**DIVERSIFIED CHEMICAL PRODUCTS**
**Specialty Products Division**
**Cambridge, MA 02139**

**MEMO #6**

TO: U.R. Engineer

FROM: A.I. Jockey (Technical Services Group)

DATE: 20th September 2007

SUBJECT: Instructions for using the JACOBIAN batch distillation model on Athena

---

## Tutorial Example: First Distillation Task in the ICE Process

This example uses a more complex model to simulate a separation similar to the first distillation task in the ICE process. The model is of the flowsheet shown in Figure 1, which contains a batch rectifier and a number of accumulators to collect overhead cuts. The number of accumulators can be changed by changing the value of an integer parameter in the flowsheet model.

Download the files *PhysicalProperties.JAC* and *Destillation1.JAC* from Stellar and put them in a folder you would remember. Start up JACOBIAN if it is not already running and create a project called *Destillation1*. Import the previous two files in *Destillation1* and *Load* the file *Destillation1.JAC*. We strongly suggest that you read through this file and understand it before proceeding. This file contains the following blocks:

1. a DECLARE block introducing a stream type for mole balance only flowsheets.
2. a MODEL block BatchRectifier implementing the dynamic model for a batch rectifier discussed in class. Note that because the file PhysicalProperties.JAC is included, the Wilson activity coefficient model will be used to predict VLE, in particular the azeotropes that constrain the separation.
3. a MODEL block Splitter for a static stream splitter that can be used in particular to direct the distillate to any one of a number of accumulators.
4. a MODEL block Accumulator that models the dynamic accumulation of material in an accumulator if the distillate stream is directed towards the accumulator by the splitter.
5. a MODEL block RectifierFlowsheet that models the entire flowsheet shown in Figure 1. It creates instances of BatchRectifier, Splitter and a number of Accumulators determined by the integer parameter No_Accum (two accumulators initially). The Equation section connects the streams of these model instances together. Also, the number of chemical components in the flowsheet is given, and values are specified for physical property parameters related to pure component vapour pressure and binary parameters for the Wilson model.
6. a SIMULATION block Distillation1 that describes a simulation uncannily close to one of the homework problems.

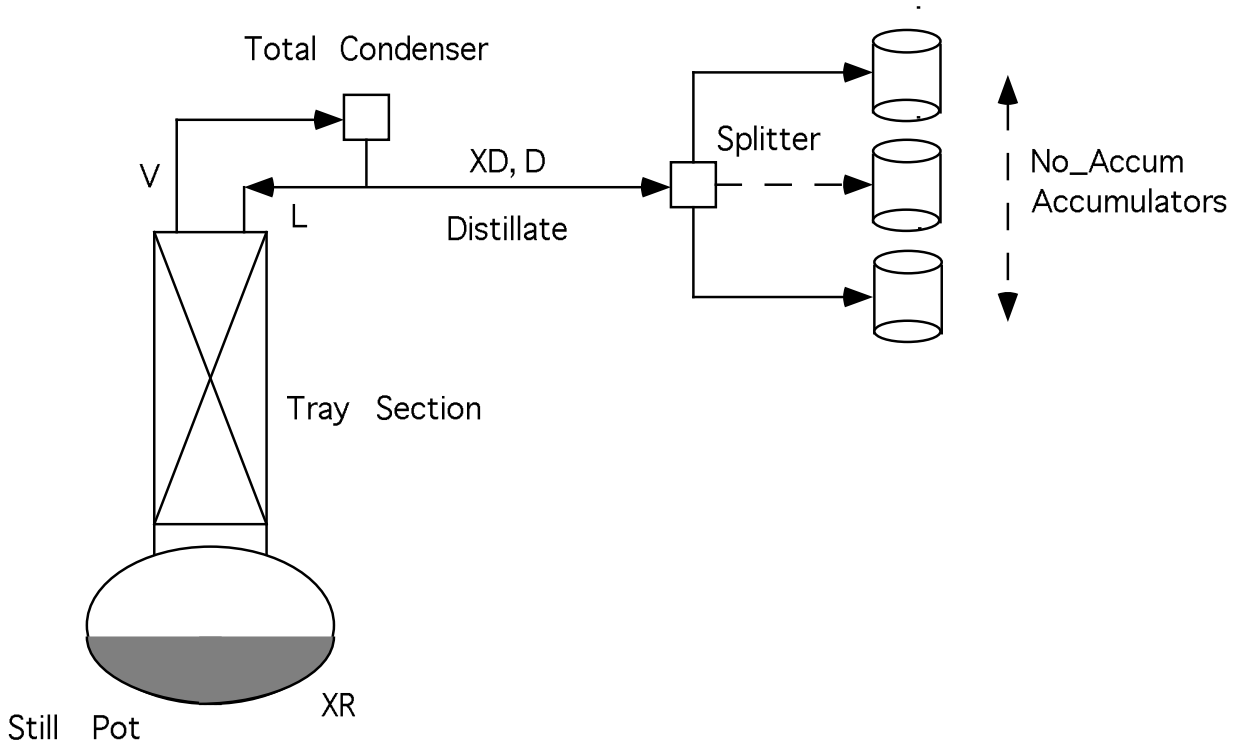


Figure 1: Flowsheet for Batch Rectifier and Associated Equipment

The functionality of the MODEL blocks in particular should be evident from reading the comments in the input file and the discussion in class.

Execute the SIMULATION block in *Destillation1.JAC*. Once this is complete you can bring up the plotting environment and plot results such as the pot composition vs. time, the column temperature profile at a number of different times, or the accumulator holdups vs. time.