

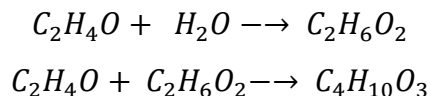
PRODUCTION OF ETHYLENE GLYCOL

BACKGROUND

Ethylene glycol is a chemical commonly used in many commercial and industrial applications including antifreeze and coolant. Ethylene glycol helps keep your car's engine from freezing in the winter and acts as a coolant to reduce overheating in the summer. Ethylene glycol also is used as a raw material in the production of a wide range of products including polyester fibers for clothes, upholstery, carpet and pillows. The global production of Ethylene glycol is 7×10^6 tons/annum. Ethylene glycol can be obtained by Ethylene carbonate process, union carbide syngas process and many other processes but the most important process is hydrolysis of Ethylene oxide.

DESCRIPTION OF FLOWSHEET

Each mole of Ethylene oxide reacts with a mole of water to give rise to one of Ethylene Glycol. But the product Ethylene Glycol formed reacts with Ethylene Oxide to give rise to Diethyleneglycol. The reactions are as follows.



In order to increase the yield of Ethylene Glycol 20 moles of water is fed to the reactor for each mole of Ethylene glycol entering. However, a maximum of around 90 % yield of Ethylene glycol is only obtained by non-catalytic reaction/ process. The Ethylene oxide limiting reactant and undergoes complete conversion in plug-flow reactor.

Therefore the reaction mixture consists large amounts of water which is mostly removed by employing multiple effect feed forward evaporators. The pressure decreases in the forward direction . The concentrated solution contains % of Glycols and rest water. Therefore water is mostly removed in multi-stage plate distillation column. The Ethylene glycol is finally removed in the next distillation which is also a multi-stage plate column.

RESULT

	EO	WAT	MSTR-037	MSTR-038	MSTR-039	units
Temperature	453.15	453.15	334.0617	388.5132	430.84	K
Pressure	202650 0	202650 0	19323.3	5066.25	5066.25	Pa
Mass flow	1.6739	4.872	11.50	2.2058	0.0212	kg/s
Molar flow	38	270.44	637.2	34.7995	0.2	mol/s
MOLAR FRACTION(MIXTURE) / ETHYLENE OXIDE	1	0	4.5350E-106	8.0754E-114	2.60819E-123	
MOLAR FRACTION(MIXTURE) / WATER	0	1	0.99	0.0038	5.3866E-11	
MOLAR FRACTION(MIXTURE) / ETHYLENE GLYCOL	0	0	0.000765	0.962	0.0025	
MOLAR FRACTION(MIXTURE) / DIETHYLENE GLYCOL	0	0	8.2609E-08	0.0337	0.99	

REFERENCE

Ullman's, Encyclopedia of Industrial chemistry, Vol. A10, 101-113.

CHEMTECH, August 1984, 504-511.

AIChE Journal, January 1999, Vol. 45, No.1, 51-54.