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# Effect of Pulse Frequencies on Low Carbon Steel in 3.5 wt% NaCl Solution under Zero Charge Corrosion Protection

## Abstract

Zero charge corrosion protection (ZCCP) is an alternative to the existing cathodic protection methods. It applies a current/voltage pulse with a certain particular frequency to attain a potential of zero charge (Epzc) on the electrode-electrolyte interface. A study on the pulse frequencies of ZCCP system on low-carbon steel in 3.5 % NaCl Na solution was carried out for 14 days. The pulse frequencies are varied from 4, 20, 50 and 100 Hz. The ability of these frequencies in protecting samples is determined by means of corrosion rate based on weight loss analysis and surface morphology. Experimental observations indicate that low carbon steel corrosion protection is strongly influenced by changes in pulse frequency. Corrosion rates were found to gradually decrease as pulse frequency increased from 4, 20 to 50 Hz, nevertheless at higher frequencies (100 Hz), corrosion protection was observed to be less effective where the corrosion rate dramatically grew up. The surface morphology of the steel surface is smooth and protected at a pulse frequency of 50 Hz. This indicates that the current / voltage pulse of ZCCP system only requires 50 Hz which is equivalent to a standard AC power frequency applied in most countries including Malaysia.