

Προσομοίωση Φυσικών Διεργασιών Ι με UNISIM 2024

Προσομοίωση εκτόνωσης αερίου:

Ρεύμα αιθανίου (C2) με παροχή 1 kgmole/h και θερμοκρασία 35 °C εκτονώνεται μέσω βαλβίδας από πίεση 6 bar σε πίεση 1 bar.

Fluid Package: NRTL µɛ Vapour Model: Ideal

Ποιά είναι η θερμοκρασία και η πυκνότητα του αιθανίου μετά την εκτόνωση?

Σημείωση: Η λειτουργία της βαλβίδας στο UNISIM είναι ισοενθαλπική.

Οδηγίες:

Δημιουργούμε ένα ρεύμα μάζας Components:

4 Component List View:	Component List - 1					×
Add Component	-Selected Components Ethane		Components Av. <u>M</u> atch	ailable in the Library	View Filters	
Other Comp Lists		Add Pure	OSim Name	Full Name / Synonym C1	⊖ Formula CH4	
			Propane i-Butane	C3 i-C4	C3H8 C4H10	
	< <u>.</u>	ubstitute->	n-Butane i-Pentane n-Pentane	n-04 i-C5 n-C5	C5H12 C5H12	
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Fluid Package:

4 Simulation Basis Manager		
Current Fluid Packages		Flowsheet - Fluid Pkg Associations
Basis-1 NC: 1 PP: NRTL - Ideal	View	Flowsheet Fluid Pkg To Use
	Add	
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		Default Fluid Pkg Basis-1 🗸
	Import	Fluid Pkg for New Sub-FlowSheets
	Export	Use Default Fluid Pkg Include Column Use Parent's Fluid Pkg
Components Fluid Pkgs Hypotheticals Oil Mana	ger Reactions	Component Maps User Properties
Enter <u>P</u> VT Environment		Return to Simulation Environment



Σύσταση, Πίεση, Θερμοκρασία

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Image:	File Edit Simulation Flowsheet Tools Window Help		
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F V 4			

2. Το ρεύμα αιθανίου τροφοδοτείται σε μία βαλβίδα εκτόνωσης (valve). Γι αυτό θα Case (Main)
Γι αυτό θα





4. Κάντε διπλό αριστερό κλίκ στο Valve (VLV-100) για να ενεργοποιήσετε το παράθυρο με τις ιδιότητες του.

3 NoName.usc - UniSim Design R430			- a ×
File Edit Simulation Flowsheet Tools Window Help			Environment: Case (Main)
E PFD - Case (Main) 日朔尼日報 P A A 2 物量		Case (Main)	Mode: Steady State Image: Steady Steady Steady State
✓ VLV-100 Design Name Connections Parameters User Valakes Notes Fuid Package Basic 1 Design Design Rating Voksheet Design Rating Voksheet Design Rating			 *
PFD 1			
Required Info : VLV-100 - Requires a feed stream Required Info : VLV-100 - Requires a product stream	Completed.		0
		Balance Tool	Errors



Προσομοίωση Φυσικών Διεργασιών Ι με **UNISIM 2024**

Προσομοίωση εκτόνωσης αερίου:5. Πατήστε το βελάκι στο πεδίο **Inlet** και επιλέξτε το ρεύμα «1» που είναι το ρεύμα τροφοδοσίας.

₩ VLV-100	
Design Connections Parameters	Name VLV-100
User Variables Notes	Inlet Outlet Fluid Package Basis-1
Design Rating	Worksheet Dynamics Cost
Delete	Requires a product stream

6. Για να δημιουργήσετε το ρεύμα εξόδου τοποθετήστε το δρομέα του ποντικιού στο πεδίο Outlet και πληκτρολογήστε 2 και Enter.

ΓΑΝΕΠΕΤΗΜΟΤΙΜΕ Τμήμα Τμήμα Χημικών Μηχανικά * VLV-100	Προσομοίωση Φυσικών Διεργασιών Ι με UNISIM 2024 Προσομοίωση εκτόνωσης αερίου:	
Design Connections Parameters	Name VLV-100	
User Variables Notes	Injet Outlet 2 Fluid Package Basis-1	
Design Rating	Worksheet Dynamics Cost Unknown Delta P	

 Τώρα μεταβείτε στο Φύλλο Parameters στο οποίο παρατηρούμε ότι περιλαμβάνεται 1 παράμετρος: η πτώση πίεσης (Delta P= P_{inlet} -P_{outlet}).

ΠΑΝΕΠΙΣΤΗΜΟ ΠΑΤΡΩΝ Τμήμα Χημικών ChemEnt[UP	Προσομοίωση Φυσικών Διεργασιών Ι με UNISIM 2024 Προσομοίωση εκτόνωσης αερίου:	
Design Connections Parameters User Variables Notes	Pressure Drop Parameters Delta P <empty> User Specified OP-F Relation</empty>	
Design Rating Delete	Worksheet Dynamics Cost Unknown Delta P	Ignored

8. Εφόσον το ρεύμα της τροφοδοσίας έχει οριστεί πλήρως, **μόνο η πτώση πίεσης** πρέπει να καθοριστεί για την βαλβίδα ώστε να ολοκληρωθούν οι υπολογισμοί.

₩ VLV-100		
Design Connections Parameters User Variables Notes	Pressure Brop Parameters Delta P 500,000 kPa User Specified P - F Relation	
Design Rating	Worksheet Dynamics Cost	
Delete	UK	



Προσομοίωση Φυσικών Διεργασιών Ι με UNISIM 2024

Προσομοίωση εκτόνωσης αερίου:

9. Παρατηρούμε ότι το πρόγραμμα ολοκλήρωσε τους υπολογισμούς. Διαβάζουμε την πυκνότητα του ρεύματος εξόδου 2 επιλέγουμε την καρτέλα Worksheet, όπου βλέπουμε ότι η θερμοκρασία του αιθανίου μετά την εκτόνωση παραμένει ίδια.

•	✓ VLV-100				
	Worksheet	Name	1	2	
	Conditions	Vapour	1,0000	1,0000	
	Conditions	Temperature [C]	35,00	35,00	
	Properties	Pressure [bar]	6,000	1,000	
	Composition	Molar Flow [kgmole/h]	1,000	1,000	
	PE Specs	Mass Flow [kg/h]	1,0000 1,0000 re [C] 35,00 35,00 var] 6,000 1,000 [kgmole/h] 1,000 1,000 [kg/h] 30,07 30,07 iq Vol Flow [m3/h] 8,454e-002 8,454e-002 alpy [kJ/kgmole] -8,420e+004 -8,420e+004 xpy [kJ/kgmole-C] 220,7 235,6 [kW] -23,39 -23,39 alpo [kJ/kgmole-C] 220,7 235,6 [kW] -23,39 -23,39 alpo [kJ/kgmole-C] 20,7 235,6 [kw] -23,39 -23,39		
	11 00000	Std Ideal Liq Vol Flow [m3/h]	8,454e-002	8,454e-002	
		Molar Enthalpy [kJ/kgmole]	-8,420e+004	-8,420e+004	
		Molar Entropy [kJ/kgmole-C]	220,7	235,6	
		Heat Flow [kW]	-23,39	-23,39	
		Name 1 2 Vapour 1,0000 1,0000 Temperature [C] 35,00 35,00 Pressure [bar] 6,000 1,000 Molar Flow [kgmole/h] 1,000 1,000 Mass Flow [kg/h] 30,07 30,07 Std Ideal Liq Vol Flow [m3/h] 8,454e-002 8,454e-002 Molar Enthalpy [kJ/kgmole] -8,420e+004 -8,420e+004 Molar Enthalpy [kJ/kgmole] -8,420e+004 -8,420e+004 Molar Entropy [kJ/kgmole] -23,39 -23,39 Heat Flow [kW] -23,39 -23,39 Image: Worksheet Dynamics Cost			
		, , ,		1	
,	Design Rating	Worksheet Dynamics Cost			
	Delete		OK		Ignored

Για να δούμε την πυκνότητα πατάμε το κουμπί **Properties,** όπου διαβάζουμε την τιμή **1,174 kg/m**³

WORSheet	Name	1	2	/
onditions	Molecular Weight	30,07	30,07	
onakions	Molar Density [kgmole/m3]	0,2342	3,903e-002	
roperties	Mass Density [kg/m3]	7,042	1,174	
omposition	Act. Volume Flow [m3/h]	4,270	25,62	
E Space	Mass Enthalpy [kJ/kg]	-2800	-2800	
i opecs	Mass Entropy [kJ/kg-C]	7,340	7,836	
	Heat Capacity [kJ/kgmole-C]	53,97	53,97	
	Mass Heat Capacity [kJ/kg-C]	1,795	1,795	
	Lower Heating Value [kJ/kgmole]	1,429e+006	1,429e+006	
	Mass Lower Heating Value [kJ/kg]	4,751e+004	4,751e+004	
	Phase Fraction [Vol. Basis]	<empty></empty>	<empty></empty>	
	Phase Fraction [Mass Basis]	4,941e-324	4,941e-324	
	Partial Pressure of CO2 [bar]	0,0000	0,0000	
	Cost Based on Flow [Cost/s]	0,0000	0,0000	
	Act. Gas Flow [ACT_m3/h]	4,270	25,62	
	Avg. Liq. Density [kgmole/m3]	11,83	11,83	