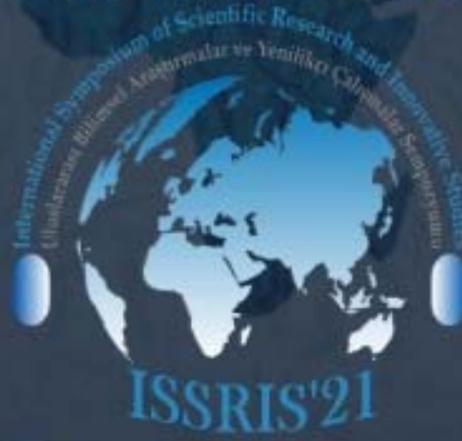




Uluslararası Bilimsel Araştırmalar ve Yenilikçi Çalışmalar Sempozyumu

International Symposium of Scientific Research and Innovative Studies



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ELECTRONIC POWER SYSTEM FOR THE DYNAMIC CORROSION CONTROL

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ABSTRACT

Introduction: Corrosion is currently a worldwide source of economic, material, environmental damage and in the worst case, even human loss due to corrosion in infrastructure. To combat it there are a variety of techniques and treatments, but even applying them in their strictest form, sooner or later, the phenomenon cannot be avoided. Cathodic protection is a technique used to control the corrosion of a metal surface by making it the cathode of an electrochemical cell. Impressed current cathodic protection systems consist of anodes that are connected to a power source that provides a perpetual source of electrical flow. This method can often provide much longer protection than a sacrificial anode, as the anode is supplied by an unlimited power source.

Purpose: The objective is the study, design and elaboration of the prototype, continuing a preliminary study called "Study of the protection against corrosion of a metallic structure" in order to introduce modifications and improvements to the prototype to allow to overcome corrosion in metallic structures.

Experimental: Therefore it is proposed a prototype based on cathodic protection is proposed, since it is defined as the method to reduce or eliminate the corrosion of a metal. To do this, the surface must be made to function as a cathode when it is in an electrolyte, that is, a medium, whether aquatic, atmospheric or terrestrial. This is done by impressed current cathodic protection. Continuing with an already open line of research, design of a prototype starting from a DC - DC Buck - Boost converter to which a closed loop power system is incorporated, thus allowing control of the printing current and the relative humidity of the environment through of a voltage and humidity sensor, respectively.

For the characterization and viability of the prototype, different tests are carried out, among them, it tested in a salt spray chamber using steel specimens to test for corrosion by generation of an adverse environment in an accelerated manner.

Results and discussion: The conditions of the test, suppose an extreme reproduction to which any structure could face against the corrosion, the commutation between the values of intensity of polarization and maintenance can take a second plane, reason why all the attention was focused on the verification whether the current protection technique printed with the values calculated on the bias current during this line of research were capable of correctly protecting. When conducting the test using the impressed current technique, it was done with a zinc anode, a material that is not recommended for this type of protection due to its rapid consumption, which is why it has been changed in the current study for the installation of platinum anodes. The specific details of how structures are constructed can also add to the complexity — and therefore cost — of cathodic protection. In addition to this cost, the system also requires routine maintenance, including periodic visual inspection. In the case of impressed current cathodic protection there is also the ongoing cost of electricity. Sacrificial anodes in particular have a limited amount of current available, are subject to rapid corrosion, and therefore have a limited lifespan.

Conclusions: In conclusion, the design proposed for the device has flaws, so it would represent a new line of research open to optimization. Regarding the tests carried out in a saline mist chamber, they proved that a greater resistance to corrosion is achieved than that obtained with the control specimen, so that different ways of applying it could be analyzed. At the same time, it is interesting to continue with the use of the new tests on the cathodic protection technique by impressed current.

Keywords: *Corrosion, Cathodic Protection, Prototype*