Corrosion Detection of Carbon Steel in Saline Environment Using Standard Weight Loss Method

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Abstract: In this study, the corrosion of A1018 Low carbon steel immersed in 10 % of sodium chloride solution under room temperature and condition was detected using its weight and dimension change.

1. Introduction

Steel and Iron, the most commonly used metals, corrode in many media including sodium chloride environment. Usually they are selected not for their corrosion resistance but for such properties as strength, ease of fabrication, and cost. These differences show up in the rate of metal lost due to rusting (Roberge PR, 1999). Here we measured weight change to detect the steel corrosion in Sodium Chloride environment.

2. Objective: The objective was to detect the steel corrosion in Sodium Chloride solution with time using standard weight loss method. Also investigate the physical changes in the metal.

3. Materials and method: As testing specimen, ASTM 1018 low carbon plate sample with dimension of about 764 mm×31 mm×4.3 mm were used for this experiment. Specimen was placed in 10 % of sodium chloride solution for 1 day and was exposed to air for 2 days which corresponds to 1 cycle. At every cycle, weight & dimension of the specimen was noted.

(a)

(b)

Figure 1. Schematic setup of (a) Non – Corroded steel and (b) Corroded steel

Corrosion rate was calculated assuming uniform corrosion over the entire surface of the coupons. The corrosion rate in mils per year (mpy) was calculated from the weight loss using the formula:

$$CR = \frac{W}{(D \times A \times t)} \times k$$

where: W = weight loss in grams, k = constant (87.6), D = metal density in g/cm^3, A = coupon area (cm^2), t = time (hours)

4. Results and Analyses:

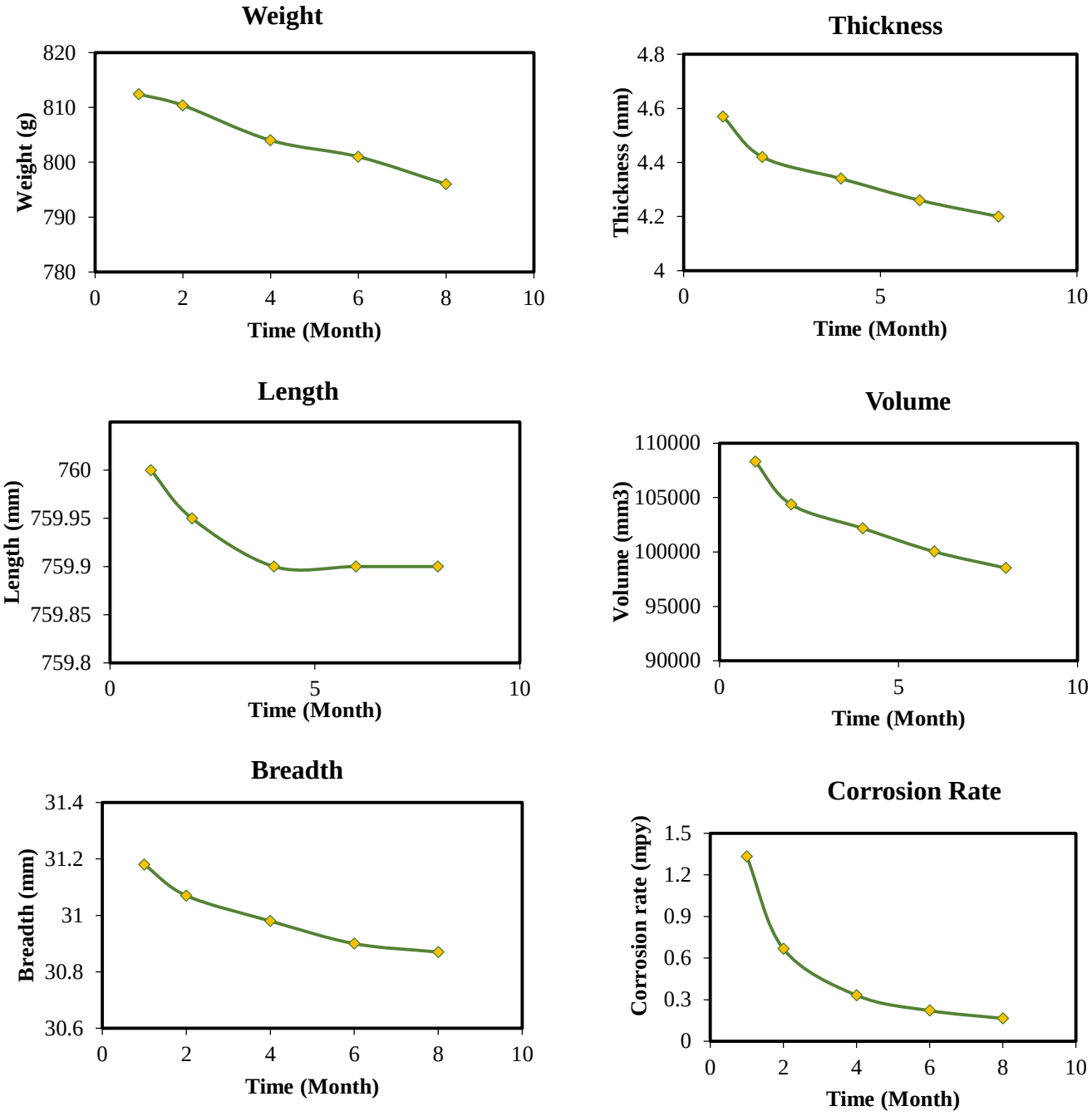

Figure 2. Weight, length, breadth, thickness, volume and corrosion rate of the steel specimen during corrosion

5. Conclusion: The corrosion of Low Carbon A1018 steel was detected using using weight loss and dimensional change.

6. Acknowledgment: This study was supported by the Texas Hurricane Center for Innovative Technology (THC -IT).

7. References: REFERENCES. [1] Roberge PR., “Handbook of Corrosion Engineering”. New York: McGraw-. Hill, 1 P, 1999.