Distillation Experiment—Flooding

Abstract

Experimenters examined a binary distillation column that was used to separate ethanol from water. The distillation column was operated at total reflux for five different steam flow rates, but data from only four rates were analyzed. The goal of this experiment was to determine the point at which flooding occurred by observing changes in operating conditions at the different steam flow rates. Operating conditions that were observed included tray temperatures, pressure drop across the column, froth height as observed through the view-port, reboiler liquid level, and liquid compositions at both the top and the bottom of the tray. The values of the steam flow rates at 50%, 75%, 100%, and 125% of flooding were determined to be 0.44 kg/min, 0.65 kg/min, 0.87 kg/min, and 1.09 kg/min, respectively. The predicted flood point of the column was determined to be 0.87 kg/min, while the experimentally determined flood point of the column was determined to be 0.82 kg/min. This discrepancy showed a 6.1% difference between the predicted and experimentally determined flood point of the column. These two values may differ due to the fact that the energy balance equation around the reboiler did not take into account the heat lost to the surroundings. Another possible cause for the difference between these two values could be tray fouling.

Notice how the authors move from the general to the specific. They use 4 sentences for the procedure, 3 sentences for the results, and 2 sentences to explain why the results occurred.