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## Geomagnetic Effects on Pipelines

### Introduction

Pipelines are used widely to transport gas, oil and water from their sources to processing plants and consumers. Damage to a pipeline is very costly; not only the replacement cost of the pipeline itself must be considered, but also the potential damage to the environment and the threat to people's lives.



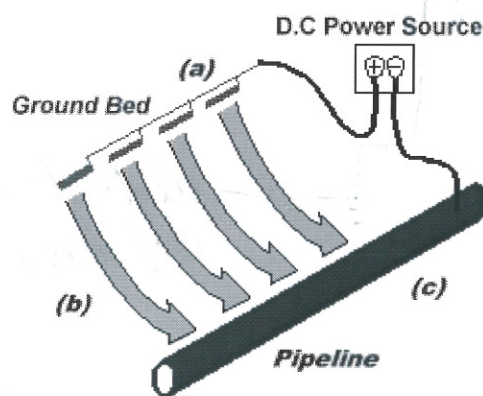
**Pipelines**

To carry large amounts of liquid or gas underground or under the sea (from off-shore oil fields) or even on the surface, pipelines are built from steel to be able to withstand the pressure. Therefore, damage to pipelines can come not only

from physical cracking, but from corrosion of the pipeline steel. To prevent corrosion, the pipeline steel is covered with an isolating coating and connected to special devices, called cathodic protection rectifiers.

### Corrosion Protection

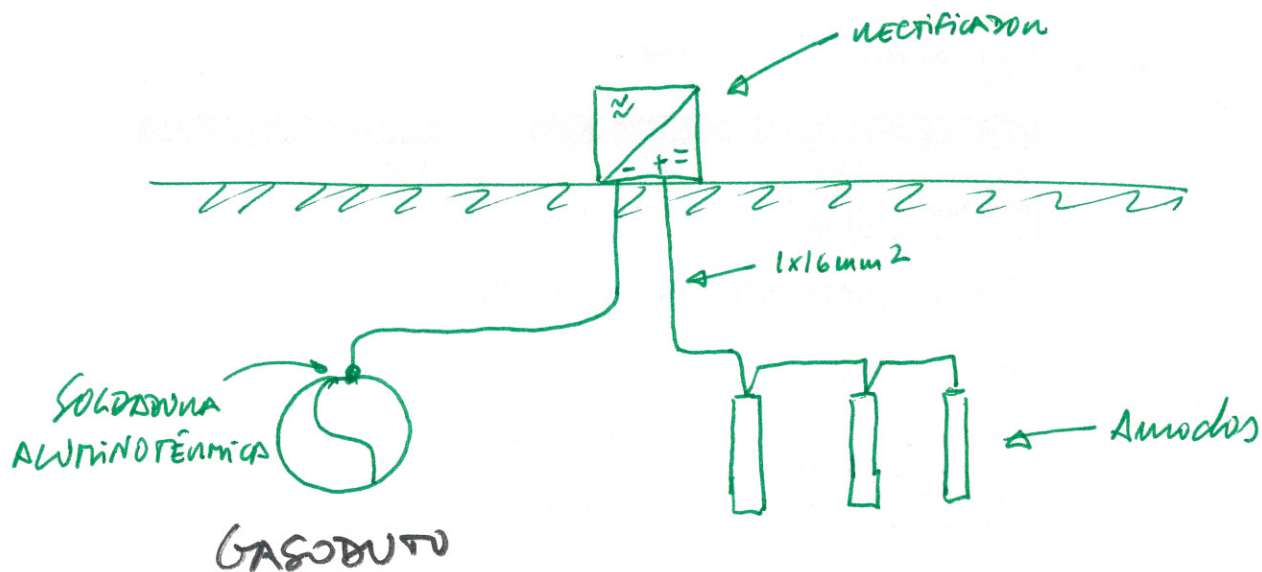
Through tiny holes in the pipeline coating, not detected by pipeline surveys because the pipeline are usually buried or placed under the water, the pipeline steel may come into contact with the soil, water or moist air and be subject to corrosion.



This electrochemical reaction can be inhibited by maintaining the pipeline steel negative (cathode) with respect to the surrounding soil (anode). It can be done by connecting the negative output of a DC power supply to the pipeline and the positive output to the anode devices placed in the soil (a) so that electric currents flow from the anode to the pipeline (b). In this arrangement the pipeline is the cathode of the circuit (c); that is why this method is called

"cathodic protection". The protection system keeps the pipeline potential with respect to the soil in a safe region from -0.85V to -1.35V.[\[top\]](#)

### How Geomagnetic Variations Affect Pipelines



Chave de medição: medição da tensão relativa ao eletrodo

