Orbit Satellite - Inmarsat	3016A-00I / 3008A-00I	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Equatorial Orbit Satellite - Inmarsat & 3G / 4G	3016A-C0I / 3008A-C0I	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Low Earth Orbit Satellite - Globalstar	3016A-00G / 3008A-00G	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Satellite - Iridium Short Burst Data	3016A-00R / 3008A-00R	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Standalone RTU / NRL - Industrial	3004A-00 / 3004A-0L	Neon Remote Logger-4 Analog Ch with or without Touch Screen Display
Cellular RTU / NRL 3G / 4G - Industrial	3004AC0 / 3004A-CL	Neon Remote Logger-4 Analog Ch with or without Touch Screen Display
M – Series Standalone RTU / NRL	3004B-M000 / 3004B-M0B0	Neon Remote Logger-4 Analog Ch with or without Li Battery
M – Series Cellular RTU / NRL 3G / 4G	3004B-MC00 / 3004B-MCB0	Neon Remote Logger-4 Analog Ch with or without Li Battery
M – Series LoRa RTU / NRL	3004B-ML00 / 3004B-MLB0	Neon Remote Logger-4 Analog Ch with or without Li Battery
M – Series Ethernet RTU / NRL	3004B-MEBL	Neon Remote Logger-4 Analog Ch, Li Battery & LCD are optional
M – Series Microsatellite RTU / NRL	3004B-MHBL	Neon Remote Logger-4 Analog Ch, Li Battery & LCD are optional
M – Series Iridium Short Burst Data RTU / NRL	3004B-MIBL	Neon Remote Logger-4 Analog Ch, Li Battery & LCD are optional

NEON APPLICATION SOFTWARE - CUSTOMER SERVER

Options	Unidata Part Number	Description
Neon Applications Software	2302A	Neon Server Software Licence Incl 5 NAL
Neon Applications Software	2302A-10	Additional 10 NRT Access Licence
Neon Applications Software	2302A-20	Additional 20 NRT Access Licence
Neon Applications Software	2302A-50	Additional 50 NRT Access Licence

NEON HOSTING SERVICE - UNIDATA SERVER

Options	Unidata Part Number	Description
Neon Hosting Service	2301A	Neon Data Initial Subscription Setup Fee
Neon Hosting Service	2301A-01	Neon Data Service Fee for 1-50 NRT
Neon Hosting Service	2301A-02	Neon Data Service Fee for 51-100 NRT
Neon Hosting Service	2301A-10	Neon Data Service Fee Metering

DATALOGGER MANAGEMENT SOFTWARE

Options	Unidata Part Number	Description
Starlog V4 Management Software	6308A-AUE	STARLOG V4 Full Licence Key