Design A Process Of Methyl Ethyl Ketone Production

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Background:

Methyl Ethyl ketone (MEK) is widely used in industrial application, especially as an industrial solvent for plastics, resins, paint, and adhesives. Due to its broad applications, MEK is considered as the most principal commercially manufactured ketone.

Some **important data** regarding methyl ethyl ketone are listed below:

Molecular weight	= 72
Boiling point (^oC)	= 79.57
Freeing point (^oC)	= -85.9
Density at 20^0C (g/lit)	= 804.5
Heat of fusion, (KJ/kg ^Ok)	= 103.3

Under normal condition and in the absence of atmospheric oxygen MEK is stable but under prolonged storage in oxygen may formed peroxide. It is heat and light stable but not in UV exposure (Yield ethane, methane, carbon monoxide, ethylene, and diacetyl).

MEK are produced today by several process and widely available in literature but the most important things to consider is **the safety and the pollution for the plant**. MEK is neither highly toxic nor does it exhibits cumulative toxicological property. Inhalation for longer time may leads to the irritation in mucus membrane and cause nausea and eventually leads to unconsciousness. Liquid MEK temporarily irritates the eye and corneas but usually absorbed through the respiratory track and by skins. It is highly flammable.

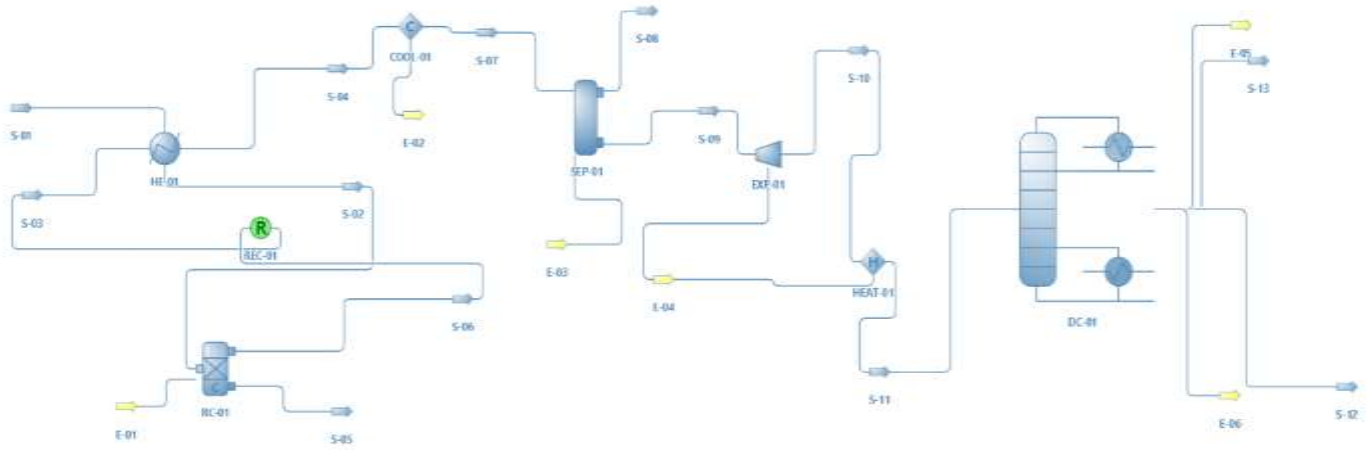
The use of safety and protective equipment likes gloves, wearing safety shoes, goggles and helmet are used at the time to MEK handling for operation. The water is polluted by the plant effluent and the critical factor operating under such a

situation is the biological oxygen demand (BOD). Microorganisms' process are used for the purification of the plant effluent water.

Description of the flowsheet

MEK produced from 2-butanol by dehydrogenation, entire flow sheet is done in C.G.S unit. 2-Butanol (S-01) is feed to the heat exchanger at 30 ^{o}C in shell side from storage tank. The output stream from a heat exchanger (S-02) is fed to the reactor at 100 ^{o}C at the 90 % conversion rate. After the reaction the product gas (S-06) mixture leaving the reactor at 400^{o}C is fed to the heat exchanger in the tube side (S-03), another output stream (S-05) from reactor has no composition. Stream in tube side (S-03) leaves the heat exchanger at (S-04) at 106.603 ^{O}C and is cooled to 80^{O}C by cooler (S-07). The gas if fed (S-07) to the gas-liquid separator (hydrogen knock out drum), where the hydrogen is separated (S-08) from the mixture of 2-butanol and MEK (S-09) at low temperature and high pressure. The mixture stream (S-09) was pass through expander and then through (S-10) heater to decrease the pressure and to increase the temperature. Then (S-11) finally introduce in the distillation column (chemsep column) in a given specification and 99.067% of pure MEK obtain from the overhead of the distillation column (S-13) and rest obtain from the bottom stream (S-12).

Flowsheet of the process in DWSIM:



Result:

Parameters of all material streams (in C.G.S unit).

Master Property Table														
Object	S-13	S-12	S-11	S-10	S-09	S-08	S-07	S-06	S-05	S-04	S-03	S-02	S-01	
Temperature	75.964	101.92	80	9.98131	10	10	80	400	400	106.603	400	100	30	C
Pressure	1	1.1	1	1	3.5	3.5	0.9797	1	1	0.9797	1	1	1	atm
Mass Flow	0	0	636.244	636.244	636.244	25.6988	661.943	661.943	0	661.943	661.943	661.943	661.943	g/s
Molar Flow	0	0	8.79938	8.79938	8.79938	8.16857	16.968	16.968	0	16.968	16.968	8.9305	8.9305	mol/s
Volumetric Flow	0	0	2264.1	778.219	778.041	54223.6	501867	937205	0	539673	937205	273434	825.9	cm3/s
Density (Mixture)	∞	∞	0.281014	0.817564	0.817751	0.00047394	0.00131896	0.000706295	∞	0.00122656	0.000706295	0.00242085	0.801481	g/cm3