

CORROSION UNDER INSULATION

NOVEL TECHNOLOGY
DEVELOPMENT TO
CONTROL CORROSION
OCCURRING UNDER
PIPING INSULATION IN
REFINERIES, CHEMICAL
AND PETROCHEMICAL
PLANTS



Typical Insulated Piping System

FIELD TECHNICAL SERVICES

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RESEARCH AND ENGINEERING
BY

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"THE CHANGING WORLD"

"CORROSION UNDER INSULATION - CUI"

"CORROSION UNDER INSULATION IS ONE OF THE MOST WELL UNDERSTOOD
CORROSION PROBLEMS IN THE INDUSTRY"

That is a common expression found in the technical literature. It is a truth.

*Human mind, supported by science, will always advance and provide new ways to focus and solve
problems. Jhonny Ramirez Dala - 2019*

IMPORTANCE OF CORROSION UNDER INSULATION

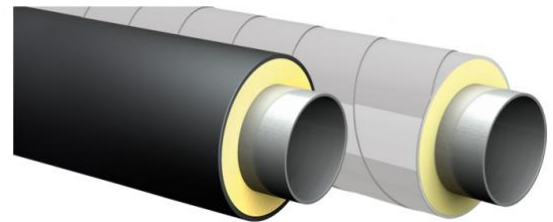
CUI COST BILLIONS

The global cost of corrosion is estimated to be US\$2.5 trillion, which is equivalent to 3.4% of the global GDP (2013). By using available corrosion control practices, it is estimated that savings of between 15 and 35% of the cost of corrosion could be realized; i.e., between US\$375 and \$875 billion annually on a global basis. These costs typically do not include individual safety or environmental consequences. Through near misses, incidents, forced shutdowns (outages), accidents, etc., several industries have come to realize that lack of corrosion management can be very costly and that, through proper corrosion management, significant cost savings can be achieved over the lifetime of an asset. As an example, in 2006, in the USA, an aging petrochemical plant had a leak from a 4 in. hydrocarbon line. The leak resulted in a massive fire that in turn destroyed half the unit and cost the company US\$ 50 million. The cause was CUI. (NACE 2016)

ExxonMobil apparently bases another figure that is frequently referenced on a study in 2003. This study showed that between 40 and 60 percent of piping maintenance costs are related to CUI.

A common belief is that CUI is more a serious problem in aging facilities than in relatively new ones. In fact, some professionals believe that CUI will start to become an increasing growing issue with time.

INSULATED PIPING SYSTEM ON PIPERACKS



PIPING INSULATION PROFILES

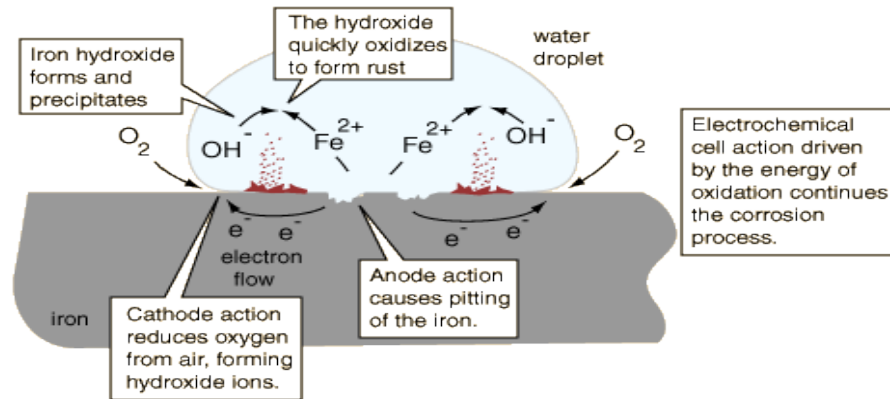


CORROSION UNDER INSULATION

THE PROBLEM

Corrosion Under Insulation, CUI, is an electrochemical degradation of metallic alloys commonly used for process piping and other supporting structures, where aqueous electrolytes accumulate under its thermal insulation.

This aqueous solution, alone or contaminated with other substances or elements are necessary for the onset of electrochemical reactions occurring under favorable conditions of metal exposure, temperature, oxygen or hydrogen, which are capable of sustaining ionic exchange and electrons movement, thus altering alloys microscopically structure which become unstable under those conditions, producing the corrosion process.



- **CORROSION COST IN THE UNITED STATES ECONOMY WAS OVER \$1.1 TRILLION IN 2016**

THE WORLD WAY FOR ADDRESSING THE CONTROL OF CUI

Piping Specifications calls for appropriate surface protection creating barriers against electrochemical corrosion with painting systems or other surface cladding technologies. A truth is that along pipe life, for any reason there will always be locations where water infiltration become in contact with clad or paint damaged locations having bare metal to start corrosion.

Also, specifications require insulation for various purposes, such as energy conservation, safety among others. At the same time, insulation must be protected with properly sealed jacketing.

Adequate insulation jacketing sealing is the primary way to prevent entry of water and other substances inside of insulation system.

Liquid electrolytes enhance electrochemical reactions generating Corrosion Under Insulation, CUI

- **GLOBAL CORROSION COST WAS OVER \$ 2.5 TRILLION IN 2016.**
- **ANNUAL COST OF UNITED STATES NATIONAL DISASTERS IS OVER \$ 19 BILLIONS**
- **MEANWHILE CORROSION COST OF THE UNITED STATES ECONOMY IS HIGHER THAN 50 TIMES, AS MUCH AS ALL THE NATURAL DISASTERS**

NOVEL TECHNOLOGY DEVELOPMENT TO CONTROL CORROSION OCCURRING UNDER PIPING INSULATION IN REFINERIES, CHEMICAL AND PETROCHEMICAL PLANTS

SCOPE

A COMPREHENSIVE CORROSION UNDER PIPING INSULATION EVALUATION AND REMEDIATION

A NEW ADVANCED WAY TO OVERCOME THE PIPING CORROSION UNDER INSULATION HAS BEEN DEVELOPED AND IS APPLIED OVER A COMPREHENSIVE EVALUATION TO ALL EXISTING INSULATED PIPING IN AN SPECIFIC UNIT. THE PROGRAM REVIEWS DESIGN AND OPERATION SPECIFICATIONS, HISTORIC OF VARIABLE CONDITIONS, ACTUAL CONDITIONS AND SEVERAL MANDATORY FIELD INSPECTION PARAMETERS.

COLLECTED DATA IS FED TO THE PROPIETARY CORROSION UNDER INSULATION (CUI) PROGRAM IN ORDER TO CLASSIFY THE PIPING SYSTEM ACCORDING TO CORROSION POTENTIAL CRITIZITY.

IN A SECOND STAGE ADVANCE, NON-CONVENTIONAL, INSPECTION TECHNIQUES ARE APPLIED TO VERIFY HIGHER RISK CORROSION LOCATIONS.

IN A THIRD STAGE A REMEDIATION PROGRAM IS PROPOSED AND APPLIED ACCORDING TO SPECIFICATIONS.

IN THE CASE OF NEW PIPING SYSTEMS PREVENTIVE ACTIONS ARE ENGINEERED AND APPLIED AND CORROSION DEVICES ARE INSTALLED TO MODIFIY THE ENVIROMENT AND TO PREVENT CORROSION.

SPECIALIZED PERSONNEL FOR ALL STAGES IS PROVIDED TO ASSURE HIGH STANDARDS AT ALL STAGES OF TECHNOLOGY APPLICATION.

BY IMPLEMENTATION OF THID UNIQUE PROGRAM THE PLANT RELIABILITY IS IMPROVED, POTENTIAL FAILURES ARE MINIMIZED, HUMAN INJURIES REDUCED AND UNPLANNED MAINTENANCE COST REDUCED.

THE COMPLETED TECHNOLOGY PACKAGE IS PROPOSED FOR: 1) PATENTING INVENTIONS ASSOCITATED 2) BECOME PARTNER TO CUI TREATY HANDBOOK 3) BECOME PARTNER TO CUI SOFTWARE.

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