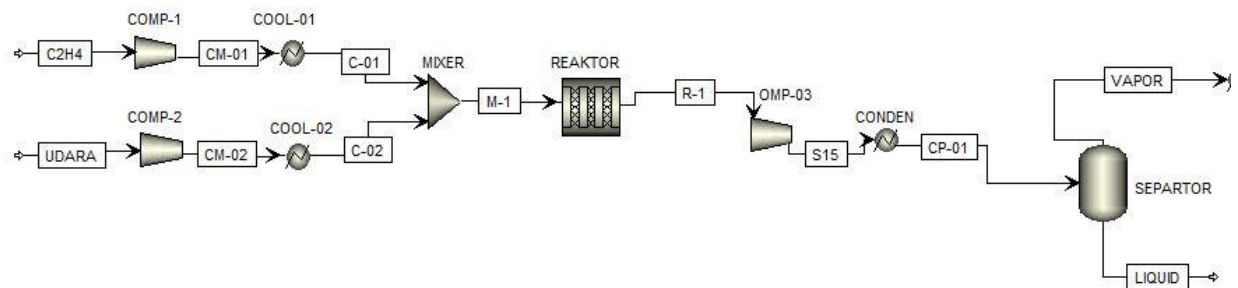


LAMPIRAN B

LAMPIRAN ASPEN PLUS

Aspen Plus merupakan sebuah *software* canggih yang dapat digunakan hampir setiap aspek rekayasa proses mulai dari tahap desain untuk analisis biaya dan profitabilitas. *Aspen plus* dapat mengubah sebuah spesifikasi seperti lembar konfigurasi, aliran operasi, kondisi dan komposisi yang mana data tersebut untuk menjalankan sebuah kasus baru dan menganalisis alternatif proses. *Aspen plus* juga memungkinkan untuk melakukan berbagai tugas-tugas seperti estimasi dan reduksi sifat fisik, menghasilkan hasil output grafis, data proses yang cocok untuk model simulasi, mengoptimalkan proses dan menampilkan hasil lembar kerja.



Hasil simulasi *Aspen Plus* dari proses Asetaldehid pada setiap alat yaitu :

1. Kompresor 1

Substream: MIXED		
Mole Flow kmol/hr	C2H4	CM-01
ETHYLENE	75,50574	75,50574
OXYGEN	0	0
NITROGEN	0	0
ACETA-01	0	0
ETHAN-01	0,7534177	0,7534177
Mass Flow kg/hr		
ETHYLENE	2118,22	2118,22
OXYGEN	0	0
NITROGEN	0	0

ACETA-01	0	0
ETHAN-01	22,655	22,655
Total Flow kmol/hr	76,25916	76,25916
Total Flow kg/hr	2140,875	2140,875
Total Flow l/hr	1890710	368285
Temperature C	29	197,6881
Pressure atm	1	8
Vapor Frac	1	1
Liquid Frac	0	0
Solid Frac	0	0
Enthalpy cal/mol	12261,41	14351,56
Enthalpy cal/gm	436,7581	511,2104
Enthalpy kcal/hr	935045	1094440
Entropy cal/mol-K	-12,79836	-11,49683
Entropy cal/gm-K	-0,4558846	-0,4095233
Density mol/cc	4,03E-05	0,000207066
Density gm/cc	0,00113231	0,00581309
Average MW	28,07368	28,07368
Liq Vol 60F l/hr	6460,036	6460,036

2. Kompresor 2

Substream: MIXED		
Mole Flow kmol/hr	UDARA	CM-02
ETHYLENE	0	0
OXYGEN	37,75938	37,75938
NITROGEN	141,9735	141,9735
ACETA-01	0	0
ETHAN-01	0	0
Mass Flow kg/hr		
ETHYLENE	0	0
OXYGEN	1208,255	1208,255
NITROGEN	3977,172	3977,172
ACETA-01	0	0

ETHAN-01	0	0
Total Flow kmol/hr	179,7329	179,7329
Total Flow kg/hr	5185,427	5185,427
Total Flow l/hr	4456160	1168040
Temperature C	29	360,4436
Pressure atm	1	8
Vapor Frac	1	1
Liquid Frac	0	0
Solid Frac	0	0
Enthalpy cal/mol	27,8735	2387,494
Enthalpy cal/gm	0,9661277	82,7533
Enthalpy kcal/hr	5009,784	429111
Entropy cal/mol-K	1,113731	2,238992
Entropy cal/gm-K	0,0386031	0,077606
Density mol/cc	4,03E-05	0,000153875
Density gm/cc	0,00116365	0,00443941
Average MW	28,85074	28,85074
Liq Vol 60F l/hr	9626,098	9626,098

3. Cooler 1

Substream: MIXED		
Mole Flow kmol/hr	CM-01	C-01
ETHYLENE	75,50574	75,50574
OXYGEN	0	0
NITROGEN	0	0
ACETA-01	0	0

ETHAN-01	0,7534177	0,7534177
Mass Flow kg/hr		
ETHYLENE	2118,22	2118,22
OXYGEN	0	0
NITROGEN	0	0
ACETA-01	0	0
ETHAN-01	22,655	22,655
Total Flow kmol/hr	76,25916	76,25916
Total Flow kg/hr	2140,875	2140,875
Total Flow l/hr	368285	291875
Temperature C	197,6881	100
Pressure atm	8	8
Vapor Frac	1	1
Liquid Frac	0	0
Solid Frac	0	0
Enthalpy cal/mol	14351,56	13058,67
Enthalpy cal/gm	511,2104	465,1569
Enthalpy kcal/hr	1094440	995843
Entropy cal/mol-K	-11,49683	-14,56422
Entropy cal/gm-K	-0,4095233	-0,5187856
Density mol/cc	0,000207066	0,000261274
Density gm/cc	0,00581309	0,00733492
Average MW	28,07368	28,07368
Liq Vol 60F l/hr	6460,036	6460,036

4. Cooler 2

Substream: MIXED		
Mole Flow kmol/hr	CM-02	C-02
ETHYLENE	0	0
OXYGEN	37,75938	37,75938
NITROGEN	141,9735	141,9735
ACETA-01	0	0
ETHAN-01	0	0
Mass Flow kg/hr		
ETHYLENE	0	0
OXYGEN	1208,255	1208,255
NITROGEN	3977,172	3977,172
ACETA-01	0	0
ETHAN-01	0	0
Total Flow kmol/hr	179,7329	179,7329
Total Flow kg/hr	5185,427	5185,427
Total Flow l/hr	1168040	687910
Temperature C	360,4436	100
Pressure atm	8	8
Vapor Frac	1	1
Liquid Frac	0	0
Solid Frac	0	0
Enthalpy cal/mol	2387,494	523,8583
Enthalpy cal/gm	82,7533	18,15753
Enthalpy kcal/hr	429111	94154,56
Entropy cal/mol-K	2,238992	-1,541474
Entropy cal/gm-K	0,077606	-0,0534292
Density mol/cc	0,000153875	0,000261274

Density gm/cc	0,00443941	0,00753794
Average MW	28,85074	28,85074
Liq Vol 60F l/hr	9626,098	9626,098

5. Mixer

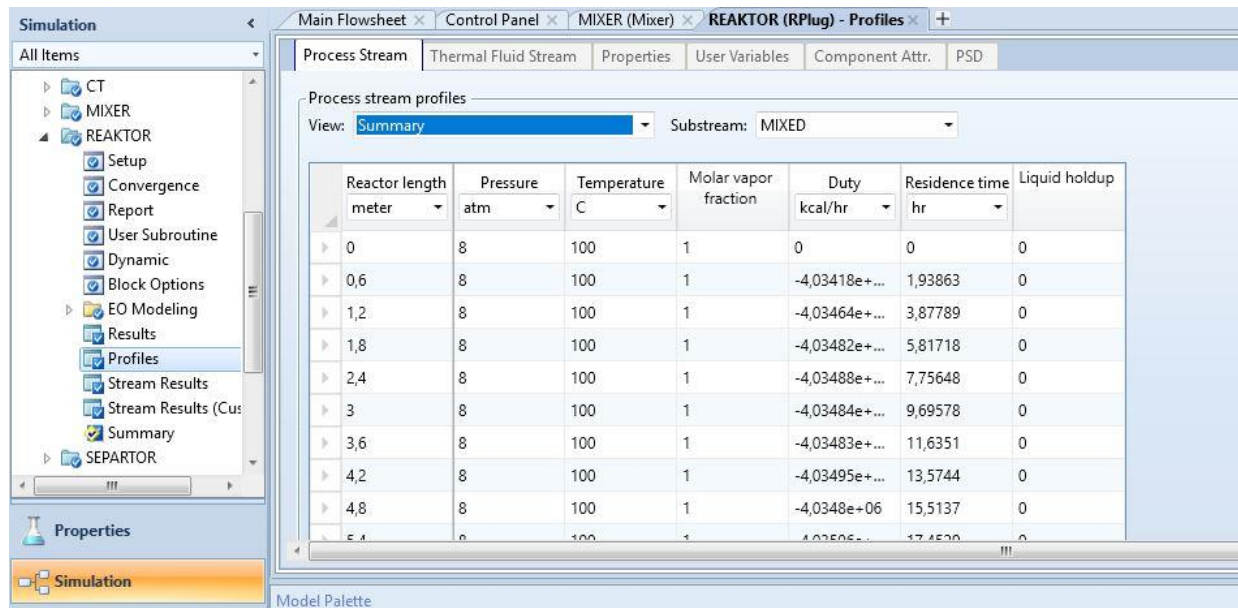
Substream: MIXED	C-01	C-02	M-01
Mole Flow kmol/hr			
ETHYLENE	75,50574	0	75,50574
OXYGEN	0	37,75938	37,75938
NITROGEN	0	141,9735	141,9735
ACETA-01	0	0	0
ETHAN-01	0,7534177	0	0,7534177
Mass Flow kg/hr			
ETHYLENE	2118,22	0	2118,22
OXYGEN	0	1208,255	1208,255
NITROGEN	0	3977,172	3977,172
ACETA-01	0	0	0
ETHAN-01	22,655	0	22,655
Total Flow kmol/hr	76,25916	179,7329	255,9921
Total Flow kg/hr	2140,875	5185,427	7326,302
Total Flow l/hr	291875	687910	979785
Temperature C	100	100	99,99996
Pressure atm	8	8	8
Vapor Frac	1	1	1
Liquid Frac	0	0	0
Solid Frac	0	0	0
Enthalpy cal/mol	13058,67	523,8583	4257,935
Enthalpy cal/gm	465,1569	18,15753	148,7787
Enthalpy kcal/hr	995843	94154,56	1090000
Entropy cal/mol-K	-14,56422	-1,541474	-4,211385
Entropy cal/gm-K	-0,5187856	-0,0534292	-0,1471522
Density mol/cc	0,000261274	0,000261274	0,000261274
Density gm/cc	0,00733492	0,00753794	0,00747746
Average MW	28,07368	28,85074	28,61926
Liq Vol 60F l/hr	6460,036	9626,098	16086,13

6. Reaktor

Setelah semua lengkap melakukan kembali RUN untuk mengetahui hasil keluaran dan untuk melihat apakah ada tidaknya eror. Setelah RUN berhasil maka hasil dari stream result yaitu sebagai berikut:

Substream: MIXED		
Mole Flow kmol/hr	M-01	R-01
ETHYLENE	75,50574	0
OXYGEN	37,75938	0,00193663
NITROGEN	141,9735	141,9735
ACETA-01	0	75,5149
ETHAN-01	0,7534177	0,7534177
Mass Flow kg/hr		
ETHYLENE	2118,22	0
OXYGEN	1208,255	0,0619696
NITROGEN	3977,172	3977,172
ACETA-01	0	3326,67
ETHAN-01	22,655	22,655
Total Flow kmol/hr	255,9921	218,2438
Total Flow kg/hr	7326,302	7326,559
Total Flow l/hr	979785	835307
Temperature C	99,99996	99,99996
Pressure atm	8	8
Vapor Frac	1	1
Liquid Frac	0	0
Solid Frac	0	0
Enthalpy cal/mol	4257,935	-13495,43
Enthalpy cal/gm	148,7787	-402,0022
Enthalpy kcal/hr	1090000	-2945300
Entropy cal/mol-K	-4,211385	-10,04326
Entropy cal/gm-K	-0,1471522	-0,2991689
Density mol/cc	0,000261274	0,000261274
Density gm/cc	0,00747746	0,0087711
Average MW	28,61926	33,57053
Liq Vol 60F l/hr	16086,13	11917,87

Sedangkan untuk hasil dari profiles reaktor yaitu :



a. View summary

Reactor length meter	Pressure atm	Temperature C	Molar vapor fraction	Duty kcal/hr	Residence time hr	Liquid holdup
0	8	99,9999634	1	0	0	0
0,6	8	99,9999634	1	-4034175,02	1,9386277	0
1,2	8	99,9999634	1	-4034642,79	3,87789061	0
1,8	8	99,9999634	1	-4034822,08	5,81718457	0
2,4	8	99,9999634	1	-4034877,95	7,75647913	0
3	8	99,9999634	1	-4034838,9	9,69578143	0
3,6	8	99,9999634	1	-4034833,61	11,6350756	0
4,2	8	99,9999634	1	-4034953,52	13,5743667	0
4,8	8	99,9999634	1	-4034795,33	15,5136684	0
5,4	8	99,9999634	1	-4035060,76	17,4529426	0
6	8	99,9999634	1	-4035290,27	19,3921989	0

b. View molar composition

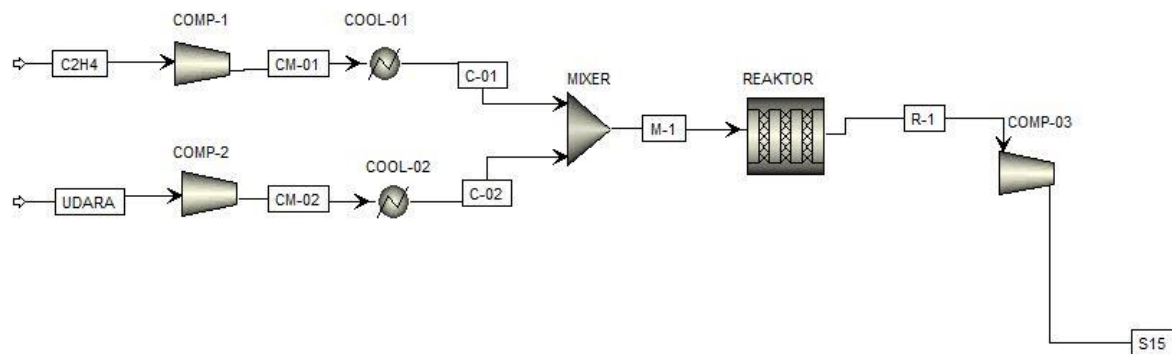
Length meter	ETHYLENE	OXYGEN	NITROGEN	ACETA-01	ETHAN-01
0	0,294953	0,147502176	0,55460123	0	0,002943129
0,6	6,42E-05	6,19E-05	0,65051999	0,345901739	0,003452146
1,2	2,41E-05	4,19E-05	0,65053304	0,345948785	0,003452215
1,8	8,70E-06	3,42E-05	0,65053804	0,345966817	0,003452242
2,4	3,91E-06	3,18E-05	0,6505396	0,345972437	0,00345225

3	7,26E-06	3,35E-05	0,65053851	0,345968509	0,003452244
3,6	7,72E-06	3,37E-05	0,65053836	0,345967977	0,003452244
4,2	0	2,81E-05	0,65053976	0,345979858	0,003452251
4,8	1,10E-05	3,53E-05	0,65053729	0,345964127	0,003452238
5,4	0	2,20E-05	0,65053577	0,345990003	0,00345223
6	0	8,87E-06	0,65052723	0,346011712	0,003452185

c. View massa composition

Length meter	ETHYLENE	OXYGEN	NITROGEN	ACETA-01	ETHAN-01
0	0,289125	0,164920174	0,54286214	0	0,003092283
0,6	5,36E-05	5,90E-05	0,54286214	0,453932896	0,003092283
1,2	2,01E-05	3,99E-05	0,54286214	0,453985531	0,003092283
1,8	7,27E-06	3,26E-05	0,54286214	0,454005704	0,003092283
2,4	3,27E-06	3,03E-05	0,54286214	0,454011991	0,003092283
3	6,07E-06	3,19E-05	0,54286214	0,454007597	0,003092283
3,6	6,45E-06	3,21E-05	0,54286214	0,454007001	0,003092283
4,2	0	2,68E-05	0,54286059	0,45402032	0,003092274
4,8	9,19E-06	3,37E-05	0,54286214	0,454002694	0,003092283
5,4	0	2,10E-05	0,54285503	0,454031763	0,003092243
6	0	8,46E-06	0,54284312	0,45405625	0,003092175

7. Kompresor 3

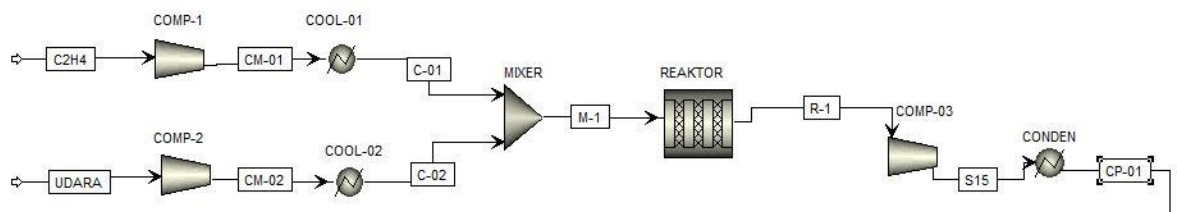


Setelah melengkapi spesifikasi kemudian di RUN kembali, dengan hasil yang didapat yaitu :

Substream: MIXED	R-1	S15

Mole Flow kmol/hr		
ETHYLENE	0	0
OXYGEN	0,00193663	0,00193663
NITROGEN	141,9735	141,9735
ACETA-01	75,5149	75,5149
ETHAN-01	0,7534177	0,7534177
Mass Flow kg/hr		
ETHYLENE	0	0
OXYGEN	0,0619696	0,0619696
NITROGEN	3977,172	3977,172
ACETA-01	3326,67	3326,67
ETHAN-01	22,655	22,655
Total Flow kmol/hr	218,2438	218,2438
Total Flow kg/hr	7326,559	7326,559
Total Flow l/hr	835307	502271
Temperature C	99,99996	175,6008
Pressure atm	8	16
Vapor Frac	1	1
Liquid Frac	0	0
Solid Frac	0	0
Enthalpy cal/mol	-13495,43	-12730,22
Enthalpy cal/gm	-402,0022	-379,2082
Enthalpy kcal/hr	-2945300	-2778300
Entropy cal/mol-K	-10,04326	-9,554526
Entropy cal/gm-K	-0,2991689	-0,2846105
Density mol/cc	0,000261274	0,000434514
Density gm/cc	0,0087711	0,0145868
Average MW	33,57053	33,57053
Liq Vol 60F l/hr	11917,87	11917,87

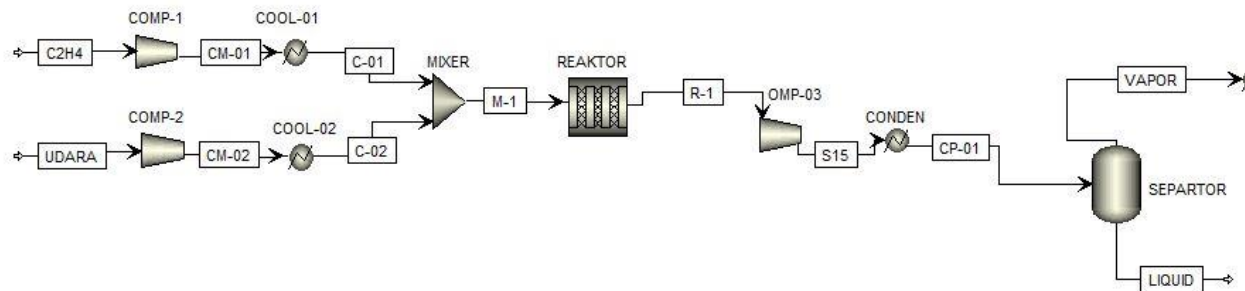
8. Condensor Parsial



Kemudian setelah lengkap dilakukan RUN kembali untuk mendapatkan hasil dari kondensor parsial ini.

	S15	CP-01
Substream: MIXED		
Mole Flow kmol/hr		
ETHYLENE	0	0
OXYGEN	0,00193663	0,00193663
NITROGEN	141,9735	141,9735
ACETA-01	75,5149	75,5149
ETHAN-01	0,7534177	0,7534177
Mass Flow kg/hr		
ETHYLENE	0	0
OXYGEN	0,0619696	0,0619696
NITROGEN	3977,172	3977,172
ACETA-01	3326,67	3326,67
ETHAN-01	22,655	22,655
Total Flow kmol/hr	218,2438	218,2438
Total Flow kg/hr	7326,559	7326,559
Total Flow l/hr	502271	188487
Temperature C	175,6008	-19,60953
Pressure atm	16	16
Vapor Frac	1	0,65
Liquid Frac	0	0,35
Solid Frac	0	0
Enthalpy cal/mol	-12730,22	-16912,14
Enthalpy cal/gm	-379,2082	-503,7794
Enthalpy kcal/hr	-2778300	-3691000
Entropy cal/mol-K	-9,554526	-22,15508
Entropy cal/gm-K	-0,2846105	-0,6599561
Density mol/cc	0,000434514	0,00115787
Density gm/cc	0,0145868	0,0388704
Average MW	33,57053	33,57053
Liq Vol 60F l/hr	11917,87	11917,87

9. Separator



Dimana data temperature pada spesifikasi separator ini merupakan diambil dari hasil RUN kondensor parsial, dan juga pressure diambil dari proses sebelumnya.

Kemudian dilakukan RUN maka didapat hasil sebagai berikut :

	CP-01	VAPOR	LIQUID
Substream: MIXED	CP-01	VAPOR	LIQUID
Mole Flow kmol/hr			
ETHYLENE	0	0	0
OXYGEN	0,00193663	0,00190116	3,55E-05
NITROGEN	141,9735	140,0586	1,914868
ACETA-01	75,5149	1,329182	74,18571
ETHAN-01	0,7534177	0,4687134	0,2847043
Mass Flow kg/hr			
ETHYLENE	0	0	0
OXYGEN	0,0619696	0,0608347	0,00113489
NITROGEN	3977,172	3923,53	53,6421
ACETA-01	3326,67	58,55465	3268,115
ETHAN-01	22,655	14,09404	8,560957
Total Flow kmol/hr	218,2438	141,8584	76,38532
Total Flow kg/hr	7326,559	3996,239	3330,319
Total Flow l/hr	188487	184456	4030,629
Temperature C	-19,60953	-19,60953	-19,60953
Pressure atm	16	16	16
Vapor Frac	0,65	1	0
Liquid Frac	0,35	0	1
Solid Frac	0	0	0
Enthalpy cal/mol	-16912,14	-762,2009	-46904,88
Enthalpy cal/gm	-503,7794	-27,05659	-1075,826
Enthalpy kcal/hr	-3691000	-108120	-3582800

Entropy cal/mol-K	-22,15508	-6,881264	-50,52073
Entropy cal/gm-K	-0,6599561	-0,244271	-1,15876
Density mol/cc	0,00115787	0,000769063	0,0189512
Density gm/cc	0,0388704	0,0216649	0,8262531
Average MW	33,57053	28,17062	43,59894
Liq Vol 60F l/hr	11917,87	7615,849	4302,018