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EFFICIENCY AND COST ANALYSIS OF POWER SOURCES IN IMPRESSED CURRENT CATHODIC PROTECTION SYSTEM FOR CORROSION PREVENTION IN BURIED PIPELINES

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Abstract
Corrosion is the physical deterioration of metals, including buried metal structures and gas pipelines, resulting from chemical reactions between metals and the surrounding environment. Cathodic protection of these underground metals structures & pipelines can be achieved either by Impressed Current method or by sacrificial anodes method. This research paper focuses on the corrosion prevention of buried metal structures in general and gas pipelines in particular, by the novel method of Impressed Current Cathodic Protection (ICCP) which uses electrical current by an external DC power source for its operation. Three major DC power sources that is, Transformer Rectifier, Thermoelectric Generator and the Solar System are selected for this purpose and are projected over a period of time in a pre-designed ICCP for high transmission underground gas pipeline in Baluchistan, a province of Pakistan. The efficiencies of these three power sources are then analyzed and compared according to the climate effects, the versatility effects, the intensity of power output, their operational limitations and also their initial, running and maintenance costs. The measured results will aid the selection of efficient and robust DC power source for ICCP design and will contribute in mitigating and controlling the corrosion rate in underground pipelines. On the basis of analysis of the measured results for the three available DC sources, the Solar System was found as the most efficient DC power source for Impressed Current Cathodic Protection of buried gas pipelines. The selection of efficient corrosion protection system will result in a smooth flow of oil and gas products through these buried pipelines which may otherwise leads to huge monitory and accidental losses when get corroded.

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