

CLL371 PROJECT

CYCLOHEXANE PRODUCTION USING BENZENE AND HYDROGEN

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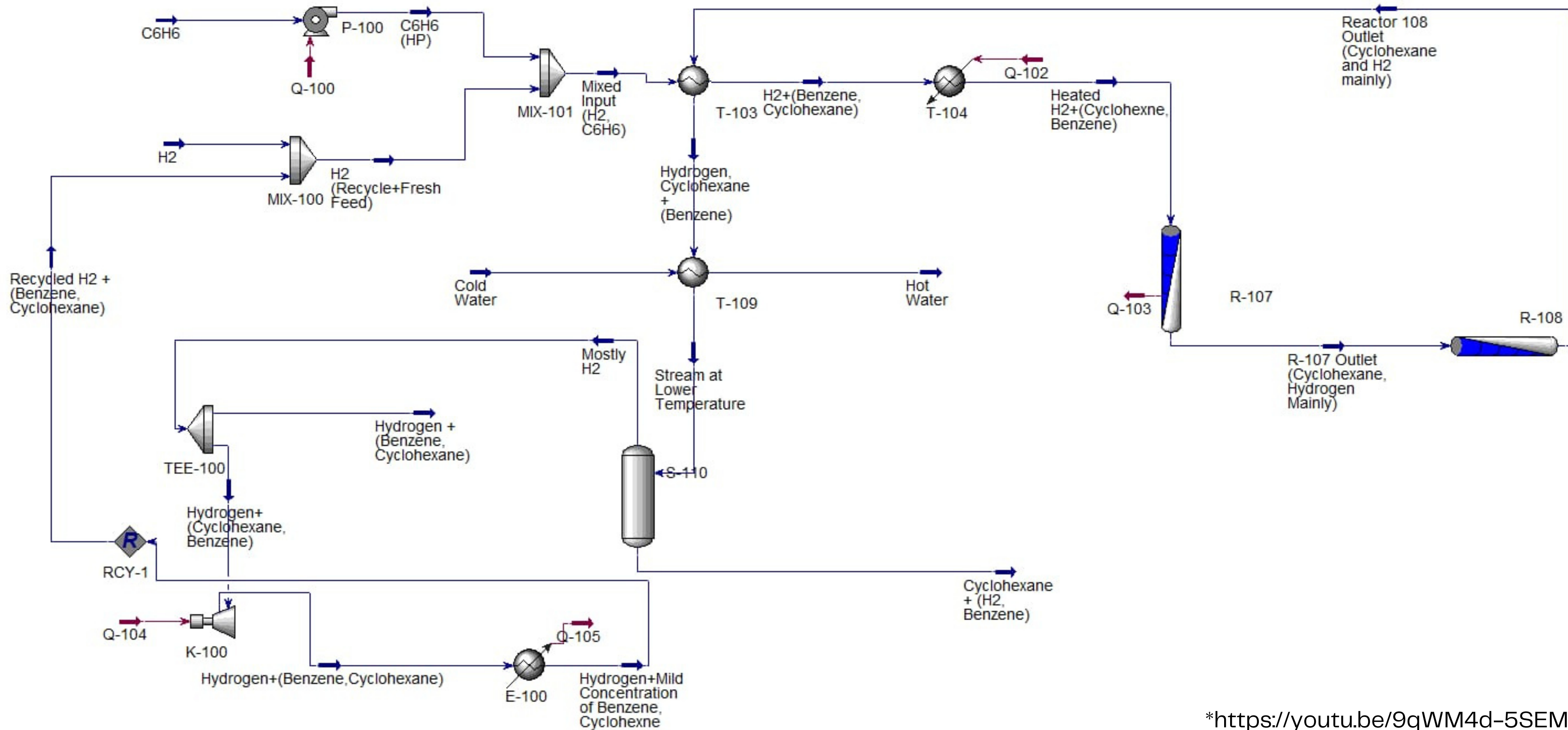
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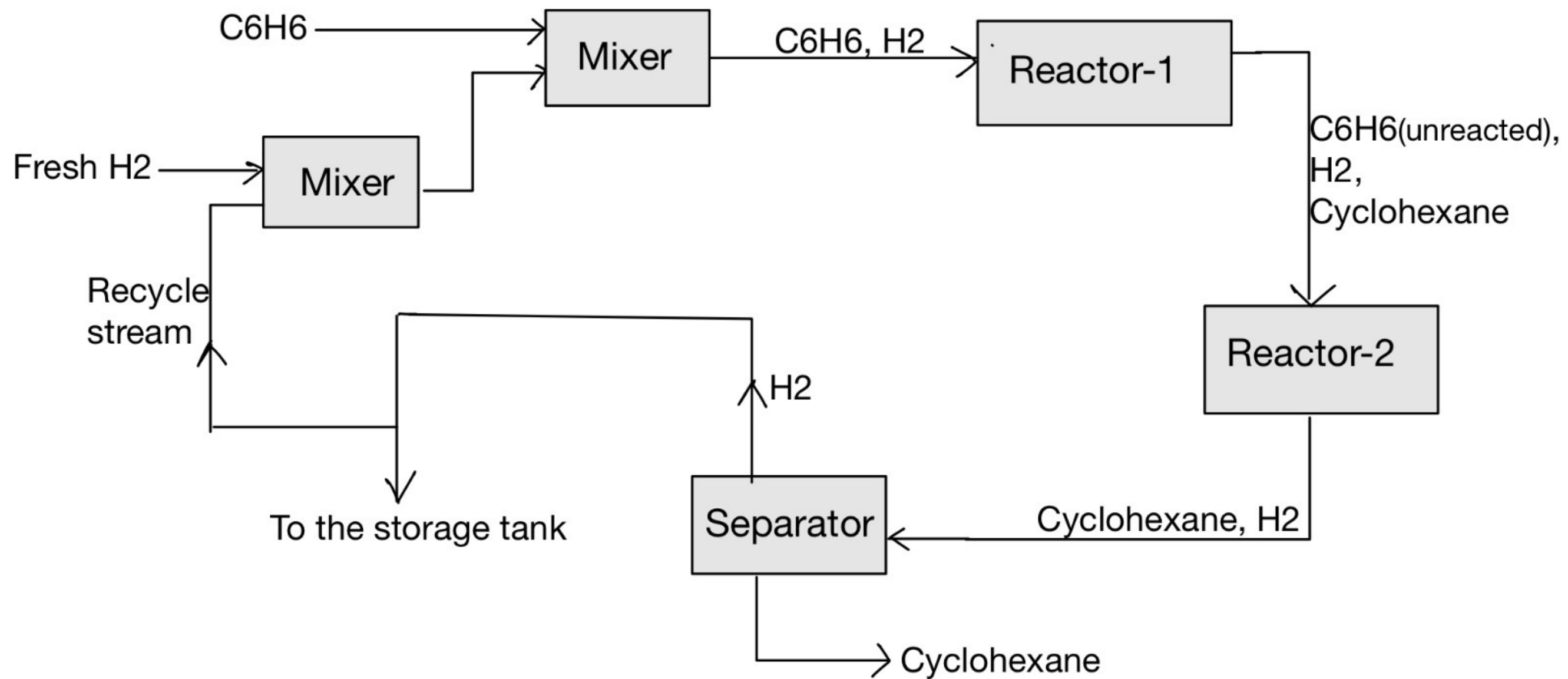
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PFD



BLOCK DIAGRAM



FEED AND PROCESS CONDITIONS

		C6H6	H2	C6H6 (HP)	H2 (Recycle+Fresh Fee	Mixed Input (H2, C6H6
Vapour Fraction		0	1	0	1	0.9039
Temperature	in degree	25	25	25.83	118.7	75.94
Pressure	kPa	401.3	2101	2101	2101	2101
Molar Flow	kmol/h	41.48	124.7	41.48	331.8	373.3
Mass Flow	kg/h	3240	251.4	3240	1476	4716
Liquid Volume	m3/h	3.673	3.599	3.673	10.35	14.02
Heat Flow	kJ/h	2082000	-176	2090000	-231200	1859000
		Cold Water	Hot Water	Stream at Lower Temp	Mostly H2	Cyclohexane + (H2, Be
Vapour Fraction		0	0	0.8105	1	0
Temperature	in degree	25	35	45	32.27	32.27
Pressure	kPa	401.3	397.8	1501	401.3	401.3
Molar Flow	kmol/h	2347	2347	249	207.5	41.53
Mass Flow	kg/h	42280	42880	4716	1227	3489
Liquid Volume	m3/h	42.37	42.37	11.23	6.763	4.464
Heat Flow	kJ/h	-6717000	-669900000	-7543000	-1163000	-6380000

FEED AND PROCESS CONDITIONS

Vapour Fraction		H2+(Benzene, Cyclohexane)	Heated H2 + (Cyclohexane, Benzene)	R-107 Outlet (Cyclohexane, Hydrogen)	Reactor 108 Outlet (Cyclohexane and H2 mixture)	Hydrogen, Cyclohexane + (Benzene)
Temperature	in degrees Celsius	1	1	1	1	0.9402
Pressure	kPa	112.8	150	170	195.9	110.7
Molar Flow	kmol/h	2001	1901	1801	1701	1601
Mass Flow	kg/h	373.3	373.3	254.4	249	249
Liquid Volume	m3/h	4716	4716	4716	4716	4716
Heat Flow	kJ/h	14.02	14.02	11.35	11.23	11.23
		3461000	4043000	-4117000	-4117000	-5719000
Vapour Fraction		Hydrogen + (Benzene, Cyclohexane)	Hydrogen+(Cyclohexane, Benzene)	Hydrogen+ (Benzene, Cyclohexane)	Hydrogen + Mild Concentration of Benzene, Cyclohexane	Recycled H2 + (Benzene, Cyclohexane)
Temperature	in degrees Celsius	1	1	1	1	1
Pressure	kPa	32.27	32.27	233.5	165	165
Molar Flow	kmol/h	401.3	401.3	2101	2101	2101
Mass Flow	kg/h	0.4	207.1	207.1	207.1	207.1
Liquid Volume	m3/h	2.365	1224	1224	1224	1225
Heat Flow	kJ/h	0.01304	6.75	6.75	6.75	6.75
		-2241	-1160000	281100	-231100	-231000

SIMULATION RESULTS

	C6H6	H2	C6H6 (HP)	H2 (Recycle + Fresh Feed)	Mixed Input (H2, C6H6)	H2+(Benzene, Cyclohexane)
Comp Mole Frac (Benzene)	1	0	1	0	0.1112	0.1112
Comp Mole Frac (Hydrogen)	0	1	0	0.9704	0.8626	0.8626
Comp Mole Frac (Cyclohexane)	0	0	0	0.0295	0.0263	0.0263
Comp Mole Frac (H2O)	0	0	0	0	0	0
	Cold Water	Hot Water	Stream at Low Temperature	Mostly H2	Cyclohexane + (H2, Benzene)	Hydrogen + (Benzene, Cyclohexane)
Comp Mole Frac (Benzene)	0	0	0	0.0001	0.0014	0.0001
Comp Mole Frac (Hydrogen)	0	0	0.794	0.9526	0.0017	0.9526
Comp Mole Frac (Cyclohexane)	0	0	0.2058	0.0474	0.9969	0.0474
Comp Mole Frac (H2O)	1	1	0	0	0	0

H2+(Benzene, Cyclohexane)	Heated H2+(Cyclohexane, Benzene)	R-107 Outlet (Cyclohexane, Hydrogen Mainly)	Reactor 108 Outlet (Cyclohexane and H2 Mainly)	Hydrogen, Cyclohexane + (Benzene)
0.1112	0.1112	0.0073	0.0003	0.0003
0.8626	0.8626	0.7983	0.794	0.794
0.0263	0.0263	0.1944	0.2058	0.2058
0	0	0	0	0
Hydrogen + (Benzene, Cyclohexane)	Hydrogen+ (Cyclohexane, Benzene)	Hydrogen+(Benzene, Cyclohexane)	Hydrogen+Mild Concentration of Benzene, Cyclohexane	Recycled H2 + (Benzene, Cyclohexane)
0.0001	0.0001	0.0001	0.0001	0.0001
0.9526	0.9526	0.9526	0.9526	0.9526
0.0474	0.0474	0.0474	0.0474	0.0474
0	0	0	0	0

Energy Streams

		Q-100	Q-102	Q-103	Q-104	Q-105
Heat Flow	kJ/h	8419	5.818e+005	8.160e+006	1.441e+006	5.122e+005

SIMULATION RESULTS

Reactor 107

Reactor 108

Temp.

150* C

170* C

Pressure

1901 kPa

1801 kPa

**Molar Flow
Rate**

373.3 kmol/h

254.4 kmol/h

SIMULATION RESULTS

Separator Results

	Inlet	Product Output	Recycle Output
Temp.	45* C	32.27* C	32.27* C
Pressure	1501 kPa	401.3 kPa	401.3 kPa
Molar Flow Rate	249 kmol/h	254.4 kmol/h	41.53 kmol/h