CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF RESEARCH

Corrosion is the breaking down or the destruction of a material, especially a metal, through chemical reaction. Typically, rusting is the form of corrosion, which occur when iron combine with water. Focusing on coiled tubing (CT) which mainly used steel, the external and internal walls CT are briefly exposed to corrosive downhole environments and treating chemicals during well servicing and workovers. Corrosion inhibitor (CI) are chemicals that react with metallic surface, or the environment this surface is exposed to, giving the surface certain level of protection. Technically, CI works by absorbing themselves on metallic surface, protecting the metallic surface by forming a film. Basically, inhibitors are categorized based on their usage and formulation; anodic & cathodic inhibitors, organic inhibitors, water-based & oil-based corrosion inhibitors.

In this proposed research, the main idea is to investigate inhibition efficiency of internal and external CI and corrosion rate of mild steel focusing on CT application using immersion test as corrosion testing. The physio-chemical properties of internal and external corrosion inhibitor are analyzed using viscometer and Fourier transform infrared (FTIR). In addition, corrosion rate and inhibitor efficiency of internal corrosion inhibitor are investigate using standard evaluation method and the halide ion’s synergistic effect on the inhibition efficiency of Internal CI (iCI).

1.2 PROBLEM STATEMENT

During well servicing and workovers, the external and internal walls of CT are briefly exposed to corrosive downhole environments and treating chemicals. Understanding and predicting the extent of corrosion damage to a CT string during these jobs in order to derate the string accordingly is still far from being accurate. After the work is completed, the string should be maintained in good condition for the next job. Improper cleaning and storage of coiled tubing can result in corrosion failures. These failures are mostly preventable if proper protection measures are taken before being run in a well and during storage after the job (John and Radovan, 2003).

Oil and gas industry are commonly used strong acids like hydrochloric (HCl) acid for different applications, including pickiling, descaling and stimulation treatments of oil/gas producer or water injector wells. Consequently, the steel surface is exposed in different equipment, such as mixing tanks, pumps, coiled tubing, tubulars and casing, to severe corrosion, resulting in deterioration of the metal parts and other associated problems. Furthermore, the metals got corroded when they come in contact with seawater because of various corrosive ions such as chloride present in water. Hence, it is important to control corrosion using a proper corrosion inhibitor system.

Among the various method to prevent destruction or degradation of metal surface, corrosion inhibitors (CI) is one of the excellent method of corrosion protection and one of the most practical on the industry. In industrial practices, CI is normally applied for both internal and external of CT. Thus, the corrosion rate and the inhibitor efficiency is investigate to overcome the problem.

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1.3 OBJECTIVES OF RESEARCH

Objectives of this research are:

1. To study the physico-chemical properties of Internal CI (iCI) using viscometer and FTIR
2. To investigate the halide ion's synergistic effect on the inhibition efficiency of Internal CI (iCI).
3. To investigate the corrosion rate and inhibitor efficiency of Internal CI (iCI) using immersion testing.

1.4 STATEMENT OF CONTRIBUTION

In this research, efficiency of commercial CI namely iCI will be characterized using viscometer and FTIR to study the physico-chemical properties. The CI will be coated on the metal surface and immersion test will be carried out. In addition, the immersion test will determine the corrosion rate and inhibition efficiency of iCI.