Distillation Of Aqueous Acetone

Background:
The main purpose of acetone being a solvent in various processes it is economically viable to recycle the used acetone rather than using fresh acetone in a given industry. Hence simple distillation can be carried out especially if it's a mixture of acetone and higher boiling components like water.

Description of flowsheet:
The feed enters a preheater heat exchanger where it is heated by the recycled bottoms from the distillation column. The preheated feed then enters the 3rd stage of the 10 staged distillation column and with a reflux ratio of 9.16. The distillate and the bottoms which is recycled to a heat exchanger and used to preheat the feed. Also the distillate obtained is cooled in a heat exchanger where the heat exchanger is designed to give purified acetone as the final product.

Results:
The bottom stream of distillation column is purely water with mole fraction 0.99. The preheated feed enters the Distillation column at 311.79 K. The cold feed is entered in Heat Exchanger 2 at 299.85 K and leaves at 302.68 K. The distillate is entered in Heat Exchanger at 331.62 K and leaves at 311.25 K. The bottom stream is used for preheating of feed. The bottom stream leaves heat exchanger 1 at 359.65 K.

Reference:
Mass Transfer Operations, by Robert E. Treybal, Chapter 9, Problem no.10