ABSTRACT

Spin bath Multistage Flash Evaporator (SPB MSFE) is a vital equipment in the rayon industry. Its main function is to evaporate water from the regeneration process of rayon fiber production. The main problem that often occurs in SPB MSFE is the formation of sulfur deposits, which reduces evaporation efficiency. The cleaning process needs to be carried out to remove the sulfur deposits. The compound used for cleaning is a press lye solution with a composition of 225–235 g/L NaOH, 20–25 g/L hemicellulose, and 9500–9600 ppb fiber.

This study explores the kinetics of sulfur dissolution in the press lye solution and the parameters that affect it (temperature and concentration). Determination of sulfur dissolution kinetics is obtained from experimental results. The method used is a graphite tube prepared with a size of 62 mm, then molded on sulfur previously melted at 200 ^oC. Sulfur attached to the surface of the graphite tube is then reacted in 500 ml of press lye solution (40,50,60 g / L) with temperature variations of 60,70 and 80 ^oC. The reaction lasts for 120 min, and every 15 minutes, the Na_2S value formed is checked using the titration method. In addition to press lye, a comparison is also made using fresh lye (NaOH). The results obtained are the rate of sulfur dissolution from a temperature of 60 ^oC to 70 ^oC of 124% in the fresh lye solution (NaOH) and 110% in the press lye solution. A significant increase occurred when the temperature increased from 70 ^oC to 80 ^oC by 272% in the fresh lye (NaOH) solution and 205% in the press lye solution.

The obtained sulfur dissolution kinetics value is then connected to a simple sulfur dissolution process model, which is then used to determine the effective cleaning time on the SPB MSFE. The resulting process model is then validated by comparing the model calculation value with actual conditions. The existence of deviations between the model and the actual is then calibrated using the non-linear least square method so that the sulfur dissolution rate value (k) is obtained, which is close. From the model calculation, the longest effective cleaning duration is obtained, namely 22 hours 5 minutes at a temperature of 60 ^oC and a concentration of 40 g / L, and the shortest is 1 hour 25 minutes at a temperature of 80 ^oC and a concentration of 60 g / L. From the results of the model calculation, the effective cleaning process is then applied to the SPB MSFE and then a comparison of the performance of the SPB MSFE before and after effective cleaning is carried out.

The conclusion obtained from this study is that the sulfur dissolution rate in fresh lye (NaOH) solution tends to be slightly higher than in press lye solution. However, the difference is not too significant. This is due to impurities in the press lye solution, namely hemicellulose and fiber. Cleaning with an effective method carried out on the SPB MSFE produces better performance than the normal method, both in terms of steam ratio 2.2 times lower, steam consumption 1.5 times lower, evaporation rate 2.2 times slower decrease and the A1 output temperature obtained is higher, namely 95.8 ^oC compared to the normal method of only 94.5 ^oC. The combination of high concentration and temperature, especially at a temperature of 80 ^oC and a concentration above 50 g / L, has a risk of erosion on the graphite tube surface. Effective and safe cleaning conditions are at a temperature of 70 ^oC and 60 g / L concentration, namely 4 hours 28 minutes.

Keywords : SPB MSFE, Sulphur, Deposits, Press Lye, Model, Effective Cleaning