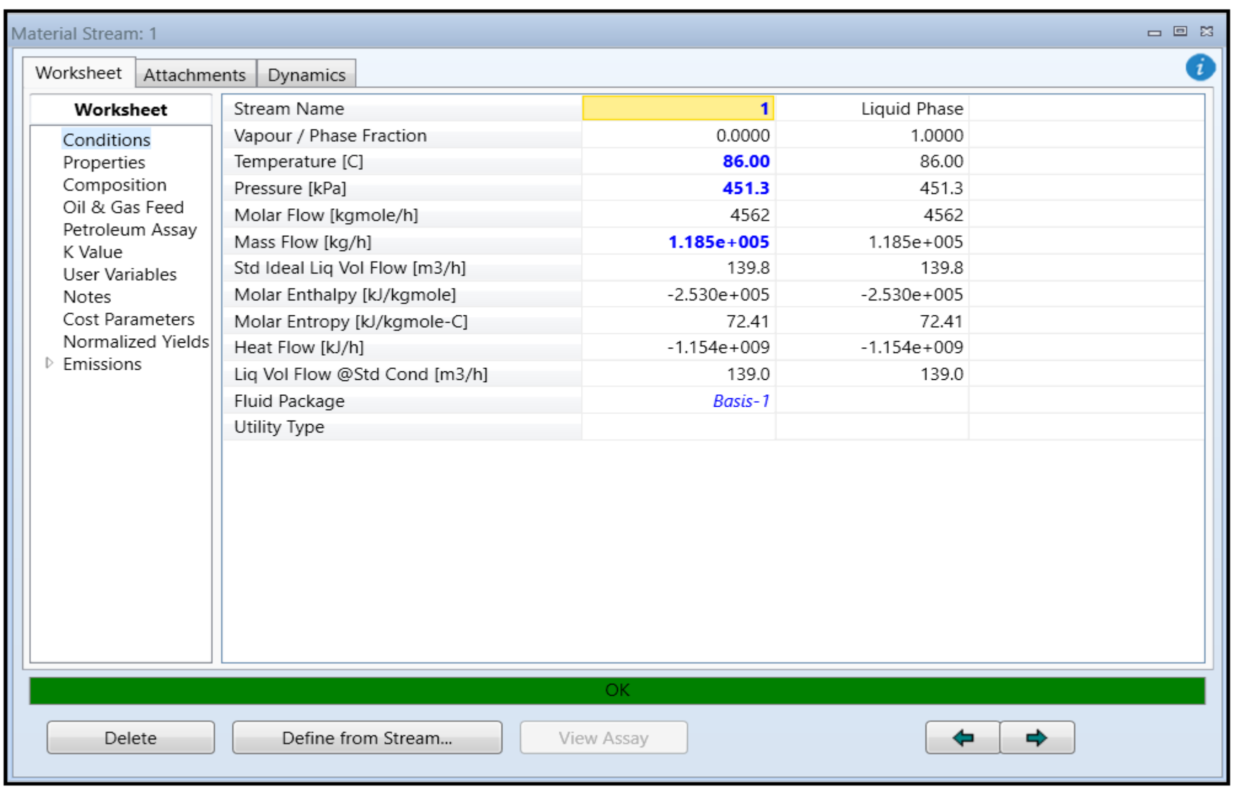
Distillation Column Sizing

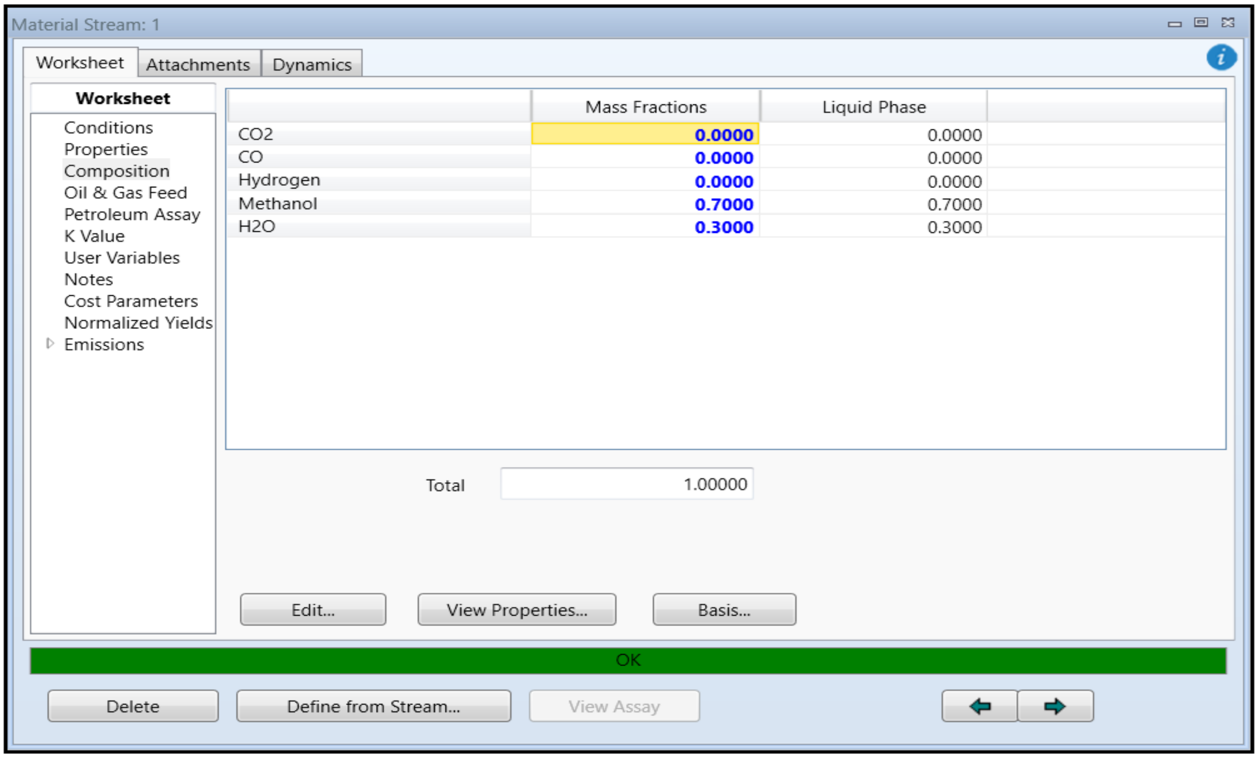
Example: Simulate and size a distillation column for the methanol + water mixture with the following condition:

Flowrate – kg/hr.	118484
Composition	Methanol 0.7 Water 0.3
Temperature- C	86
Pressure-barg	3.5

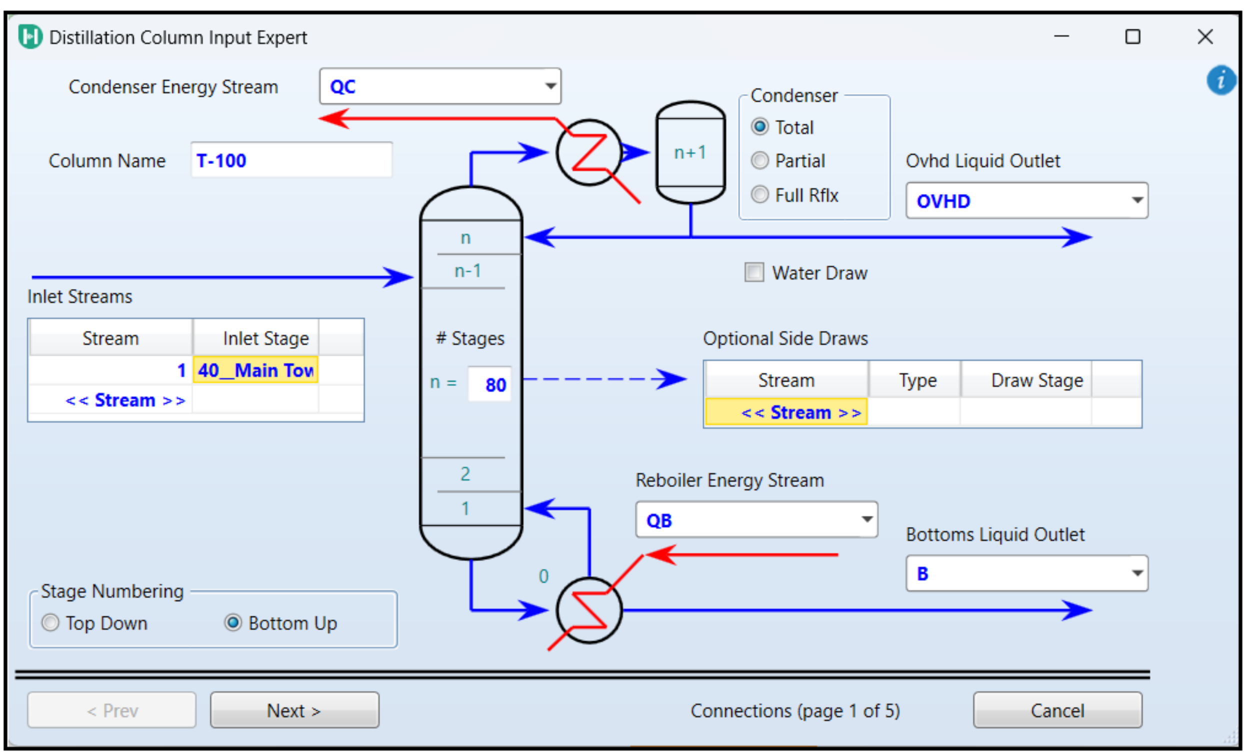
Steps to be taken:

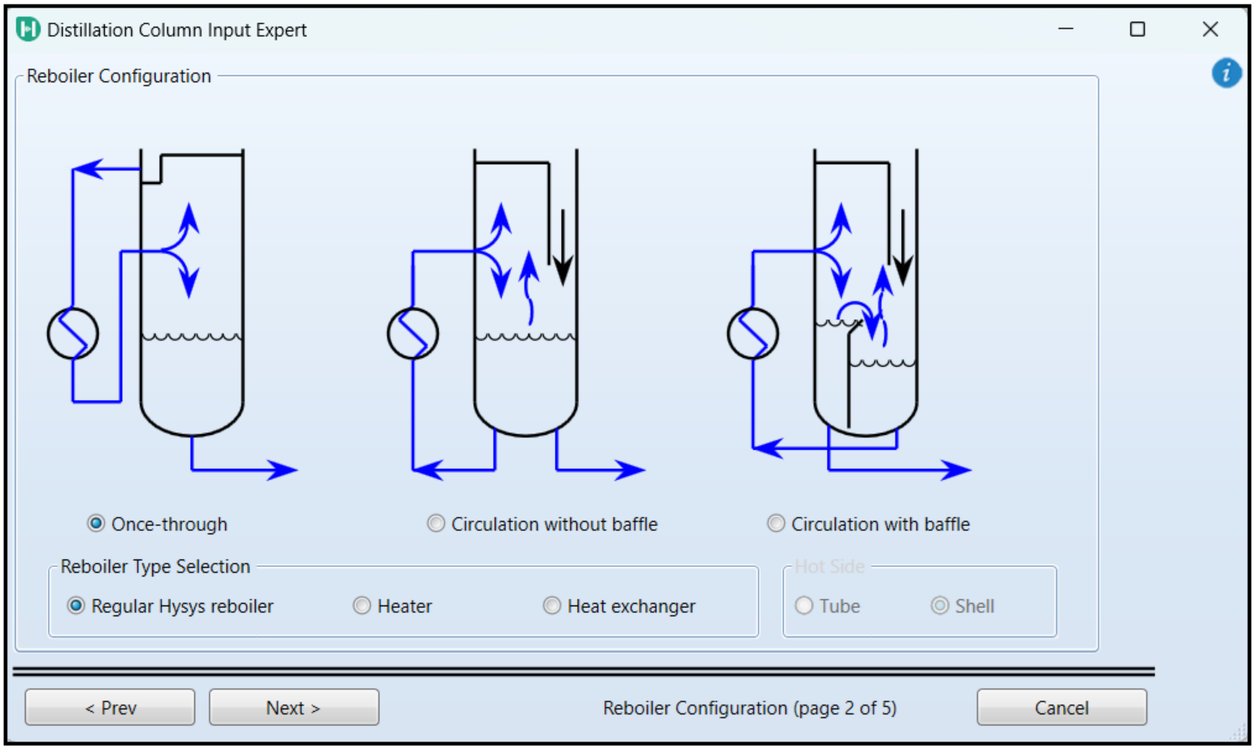
1.Add water and methanol to the component list.
2.Select NRTL as the fluid package
3.Enter Simulation Environment and define the stream with the above conditions.

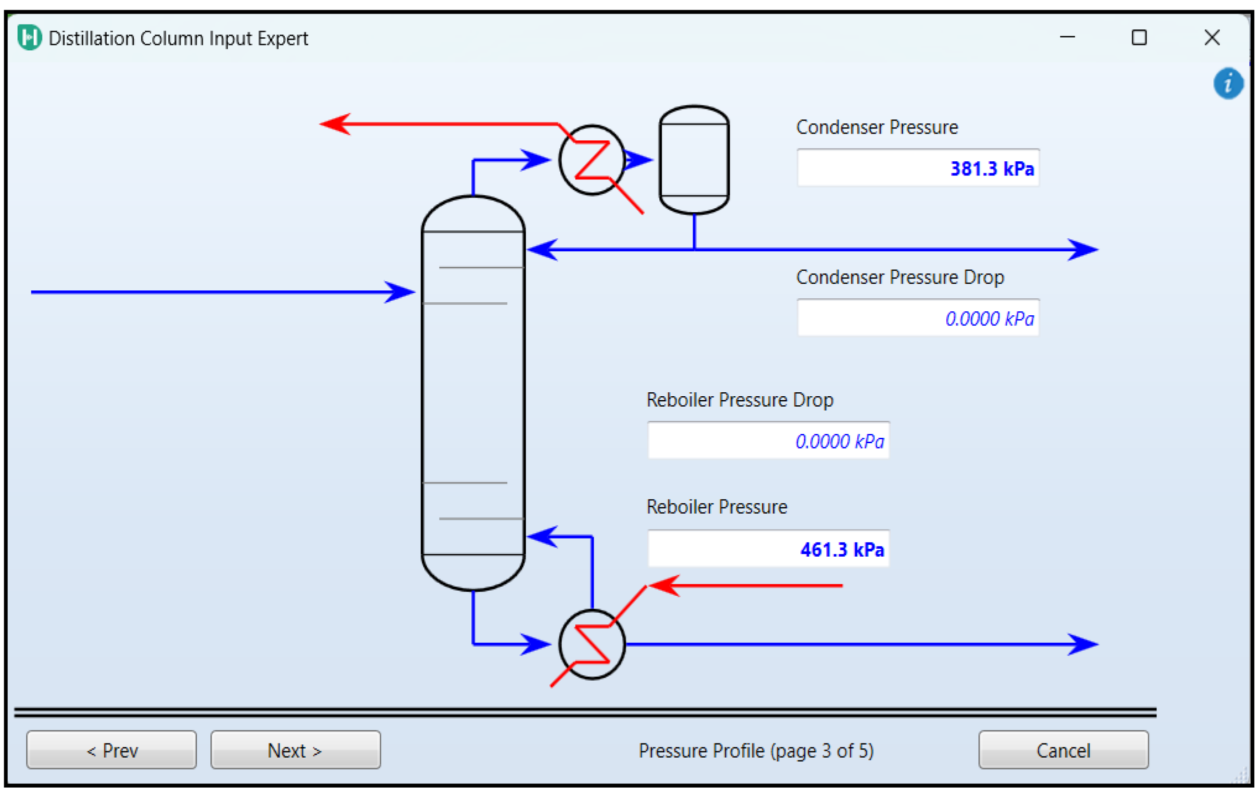


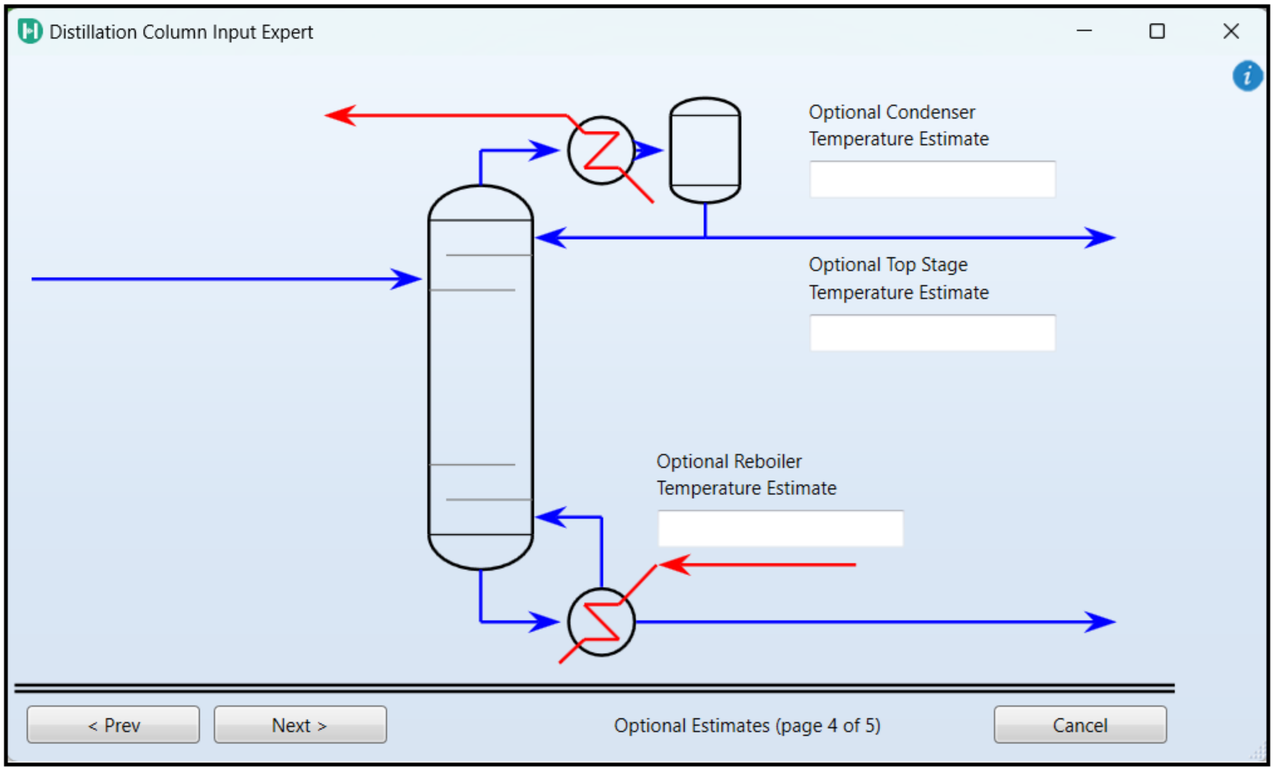


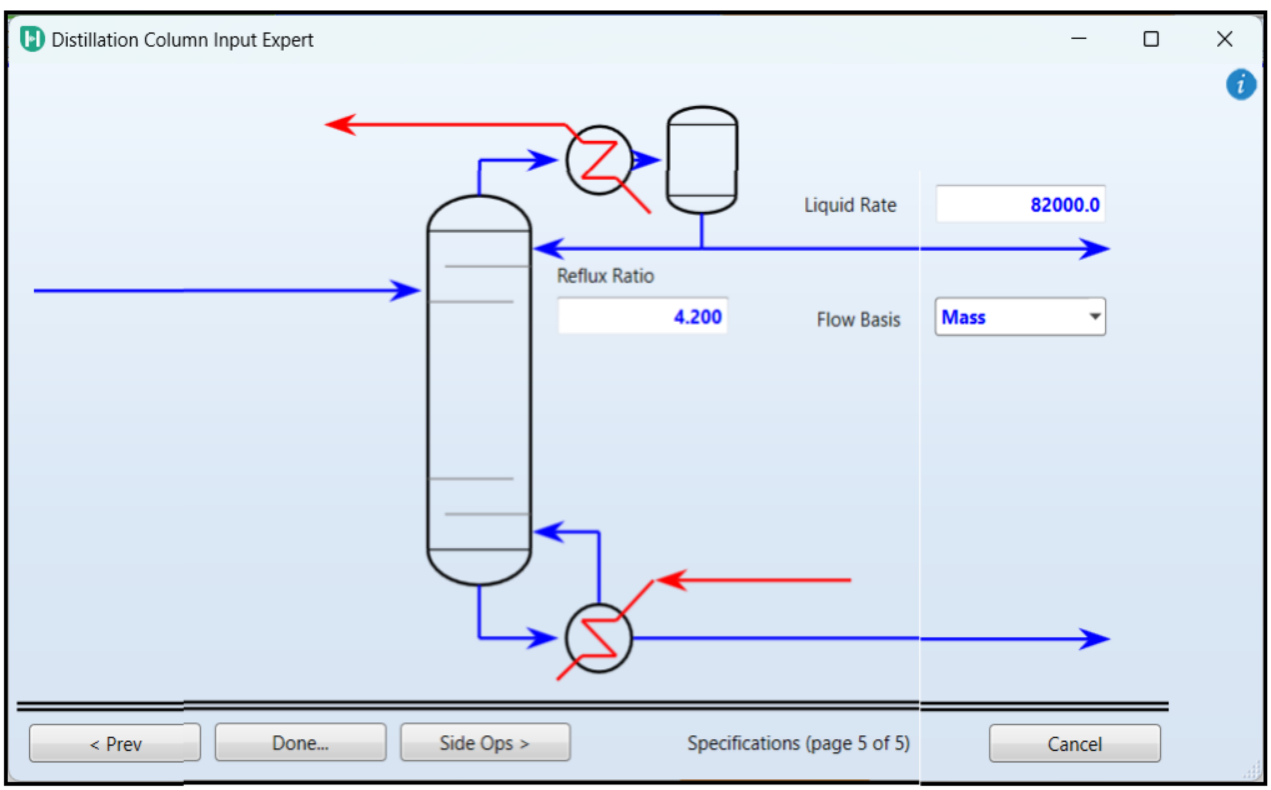
4.Add a distillation column and act like below:

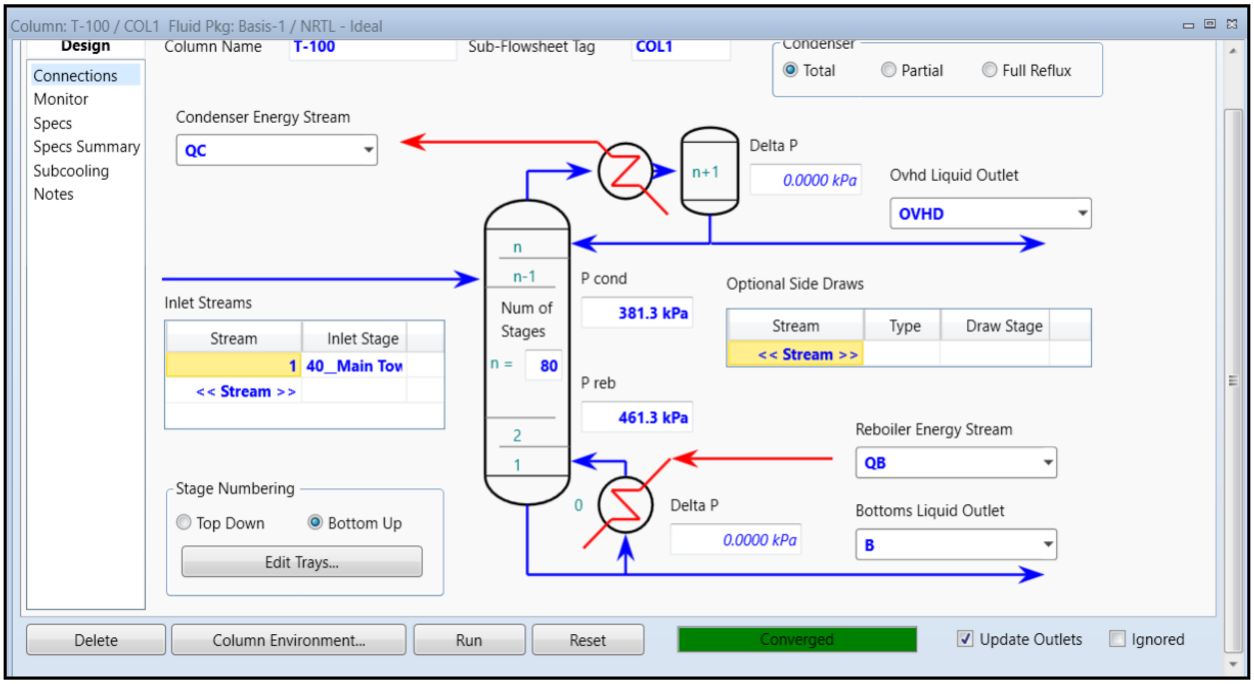



Distillation Column Input Expert
Reboiler Configuration
Once-through
Circulation without baffle
Circulation with baffle
Reboiler Type Selection
Regular Hysys reboiler
Heater
Heat exchanger
Hot Side
Tube
Shell
< Prev
Next >
Reboiler Configuration (page 2 of 5)
Cancel

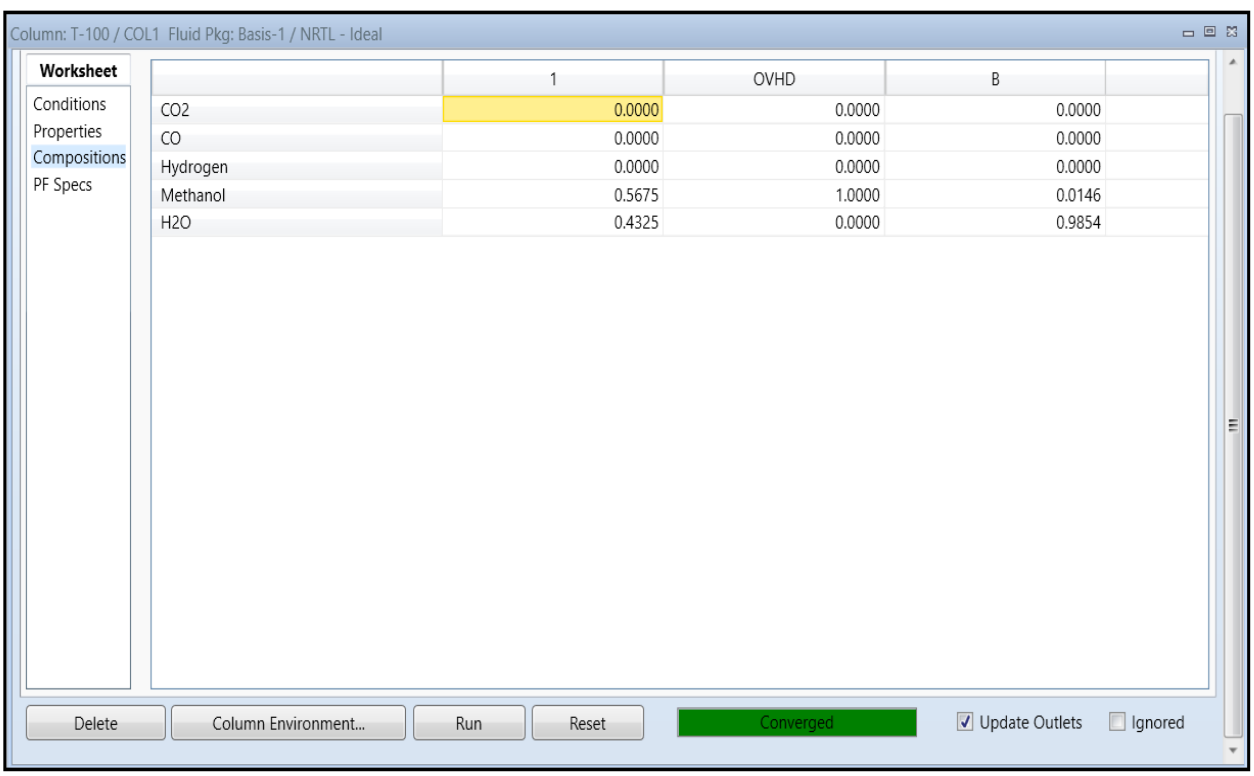

Distillation Column Input Expert
Condenser Pressure
381.3 kPa
Condenser Pressure Drop
0.0000 kPa
Reboiler Pressure Drop
0.0000 kPa
Reboiler Pressure
461.3 kPa
< Prev
Next >
Pressure Profile (page 3 of 5)
Cancel


Distillation Column Input Expert
Optional Condenser Temperature Estimate
Optional Top Stage Temperature Estimate
Optional Reboiler Temperature Estimate
< Prev
Next >
Optional Estimates (page 4 of 5)
Cancel

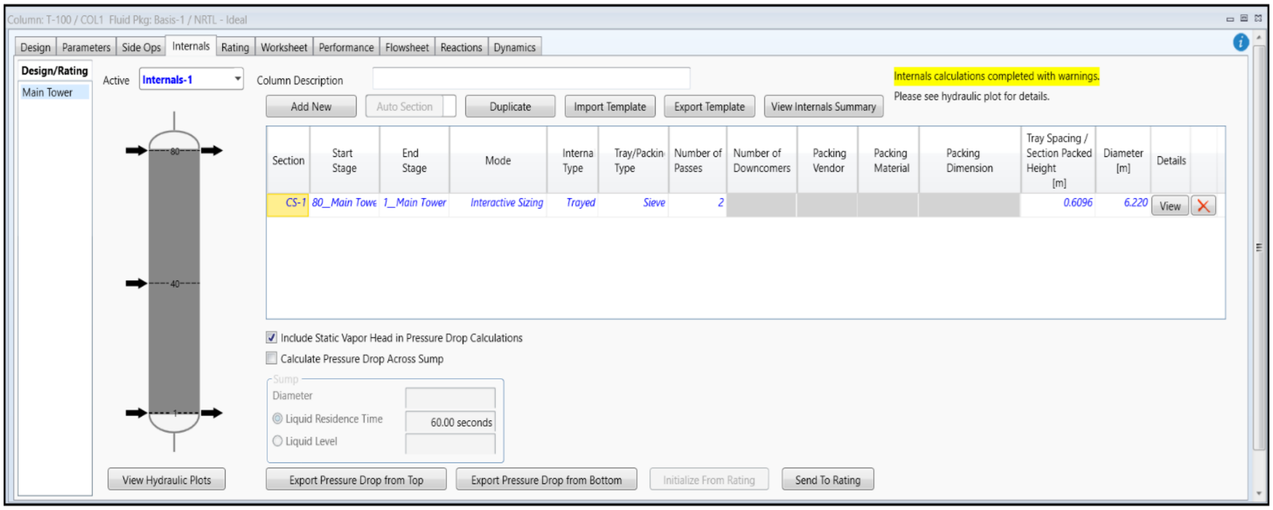

Distillation Column Input Expert
Liquid Rate
82000.0
Reflux Ratio
4.200
Flow Basis
Mass
< Prev
Done...
Side Ops >
Specifications (page 5 of 5)
Cancel



Based on Worksheet/composition, the separation has been perfect.

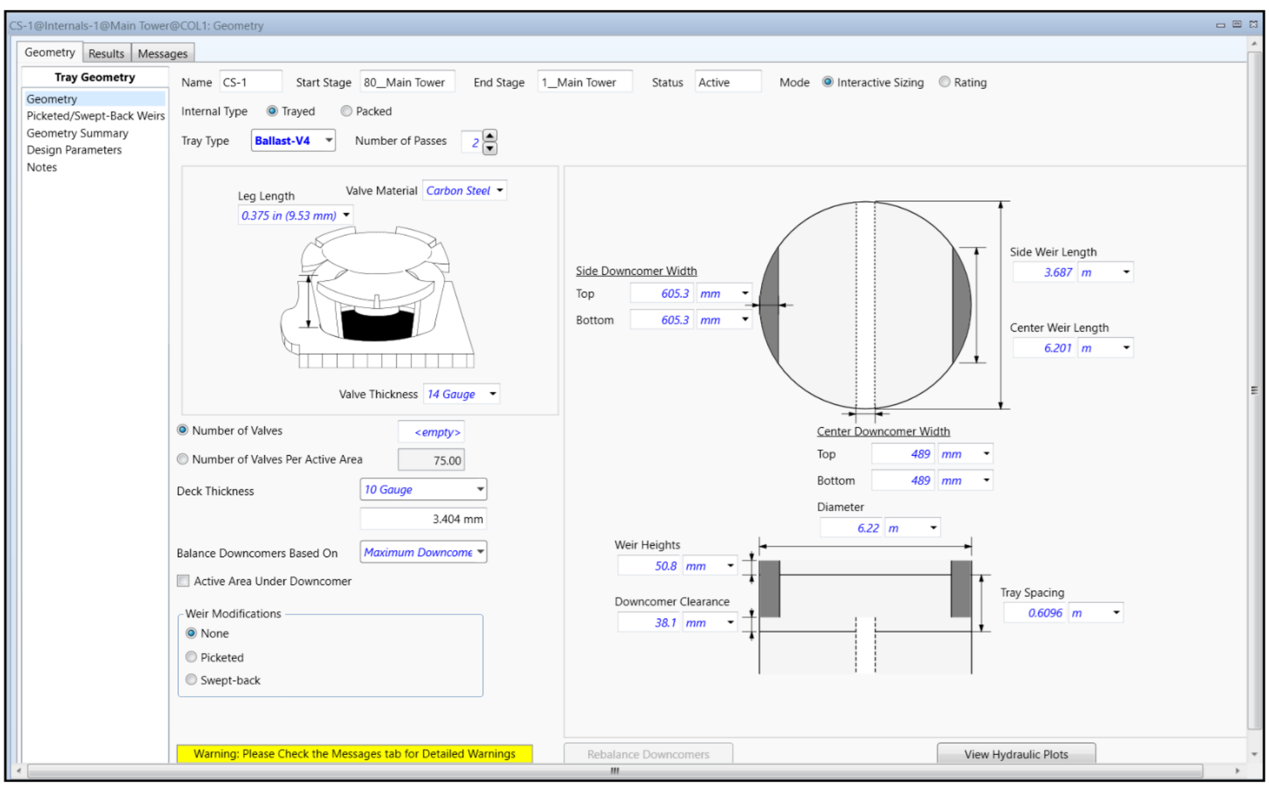


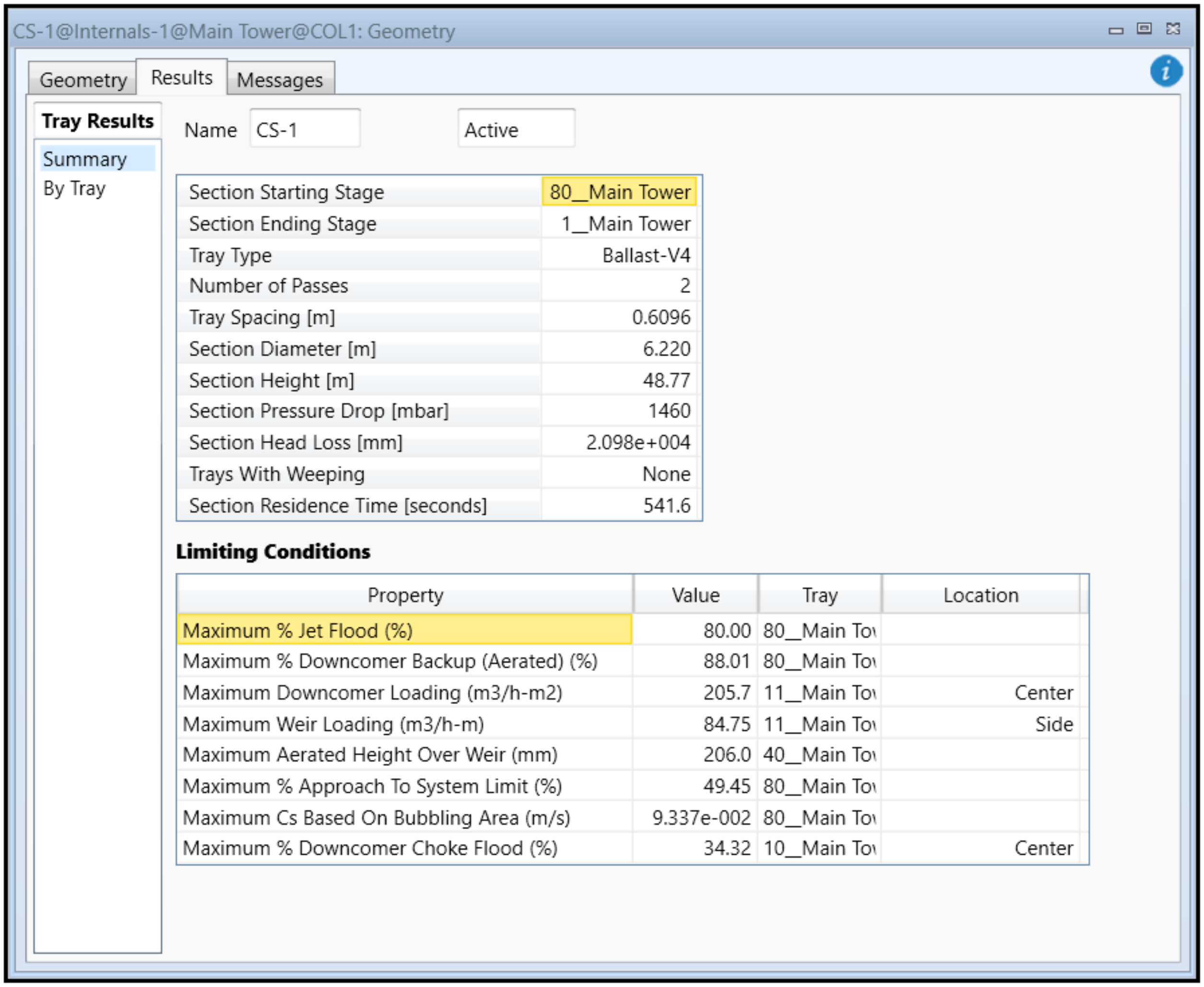
5.Go to Internals and add new.



The moment we create one, the diameter is calculated.

6. Click view and see how you can change the geometry.





Under result, we see that the diameter calculated by Aspen Hysys is 6.22 m. As stated, before it is recommended to see how such tower is designed using KG Tower and excel-sheet. Here is the comparison between KG method's result, Aspen Hysys result, excel result and licensor's result.

Licensor	Excel-sheet	KG Tower	Aspen Hysys
6350 mm	6140 mm	6332 mm	6220 mm

Now let's focus on the tower height:

To see how Aspen Hysys calculates the height let's do it manually; we know that the tray spacing is 0.6096 m and since we have 80 trays, the height between first tray and last tray would be:

Height = $(80-1) \times 0.6096 = 48.15$ m

Assuming that the feed tray has the same tray spacing of 0.6096 m. Such assumption is not exact and is one of the reasons why there is a difference of 0.5 m. Nonetheless, the difference is negligent.

Neither calculation by Aspen Hysys or manual approach is right since they do not take into account bottom height or spacing above first tray.

Total Height = H1 + H2 + H3

The problem arises from the fact Aspen Hysys simply neglects

H1 and H3.