1 INTRODUCTION

1.1 Motivation and statement of problem

Pipeline affect our daily lives of most people in this world and most of the chemical industry used carbon steel for the pipelines materials because of the high availability of carbon. Pipeline usually transport gasses and liquid substances through millions of miles of underground pipelines that contain crude oil, natural gas liquids, gasoline, diesel fuel, jet fuel, carbon dioxide, anhydrous ammonia, and other commodities. Pipeline allows continuous, stable and high capacity to supply of hydrocarbon compared to the other forms of transport. Therefore, pipelines are cost effective, efficient and readily expandable. Pipeline also supported by pumping and compression stations that carry billions of cubic meters of our energy needs. For example in oil and gas transportation, it is currently provide 54% of the world’s primary energy needs and there are over 3500 000 km of high pressure oil and gas pipeline around the world (P. Hopkins, 2014). Most of the pipelines are operated for a number of years and without inspection through this pipelines, either buried in the ground, exposed to the atmosphere or submerged in water there are still have probabilities for the pipelines to corrode and having an external damage. Buried pipeline transportation in the ground is believed as the most efficient method of transporting oil, gas or chemicals. It has a lower rate and is relatively reliable, but corrosion is still a major problem for its safe operation (Wenhe et al., 2014).

Corrosion is one of the leading causes of pipelines failures (both gas and hazardous liquids) in the United States. As shown in Figure 1-1, corrosion has been responsible for 18 percent of the significant incidents (both onshore and offshore) in the 20 year period through 2008 in United States (Michael 2008). Almost any environment can cause corrosion, which occurs under numerous complex conditions in pipeline system. It also can occur when the acidic gases such as H₂S and CO₂ are dissolved in water, it create an acidic environment which in the vicinity of the steel will cause severe corrosion.
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Some of the ways to overcome these problems are linings and protective coatings, cathodic protection, material selection and inhibitors (Sankara Papavinasam, 2014). Coating is the first defence line in front of a corrosive environment when pipe has been buried. Good function of coating depends on its adhesiveness rate to the metal surface. Initial adhesion and durability in contact situations are factors that are cause to high efficiency in the long term. The quantity of initial adhesion has the relationship with flow of coating and wetting of the surface by applying a coating and depends on clean and ready of the pipe surface (Amir Samimi 2012). However, the corrosion of pipelines' coatings is one of the main problems in oil and gas industries for which a large amount of money is spent each year.

Besides coating, corrosion inhibitor also can help to reduce the corrosion rate in pipeline. Corrosion inhibitor is a chemical substance organic or inorganic which when added (Andrade et al., 2001) is a required amount to corrosive environment decreases the rate of corrosion. Corrosion inhibitors frequently work as anodic, cathodic or mixed inhibitors (Pasheco et al., 2011, Xu et al., 2008) by adsorbing themselves on the metallic surface (physical adsorption) by forming a film layer on the surface. Inhibitors reduce corrosion rate activities by increasing the cathodic and anodic polarization behaviour, decreasing the mobility of ions to the surface of the metal, raising the electrical resistance of the metallic surface and creating a barrier film on the surface of the metal. For industrial and large scale applications, cost, availability and environmental friendliness are essential considerations (Ji et al., 2011). Environmental concern must be evaluated first before choosing the best method to control the corrosion on pipelines. Cost of organic inhibitors is relatively low, but many of the effective inhibitors such as chromate, mercride, arsenate are very toxic and harmful to both humans and environment whereas plant extracts corrosion inhibitors are cheap, non toxic and also environmental friendly.

For this research, green corrosion inhibitor from extraction of pineapple peels is chosen as a raw material for corrosion inhibitor. Pineapple is a type of tropical plant believed to originate from East Area South America and introduced to Malaysia in the 16th century by Portuguese. It has long been recognized as one of the most popular subtropical fruit and grown extensively in Hawaii, Philippines, Caribbean area, Malaysia, Taiwan, Thailand, Australia, Mexico, Kenya, South Africa and Hainan province of China (Xie W et al., 2006). In Malaysia, Malaysian Pineapple Industry Board (MPIB) reported that