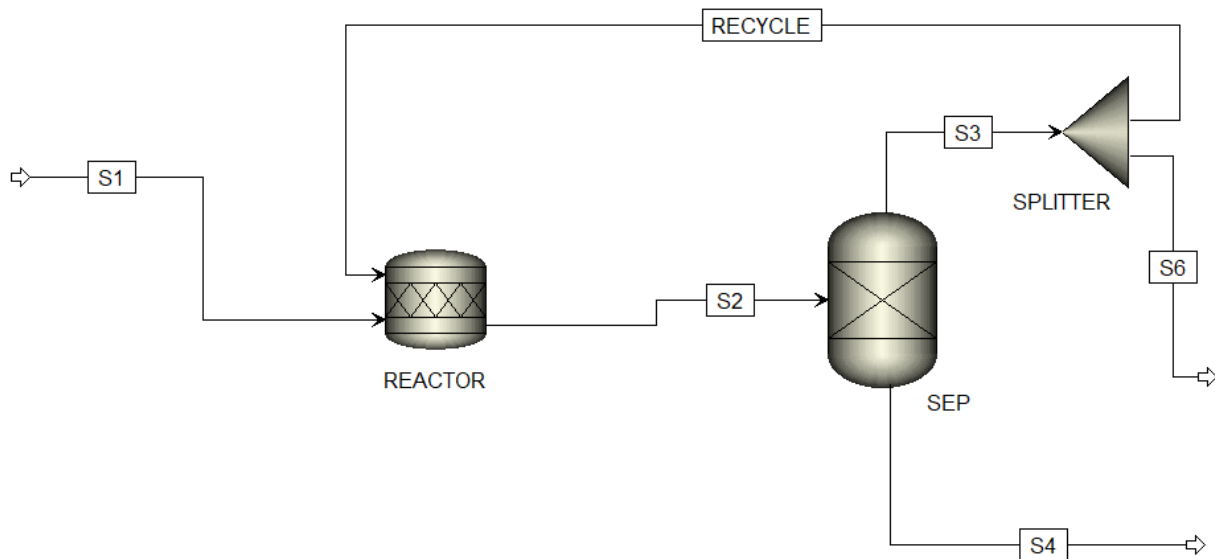


## Example 2: Mass-Balance Only with Standard Input and a Flow Splitter and a Recycle Stream

Let's make the problem more interesting by assuming the reaction is not 100% complete, but has a fractional conversion of 80%, and adding a flow splitter to recycle some of the unreacted components. The recycle stream recycles 90% of the inlet into the splitter.



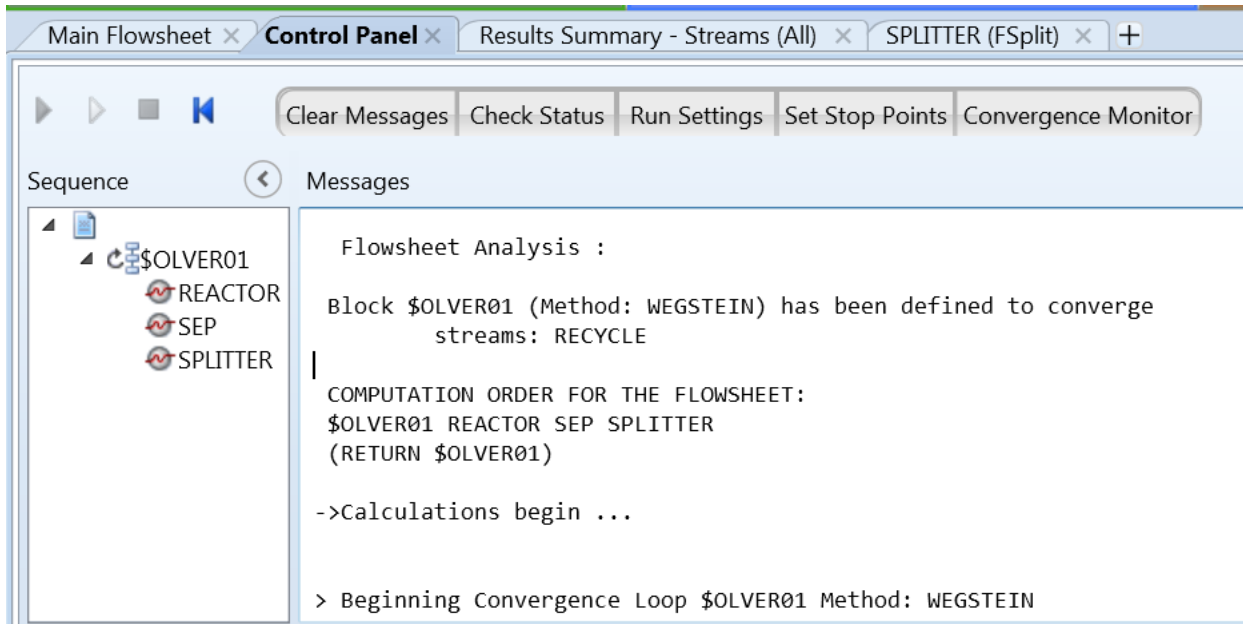
### Points to observe:

1. There is a tear stream created by A+, which is RECYCLE. Notice the convergence block called \$SOLVER01.
2. The Control Panel shows iterative calculations in which the default numerical solver called Wegstein was used by A+, and the total number of iterations is 9.
3. Can provide initial an initial guess for the tear stream (RECYCLE) by providing component flow rates (T and P are irrelevant because we are doing mass-balance only calculations). A good initial guess can reduce the number of convergence iterations.

Try the following component flow rates (lbmol/hr):

$\text{CH}_4 = 90$ ,  $\text{O}_2 = 0$ ,  $\text{CO}_2 = 120$ ,  $\text{H}_2\text{O} = 1$ , and  $\text{H}_2 = 80$ .

We must reset the calculations, and notice that the number of iterations went from 9 to 5, thus using less computation time. Also, note how you can use Clear in the Data Browser to clear the content of the RECYCLE stream.



		S1	S2	S3	S4	S6	RECYCLE
From			REACTOR	SEP	SEP	SPLITTER	SPLITTER
To		REACTOR	SEP	SPLITTER			REACTOR
Stream Class		CONVEN	CONVEN	CONVEN	CONVEN	CONVEN	CONVEN
Average MW		22.618092	23.332612	23.582415	22.171148	23.582415	23.58277
Mole Flows	lbmol/hr	100	385.62721	317.36881	68.258397	31.736881	285.62721
CH4	lbmol/hr	40	105.26316	94.736842	10.526316	9.4736842	85.263158
O2	lbmol/hr	50	10	0	10	0	0
CO2	lbmol/hr	0	137.93097	131.03442	6.8965486	13.103442	117.93097
H2O	lbmol/hr	0	40.733198	0.814664	39.918534	0.0814664	0.7331976
H2	lbmol/hr	10	91.699882	90.782883	0.9169988	9.0782883	81.699882
Mole Fractions							
CH4		0.4	0.2729661	0.2985071	0.1542128	0.2985071	0.298512
O2		0.5	0.0259318	0	0.1465021	0	0
CO2		0	0.3576796	0.4128774	0.1010359	0.4128774	0.4128842
H2O		0	0.1056284	0.0025669	0.584815	0.0025669	0.002567
H2		0.1	0.2377941	0.2860485	0.0134342	0.2860485	0.2860368
Mass Flows	lb/hr	2261.8092	8997.69	7484.323	1513.367	748.4323	6735.8808