

Production Of Acetone Via The Dehydrogenation of Isopropanol

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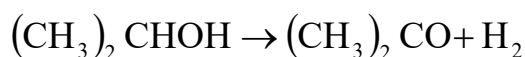
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Background:

The organic compound acetone, or propanone, is the simplest and smallest ketone containing a carbonyl group bounded to two methyl groups. Acetone is a highly volatile, easily flammable and colorless liquid with characteristic pungent odor. Acetone can dissolve most of the fats and resins as well as cellulose esters like cellulose acetate, it is miscible with water and organic compounds like methanol, benzene, diethylether, chloroform. It is used for thinning polyester resin, cleaning tools used with it, and dissolving two-part epoxies and superglue before they harden. It is used as one of the volatile components of some paints and varnishes. Acetone is often produced as a by-product in the production of phenol. Acetone is also prepared by the dehydrogenation of 2-propanol (isopropyl alcohol). Boiling Point of Acetone is 56°C and that of Isopropanol is 82.5°C.

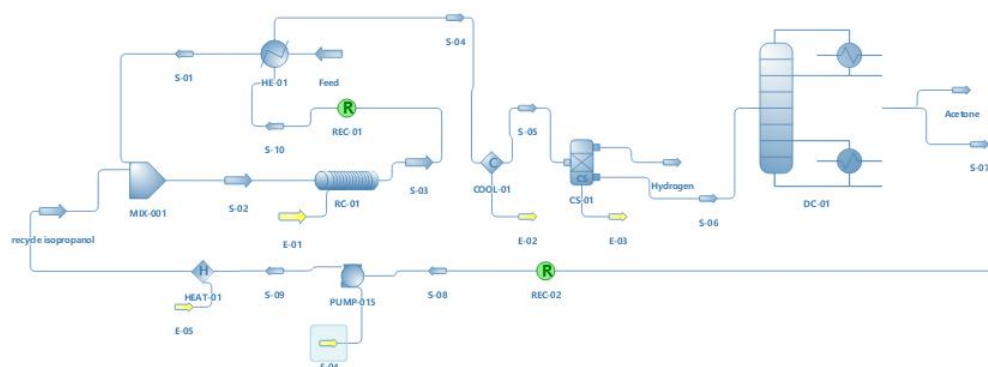
Description:

The simulation is performed to produce about 100000 tons/year (1year=8,000 operating hours) of acetone (99.9 wt%) by dehydrogenation of isopropanol. The reaction is first order with respect to the concentration of isopropanol, and occurs over a catalyst.



The process flowsheet for the gas-phase dehydration of IP-OH using zinc/zirconium oxide catalyst, followed by a cooling, separating, distillation, step. The heat exchanger "HE-01" is used to heat the cold feed at the same time decreasing the temperature of the hot product stream before sending it to separation.

Flowsheet:



Results:

Results					
Object	recycle isopropanol	Hydrogen	Feed	Acetone	
Temperature	228	40	25	56.5448	C
Pressure	35	34.9499	35	1.01325	bar
Mass Flow	2.15276	0.122972	3.6658	3.54282	kg/s
Molar Flow	35.8254	61.0019	61	60.9999	mol/s
Mixture Density	77.9428	2.65796	671.476	2.20995	kg/m3
Vapor Phase Molar Fraction	0	1	0	1	
Molar Fraction (Mixture) / Isopropanol	0.997726	0	1	7.06127E-10	
Molar Fraction (Mixture) / Acetone	0.0022741	0	0	1	
Molar Fraction (Mixture) / Hydrogen	0	1	0	0	

From the results it is clear that the design gives 99.99wt% pure acetone at an annual production rate of 1,00,000 tons/year (1year=8,000 operating hours).