

## Utilizing of Sodium Nitrite as Inhibitor for Protection of Carbon Steel in Salt Solution

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Received: 30 May 2012 / Accepted: 28 June 2012 / Published: 1 August 2012

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Preventing corrosive action induced by the presence of chlorine in utility water used as a coolant in cooling towers is a challenging task. Anodic inhibition is one of the commonly used techniques for protecting metallic parts of the cooling towers. In this study, the effect of chloride ions on the sodium nitrite ( $\text{NaNO}_2$ ) inhibitor concentration was investigated for the protection of carbon steel pipes under controlled conditions of mass transfer. A rotating cylinder electrode system was utilized to provide quantified hydrodynamic mass transfer conditions. Potentiostatic polarization experiments were carried out at 313 K and rotational speeds of 0, 200, 350 and 500 rpm. It was selected a typical industrial chloride solution at a concentration of 250 ppm  $\text{NaCl}$ . The experiments were conducted in the presence of  $\text{NaNO}_2$  with different concentrations depending on the  $[\text{NaNO}_2/\text{NaCl}]$  molar ratio, i.e. ratios of 0 to 1. A new calculation was used to find the best protection value which depends on the passive film stability in the polarization curve. The current analysis revealed that the new method for predicting the optimum protection value is more reliable than the conventional corrosion current density based technique.

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**Keywords:** carbon steel, anodic inhibition, sodium nitrite, passive film, polarization

### 1. INTRODUCTION

In the oil extraction and processing industries, inhibitors have always been considered to be the first line of defense against corrosion. A great number of scientific studies have been devoted to the subject of corrosion inhibitors [1]. Corrosion inhibitors are chemical substances or combination of substances that, when present in the environment, prevent or reduce corrosion [2].