Initial Flowsheet

- Flowsheet options: General with Metric units template
- Property method: UNIFAC
- Feed stream #1: 200 kg/min ethanol, 25 C
- Feed stream #2: 261 kg/min acetic acid, 25 C

Reactor

- REquil
    - Temperature: 55 C
    - Pressure: 1 bar
    - Reactions: ETHANOL + ACETIC ACID -> ETHYL ACETATE + WATER
        - Coefficients: -1, 1 (reactants), 1, 0 (products)

Reactor (RadFrac)

- RadFrac specifications
    - Stages: 23
    - Type: Total condenser
    - Reflux Ratio: 3 (mol ratio)
    - Reboiler duty: 3500 kJ/sec
    - Feed stage: 12, on-stage

Heat Exchanger

- 2 HeatX blocks, one per feed stream
- Hot water stream:
    - Temperature: 80 C
    - Pressure: 1 bar
    - Flowrate: 200 kg/min.
- HeatX:
    - Model fidelity: Shortcut
    - Outlet temperature: 55C
    - Min temperature approach: 5 C

Pump

- 2 Pumps, each before their respective heat exchanger
- Discharge pressure: 1 bar

Design Specifications

- Starts from Ch 2.3
- RadFrac block:
    - Stages: 10
    - Type: Total condenser
    - Reflux ratio: 2 (mol ratio)
    - Bottoms rate: 20 kg/min
    - Feed: Stage 6 (On-stage)
    - Condenser pressure: 1 bar
    - Column design spec:
        - Specification RECOVERY
            - Type: Mol recovery, .999
            - Component: acetic-acid
            - Product stream: column bottoms
        - Vary bottoms rate
            - Lowerbound: 2000 kg/hr
            - Upperbound: 5000 kg/hr
    - Convergence options
        - Iterations: 200
- Mixer:
- Decanter:
    - Pressure: 1 bar
    - Temperature: 25 C
    - 2nd liquid phase: water
- RadFrac #2:
    - Stages: 15
    - Type: total condenser
    - Distillate rate: 18500 kg/hr
    - Reflux ratio: 5 (mol ratio)
    - Feed: Stage 8
    - Condenser pressure: 1 bar
- Additional streams:
    - Water, 25 C, 1 bar, 200kg/min into the mixer.
- Design Specification 2:
    - AAPURITY (under flowsheeting options)
    - Variable -> PURITY
    - Type: Mass-Frac
    - Final ethyl acetate stream, componentis ethyl acetate
    - Specifications:
        - PURITY, target .98, tolerance .0001
    - Vary:
        - Mass-Flow, WATER stream, WATER component, kg/min units
        - Lower bound: 200
        - Upper bound: 800

Sensitivity Analysis

- New variable -> Block-Var -> RadFrac #2
- MOLE-RR:
    - Range is 2.5 to 6, 150 points of evaluation
    - Define tab -> New Variable:
        - Type: Mass-Flow
        - Stream: Distillate out top of column
        - Component: Ethanol
        - Units: kg/hr
    - Tabulate tab -> Fill Variables

Note: any parameters not specified in this memo assume their default values.