

Depolarisation phenomena in soils: remanence of protection after interruption of cathodic protection.

C. *ROGIER*^{a)}, A. *FAKHRY*^{a)}, E. *FLEURY*^{a)}, F. *CASTILLON*^{b)}, L. *HENRY*^{c)}, D. *SELLAM*^{d)}, Y. *ZANNIER*^{e)}

a) GRTgaz, Research & Innovation Center for Energy (RICE), Villeneuve-la-Garenne, France, clemence.rogier@grtgaz.com, ahmed.fakhry@grtgaz.com and elisabeth.fleury@grtgaz.com

b) TEREKA, Technical Department, Pau, France, francois.castillon@tereka.fr

c) GRDF, Technical Department, Paris, France, laurent.henry@grdf.com

d) GRTgaz, Technical Department, Compiègne, France, david.sellam@grtgaz.com

e) Storengy, Technical Department, Bois-Colombes, France, yves.zannier@storengy.com

Cathodic protection conveys an active protection against corrosion to pipeline steel surface in case of coating defect. Operators can be confronted to cathodic protection interruptions leaving the steel surface exposed to corrosion and without active protection during a certain amount of time. This work studies depolarisation phenomena that occurs after cathodic protection interruption. The term “depolarisation” refers to the pipes returning to its free potential value after cessation of cathodic protection. Here we present a laboratory study in soils which shows that shortly after cathodic protection interruption the free potential value of the metallic steel coupon doesn't return to initial free potential value. A higher free potential value than before cathodic protection application is measured for a long period of time. This effect can be attributed to the formation of a passivation layer at the metallic surface due to pH increase during cathodic protection application. This passive layer confers a remanence to the protection against corrosion of the metallic surface after cessation of cathodic protection. After a certain amount of time a sudden drop of free potential value is observed. This phenomenon can be attributed to the damage of the passivation layer explaining the end of the remanence of protection and localized corrosion initiation. This study focuses on understanding this depolarization behaviour depending on various parameters: level of cathodic protection, time duration of uninterrupted cathodic protection, composition of the soil media and successive cathodic protection interruptions. The objective is to give insight to pipeline operators as to the safety of cathodic protection interruptions on the network depending on environmental conditions.

Keywords : cathodic protection, depolarisation, pipelines, corrosion