

الآية

قال تعالى: (سنريهم آياتنا في الأفق وفي أنفسهم حتى يتبين لهم أنه الحق أولم يكفي بربك أنه على كل شيء شهيد)

سورة فصلت: 53

DEDICATION

Thankful and appreciation for support, encouragement and understandings to our beloved mothers, fathers, brothers and sisters.

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ABSTRACT

Corrosion is one of the most important problems encountered by the owners and operators of underground, offshore, submerged and other metallic structures exposed to an electrolyte, if corrosion is not controlled, it can lead to large costs in repairs or facility replacement, even greater costs can be incurred from environmental damage, injuries and fatalities,

The research aims to study of corrosion problem in pipe lines and design a Cathodic protection system that controls corrosion and monitor it remotely.

المستخلص

التآكل هو واحد من أهم المشاكل التي تواجه مالكي ومشغلي المنشآت الحديدية سواء كانت تحت الأرض أو بحرية أو مغمورة في الماء وتتعرض للتحلل بالكهرباء، إذا لم يتم التحكم في التآكل، فإنه يمكن أن يؤدي إلى تكاليف كبيرة في إصلاح أو استبدال المرافق و تكاليف أكبر يمكن تكبدها من الضرر البيئي والإصابات والوفيات. يهدف البحث الى دراسة مشكلة التآكل في خطوط أنابيب البترول بالإضافة الى تصميم نظام حماية كاثودية والتحكم فيها ومراقبتها عن بعد للحد من التآكل.

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LIST OF SYMBOLS

I_s	Protection current density of buried pipes for permanent protection, mA/m ²
D	Outside diameter of pipeline, m
L	Length of pipeline, m
R_s	Steel specific resistivity, Ohm. M
s	Wall thickness of pipe, m
R_i	Insulation resistance for Polyethylene/Polypropylene coating, Ohm.m ²
R_t	Coating leakage resistivity, Ohm. Km
α	Attenuation coefficient
RI	Pipeline lineal resistance
ΔU_s	Change in pipeline potential at drain point due to application of impressed current
ΔU_0	Change in pipeline potential at a point at distance L_{max} due to application of impressed current, v
U_0	Pipeline native potential (-0.5V for steel),v
y	Design life ,years
c	Consumption rate, Kg/ year
u	Utilization factor
i	Minimum current requirement, A
w	Weight of one anode
ρ	resistivity of backfill material, ohm.cm
R_a	Anode to backfill Resistance, ohm
R_b	Backfill column to earth resistance, ohm
R_g	Anode to earth total resistance, ohm
H	Depth of backfill column, m
w_{cb}	Weight of Coke Breeze backfill, kg

LIST OF ABBREVIATIONS

CP	Cathodic Protection
ICCP	Impressed Current Cathodic Protection
AC	Alternating Current
DC	Direct Current
NIST	National Institute of Standards and Technology
GNP	Gross National Product
TRU	Transformer Rectifier Unit
CSE	Copper Sulfate reference Electrodes
NACE	National Association Corrosion Engineers