EFFECT OF TEMPERATURE ON CORROSION OF CARBON STEEL UNDER MINERAL WOOL INSULATION

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INTRODUCTION

This study is targeted at investigating the effects of temperature on the corrosion of carbon steel under mineral wool insulation. Corrosion under insulation (CUI) is the degradation of metals due to ingress of water and contaminants such as chlorides through the insulation to the surface of the metal, resulting in anodic dissolution of the metal. In industry, the high temperature of fluids flowing through insulated metals as well as contaminants may have significant impact on the corrosion rate. Therefore, it is important to assess and quantify these factors to better understand their contribution to corrosion of insulated assets.

OBJECTIVES

1. To design a test system for the simulation of CUI in the laboratory.
2. To investigate the effects of temperature on the corrosion rate of carbon steel rings under mineral wool insulation.

MATERIALS AND METHODS

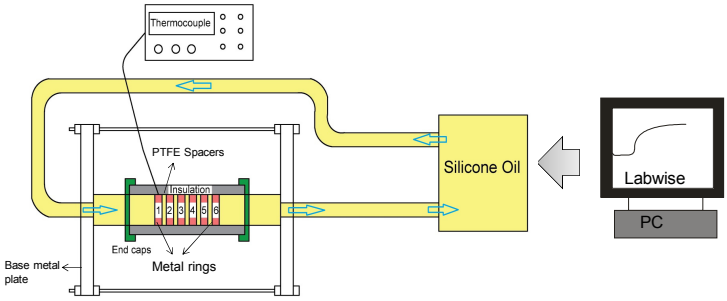


Fig. 1: CUI test rig

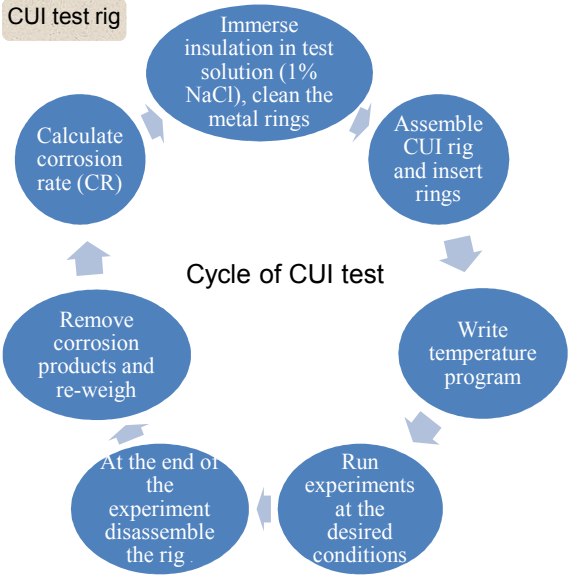
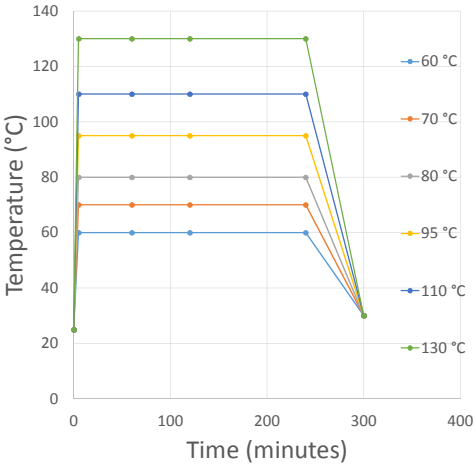


Fig. 2: Cycle of CUI test



Temperature is ramped from 25 °C to the target temperature and was maintained for hours before cooling down to room temperature.

Fig. 3: Temperature program for CUI

RESULTS

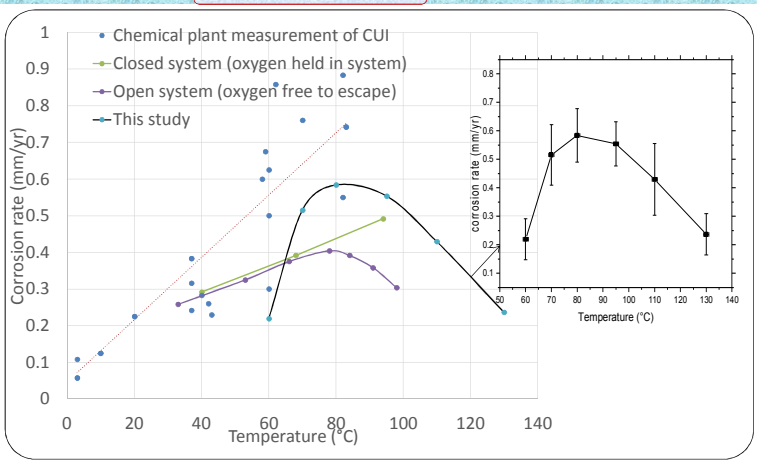
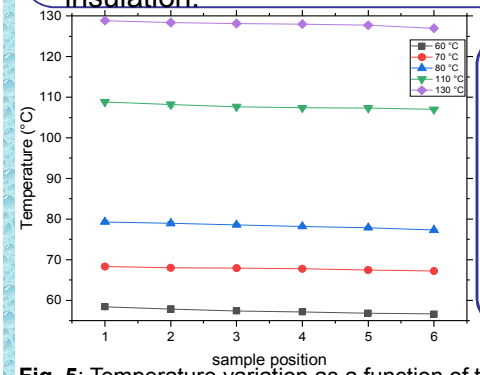


Fig 4. Effect of temperature on corrosion of carbon steel rings

- There is rapid increase in corrosion rate as temperature is increased up to 100 °C as in a closed system. Further increase in temperature resulted in a decrease in corrosion rate which may be attributed to the drying out effect of the insulation.



- The rings closer to the oil inlet tends to be hotter than the outlet this may result in different corrosion rate at the ends.

Fig. 5: Temperature variation as a function of the position of ring samples.

CONCLUSION

- A CUI test rig was developed according to ASTM G189 standard to study the effect of temperature on the corrosion of carbon steel rings under mineral wool insulation.
- The corrosion rate was observed to increase with temperature up to 100 °C as in a closed system, but later decreased on further increase in temperature up to 130 °C, which may be as a result of rapid drying out of the insulation at higher temperatures.
- Further study to verify the drying out effect will be conducted using impedance technique.

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