



KONGSBERG

Inspection of cathodic protection systems



LISTEN sensor system

A working CP-system along a pipeline generates electric currents in the seawater. An electric current is flowing out from each anode and returns into the structure at dedicated drain points or at places where the pipeline coating has been removed or damaged into bare metal. The CP-system works as a galvanic element where the electric current in the seawater generates an electric field.

An AUV equipped with the Listen electrode sensor system continuously measures the 3D electric field at a height of 5-10 m above the pipeline at a speed of 3-4 knots. Anode output currents and material consumption rates are calculated from the measured electric field data as well as currents back into the pipeline discovering coating deficiencies.

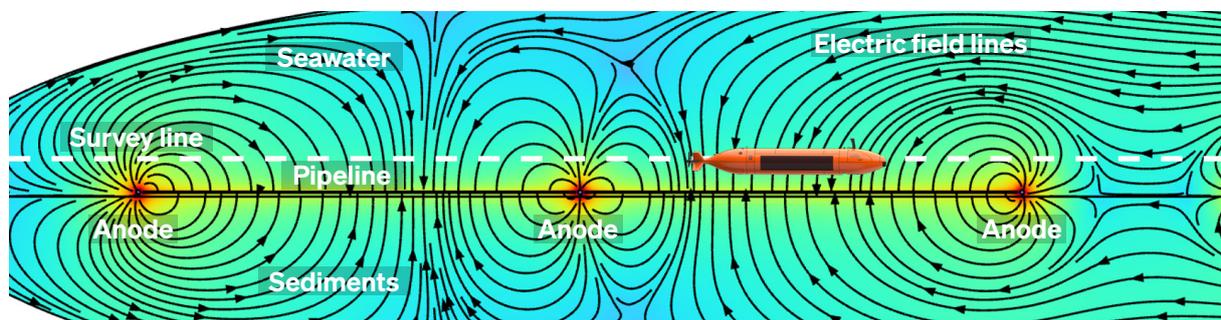
- ✓ **Up to 150 km** per day of high productivity inspection
- ✓ **3-3.5 knots** survey speed
- ✓ **Near real-time** data analysis during field operations

SHORTER TIME TO HIGH QUALITY RESULTS

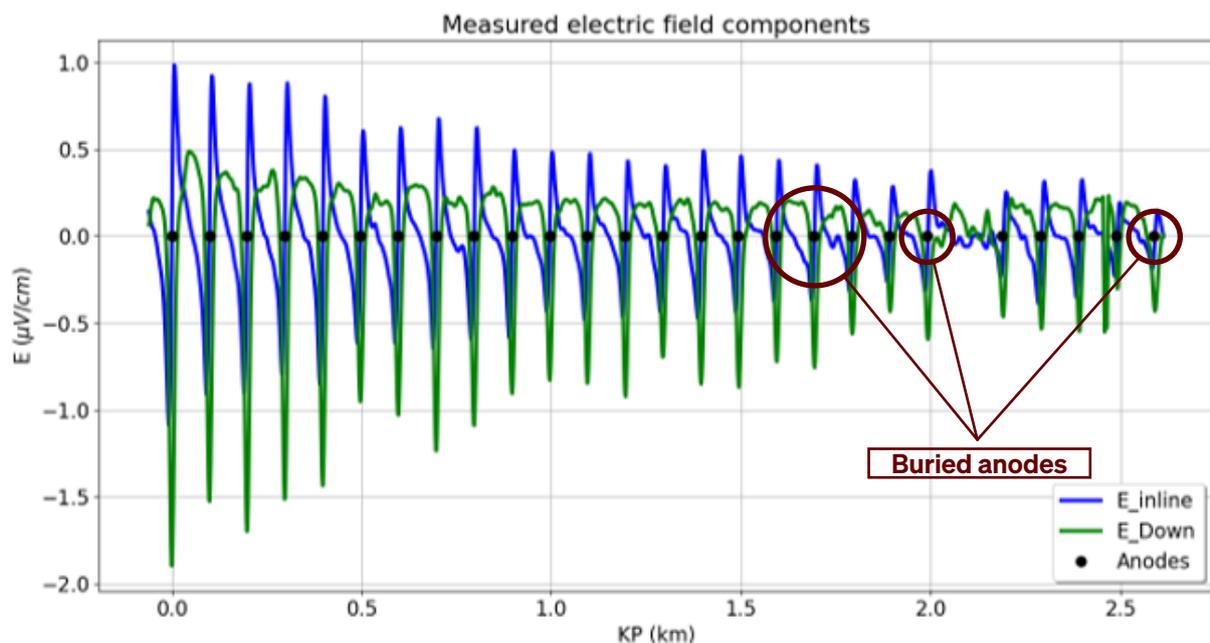
- Efficient inspection of pipelines, both buried and on seafloor
- Rapid estimation of cathodic protection status and remaining lifetime
- Simultaneous data acquisition with other sensors
- Complete characterisation through integration of all sensor data
- Faster project turnaround providing safer operations with lower HSE risk
- Accurate and high-quality data with low noise levels
- The system is modular and can be installed on a variety of underwater platforms

Cathodic Protection inspection workflow

- Run the AUV at 3-4 knots at height of 5-10 m above the pipeline or similar construction
- Continuous measurement of the electric and magnetic fields in the seawater caused by the CP system (Construction with Cp-system can be buried)
- Create a mathematical (computer) model of the Cathodic Protection system including the Listen measurement configuration
- Continuous calculation of anode and return electric currents and potential along the construction using the mathematical model
- Continuous fault detection and analysis of the status of the CP-system condition regarding performance and aging including estimation of anode material consumption rate using Faraday's law
- Integrate with camera data if available as well as with other information such MBES data

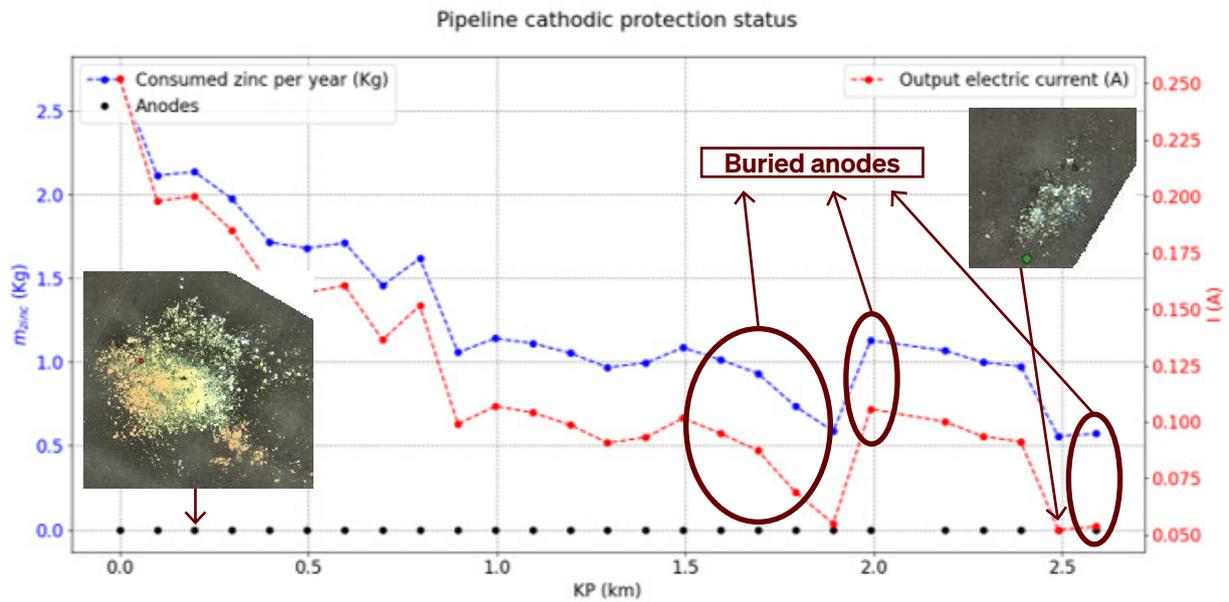


Example of measurements along a pipeline

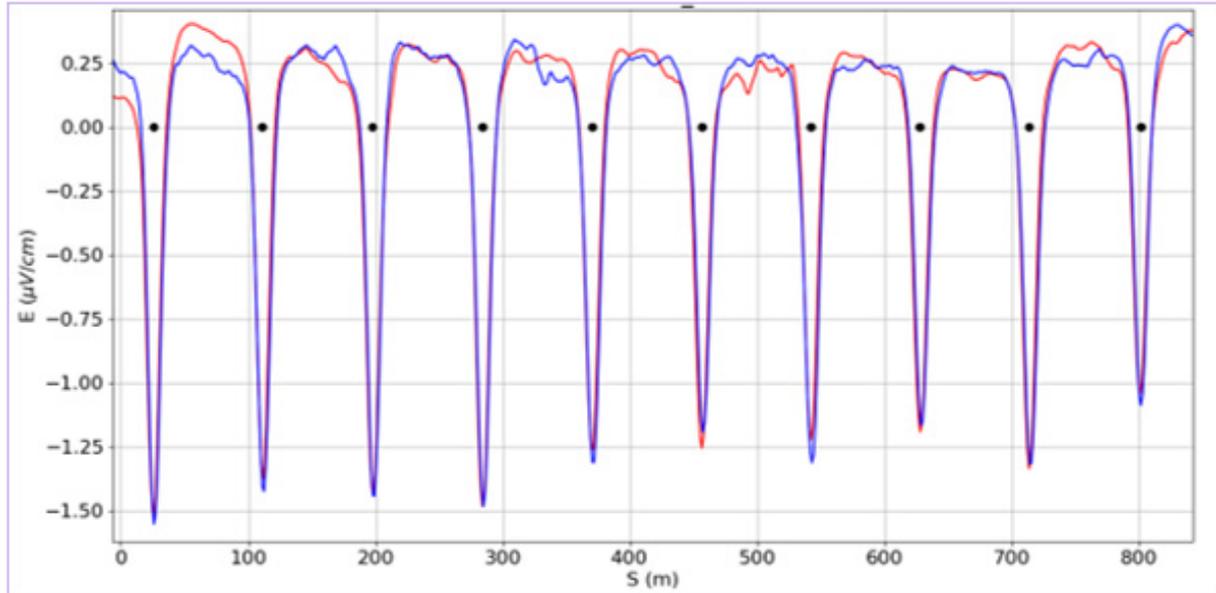


Analysis

- Estimated anode output currents from electric field data
- Good correlation between estimated material consumption and camera images



Repeatability



- Good repeatability when surveying a pipeline multiple times
- High signal to noise ratio