

Separator Sizing in Aspen Hysys



Example 1: Size a horizontal separator whose function is to separate dissolved gas from methanol. Here is the condition of the separator:

Flowrate	246700	Kg/hr
Operating Pressure	4	barg
Operating Temperature	47	С
Composition	Methanol 79.53%, Water 18.65% CO ₂ 0.7%, H ₂ 0.7%, CH ₄ 0.1%	Mol%
Fluid Package	PR	



Simulation and sizing in Aspen Hysys

Steps to be taken:

- 1.Add Methanol, Water, CO_2 , H_2 , CH_4
- 2.Select PR as the fluid package
- 3.Enter simulation environment and define the stream 4, select a separator, change its icon.
- 4.Define stream 5 and 6 as the outlets

Vorksheet Attachm	ents Dynamics			
Worksheet	Stream Name	4	Vapour Phase	Liquid Phase
Conditions	Vapour / Phase Fraction	0.0099	0.0099	0.9901
Properties	Temperature [C]	48.00	48.00	48.00
Composition	Pressure [kPa]	501.3	501.3	501.3
Oil & Gas Feed	Molar Flow [kgmole/h]	8424	83.20	8341
Petroleum Assay K Value	Mass Flow [kg/h]	2.467e+005	1151	2.455e+005
User Variables	Std Ideal Liq Vol Flow [m3/h]	304.3	2.942	301.3
Notes	Molar Enthalpy [kJ/kgmole]	-2.478e+005	-1.039e+005	-2.492e+005
Cost Parameters	Molar Entropy [kJ/kgmole-C]	35.60	131.7	34.64
Normalized Yields	Heat Flow [kJ/h]	-2.087e+009	-8.641e+006	-2.079e+009
Emissions	Liq Vol Flow @Std Cond [m3/h]	303.5	1965	300.1
	Fluid Package	Basis-1		
	Utility Type			



Vorksheet Attachm	ents Dynamics				
Worksheet			Mole Fractions	Vapour Phase	Liquid Phase
Conditions	Methane		0.0001	0.0083	0.0000
Properties	со		0.0000	0.0000	0.0000
Composition Oil & Gas Feed	CO2		0.0071	0.2238	0.0050
Petroleum Assay	Hydrogen		0.0071	0.6900	0.0003
K Value	H2O		0.1873	0.0030	0.1891
User Variables	Methanol		0.7984	0.0749	0.8056
Emissions					
 Emissions 		Total	100000	٦	
Emissions		Total	1.00000		
Emissions	Edit	Total View Prop			

5.Simulation output

Design Reacti	ions Rating Worksheet Dynamics				
Worksheet	Name	4	6	5	
Conditions	Vapour	0.0099	0.0000	1.0000	
Properties	Temperature [C]	48.00	48.00	48.00	
Composition	Pressure [kPa]	501.3	501.3	501.3	
PF Specs	Molar Flow [kgmole/h]	8424	8341	83.20	
	Mass Flow [kg/h]	2.467e+005	2.455e+005	1151	
	Std Ideal Liq Vol Flow [m3/h]	304.3	301.3	2.942	
	Molar Enthalpy [kJ/kgmole]	-2.478e+005	-2.492e+005	-1.039e+005	
	Molar Entropy [kJ/kgmole-C]	35.60	34.64	131.7	
	Heat Flow [kJ/h]	-2.087e+009	-2.079e+009	-8.641e+006	



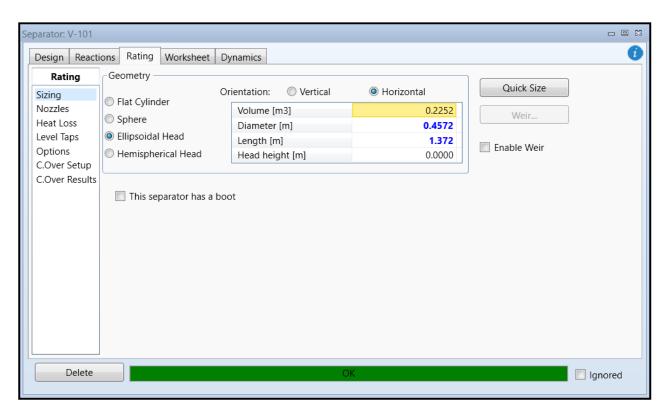
6.Now click on the separator, go to rating tab, and click on quick sizing. Also select horizontal orientation and ellipsoidal head.

Note:

Simple rule in separator design:

1.If gas flowrate to liquid flowrate is high or otherwise it is gas dominant, then we use vertical separator.

2.If liquid flowrate to gas flowrate is high or otherwise it is liquid dominant, then we use horizontal separator.





7. Under Home, click on Equipment Design and select vessel sizing.

Flowsheet Case (Ma	in) - Solver Acti	/e × Vessel Sizing: Vessel Sizing	1-1× +				•
Design Performan	ce						()
Design	Name	Vessel Sizing-1		Select Separator		- 0 ×	
Connections				Flowsheet	Object	0	
Sizing Construction	Separator		Select Separator	Case (Main)	V-100 V-101	Object Filter	
Costing						All	
Notes						Streams	
						O UnitOps	
	1	Horizontal				 Logicals ColumnOps 	
		Vertical	Set Defaults			© Custom	
	1		·				
		<u>ц</u>				Custom	
						Disconnect	
						ОК	
				Requires a Vessel			
				Nequiles a vessel			
Delete							Ignored

8. The moment you click OK, the separator is sized. To see the result, go to Performance tab.

Flowsheet Case (N	Main) - Solver Active × Vessel Sizing: V	essel Sizing-V-101-1 $ imes$			
Design Perform	ance				
Performance	Sizing Results				
Sizing Results	Diameter [m]	2.134			
/apour Space	Total Length [m]	11.73			
	L/D Ratio	5.000			
	Max. Allow. Vap. Velocity [m/s]	0.3698			
	Demister Thickness [mm]	-0.0000			
	Liq. Residence Time [seconds]	000:05:0.00			
	Liq. Surge Height [m]	7.467			
	LLSD [m]	0.9144			
	Liq. Res. Time at LLSD [seconds]	000:00:30.32			
Delete			DK		Ignore

Based on the result, the diameter is 2.13 m and the length is 11.73 m.



9.To see the assumption taken by Aspen Hysys, go to Design/Sizing tab.

Flowsheet Ca	se (Main) - Solver Active × Vessel	izing: Vessel Sizing-V-101-1 × +	
Design Perf	ormance		
Design Connections Sizing Construction Costing Notes	Available Specifications Max. Vap. Velocity Diameter Demister Thickness Liq. Surge Height LISD Nozz. To Demister Tot. Length - Height Add Spec	Active Specifications U/D Ratio 5.000 U/D, Res. Time 00:00:50:00 ser Demister to Top 0.3048 m	
Delet	te		

Based on experience, the L/D ratio is high and the separator is oversized. Let's reduce the L/D to 3 which is more typical. Also, based on the literature the residence time should be changed to 2 minutes.

Flowsheet Case	e (Main) - Solver Active × Vessel Sizing: Vessel	izing-V-101-1 × +	
Design Perfo	rmance		
Design Connections Sizing Construction Costing Notes	Available Specifications Active Spec Max. Vap. Velocity Demister Thickness Liq. Surge Height LLSD Nozz. To Demister Tot. Length - Height Add Spec	ications L/D Ratio 3.000 Liq. Res. Time 000:02:0:00 sec mister to Top 0.3048 m Remove Spec	
Delete	e	UK.	Ignore



10.Let's see the optimized results.

Flowsheet Case (N	Main) - Solver Active × Vessel Sizing: Ve	essel Sizing-V-101-1 $ imes$ +	
Design Performa	ance		
Performance	Sizing Results		
Sizing Results	Diameter [m]	1.981	
Vapour Space	Total Length [m]	6.934	
	L/D Ratio	3.000	
	Max. Allow. Vap. Velocity [m/s]	0.3698	
	Demister Thickness [mm]	-0.0000	
	Liq. Residence Time [seconds]	000:02:0.00	
	Liq. Surge Height [m]	3.547	
	LLSD [m]	0.9144	
	Liq. Res. Time at LLSD [seconds]	000:00:26.59	
Delete			OK

11.Here is the comparison between Aspen Hysys, excel-sheet and licensor results.

Parameter	Svercheck	Aspen Hysys	Licensor
D	2215 mm	1981 mm	2125 mm
L	6300 mm	6934 mm	6450 mm