

# Incomplete cathodic protection of water pipelines in soil

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## **Abstract**

The influence of galvanic sacrificial anodes on the corrosion rate of cast iron and carbon steel water pipes has been evaluated in order to determine what potentials are needed to mitigate local corrosion that leads to leakage. A field study on galvanic anodes in use to protect pipelines was conducted. A laboratory setup was used to determine the relation between potential and corrosion rate for a clay type soil and a sand type soil.

During the field study, pipe to soil potentials were measured and it was concluded that the galvanic anodes decrease the potential of the pipe but not to the level of complete cathodic protection. The protection levels achieved are considered enough since leakages have been stopped. After the laboratory study it was concluded that the clay type soil is more corrosive than the sandy soil. A more negative potential of 40 mV to 60 mV is needed to reduce the corrosion rate in clay to the same as in sand. A negative polarization of about 100 mV lowers the corrosion rate by one order of magnitude for both the clay and sand type soils.

The leakages have been stopped where galvanic anodes were installed but the polarization potentials are not considered as complete cathodic protection. From this it can be concluded that the polarization from galvanic anodes have a large effect in mitigating local corrosion on water pipes in soil.