A STUDY OF THE EFFECT OF CRUDE OIL ON THE RATE OF CORROSION AND THE PROPERTIES OF SELECTED FERROUS METALS

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by

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Abstract

In the industry of crude oil refining, can be found wide range of applications of ferrous metals such as in the storage and transportation. The corrosion is a kind of major problem faced in the usage of such ferrous metals. The formation of the oxides, sulfides, hydroxides or the compound related to the carboxylic group on the surface of metal due to the chemical reaction between metals and surrounding are known as the corrosion which is highly depended on the sulfur content, salt content, mercaptans content and the acidity of crude oil as well as the chemical composition of ferrous metals. In the current research it was expected to investigate the effect of Murban and Das blend crude oils on the rate of corrosion of seven different ferrous metals which are used in the crude oil refining industry and also expected to investigate the change in hardness of each metal due to the corrosion. The sulfur content, acidity and salt content of each crude oil were determined. A series of similar pieces of seven different types of ferrous metals were immersed in each crude oil separately for 15, 30 and 45 days. Their rate of corrosion was determined by using their relative weight loss after these time periods. The corroded metal surfaces were observed under the microscope. The hardness of each metal piece was tested before the immersion in crude oil and after the corrosion with the aid of Vicker's hardness tester. It was found that Das blend crude oil contains higher sulfur content and acidity than Murban crude oil. Carbon steel metal pieces show the highest corrosion rates whereas the stainless steel metal pieces show the least corrosion rates in both crude oils. The mild steel piece and the Monel piece show relatively intermediate corrosion rates compared to the other types of ferrous metal pieces in both crude oils. It can be observed that there is a slight decrease in hardness of all the ferrous metal pieces due to corrosion. The corrosion rates of ferrous metals are varied with the properties of crude oils such as sulfur content, acidity and the amount of mercaptans present. Finally the relevant metallic concentration of each crude oil sample was tested using atomic absorption spectroscopy (AAS). According to those results significant Fe and Cu concentrations were observed from some of crude oil samples.