



Specifying Recycle Blocks

When simulating a closed recycle loop (see Figure 1), it is necessary to provide a starting point for the simulation. In other software packages, this may be referred to as a tear stream. In ProTreat®, we refer to it as a Recycle block (see Figure 2).

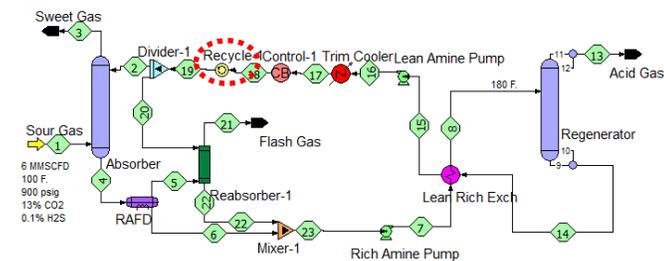


Figure 1. Example Recycle in Amine Circuit

The Recycle block simply provides a set of initial estimates which the simulation then uses to start calculations.

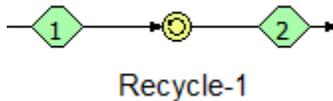


Figure 2. Recycle Block in ProTreat®

The input data provided for a Recycle block are identical to those for an Inlet block, but some additional parameters (Figure 3) are required. As the sequence of flowsheet block calculations return to the recycle, the stream results for the current iteration are compared with those of the previous iteration. Convergence is declared when the current and previous stream results for the Tear stream (in which the Recycle block is embedded) are the same to within a specified tolerance. The additional parameters required are the convergence tolerance and the maximum number of passes through the Recycle block that are allowed.

Because the Recycle is an iterative block, the results from an earlier simulation can be used as initial estimates for the next simulation—this significantly decrease convergence time for successive simulations of the same flowsheet. This is similar to column auto restarts discussed in ProTips™ Volume 2 Issue 2.

Recycle blocks should be placed where defining a set of conditions will allow calculations to start.

There are always several possible locations, so the Recycle block should be placed where you can provide the best estimates of composition, flow, temperature, and pressure. Minimizing the number of Recycle blocks will reduce convergence time. For example, in Figure 1, the lean amine is split between the main absorber and the flash gas absorber. The simulation will accept and run if a recycle block is placed on *both* streams 2 and 20. However, placing it before the Divider, as shown, reduces the number of Recycle blocks from two to one.

Figure 3. Recycle Block Input

PROTIP: When starting a new simulation without results from a previous simulation being available, it is best to input initial conditions that are as close to the expected results as possible. In a water wash section or a pump around section, remember to include components that may have vaporized from the liquid phase, even though they are present predominantly in the aqueous phase.

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