

# Production of Trichloroacetaldehyde from Ethanol

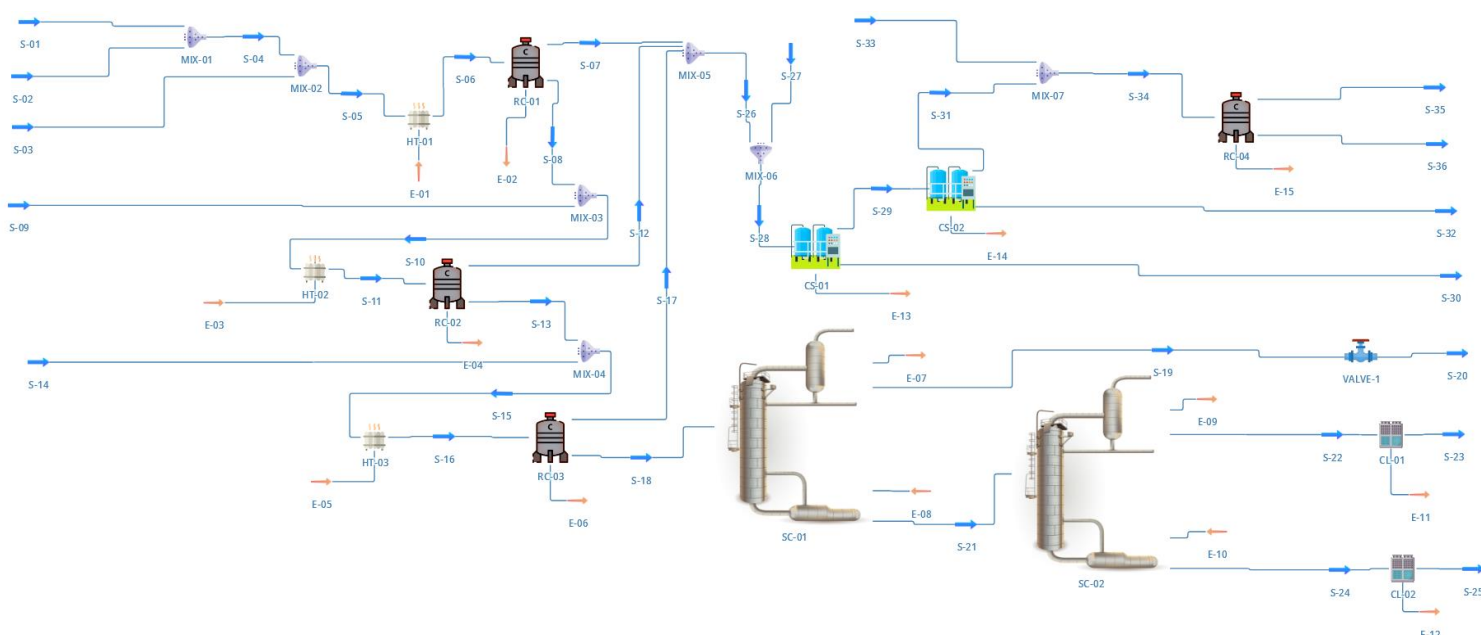
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## Background & Description:

Trichloroacetaldehyde also known as 'chloral' is an organic compound with the formula  $\text{Cl}_3\text{CCHO}$ , it is a colourless liquid. It is widely used as a sedative and hypnotic agent in pediatrics, and it is the building block of DDT (dichloro-diphenyl-trichloroethane) and other insecticides. In this flowsheet production of chloral via a continuous process is demonstrated by reacting ethanol with chlorine. ethanol is taken in the reactor at a flow rate of 1000 kg/hr and chlorine at 5000 kg/hr both react to form 2,2,2-Trichloro-1-ethoxy ethanol with an efficiency of 90% then products are further added to 2nd reactor (RC-02) where water is introduced to produce 2,2,2-Trichloroethane-1,1-diol.

In acidulator (RC-03),  $\text{H}_2\text{SO}_4$  will reduce 2,2,2-Trichloroethane-1,1-diol in Trichloroacetaldehyde. This whole process combined produces 1492 kg/hr of Trichloroacetaldehyde, with an efficiency of 95%. Distillation columns are used to purify trichloroacetaldehyde, 1<sup>st</sup> distillation column (SC-01) distilates all low boiling compounds, 2<sup>nd</sup> column (SC-02) separates trichloroacetaldehyde from spent sulphuric acid. Absorption of excess Chlorine takes place in RC-04 and other organic compounds are separated with the help of O-dichlorobenzene. At the end of process, 1239 kg/hr of Trichloroacetaldehyde is recovered, the efficiency of the complete process is 83%.

## Flowsheet:



## Results:

Table 1: Simulation Results

Object	S-07	S-08	S-15	S-18	S-21	S-23	Units
Trichloroacetaldehyde	0	0	0	1261.25	1248.18	1239.28	kg/h
Ethanol	90.0523	7.87351	422.529	379.601	3.18754	3.18743	kg/h
Chlorine	2278.13	9.30025	9.30024	9.09282	1.32E-77	1.32E-77	kg/h
Water	29.2156	4.67266	264.519	426.816	426.816	1.54263	kg/h
2,2,2-Trichloroethane-1,1-diol	0	0	1492.22	74.611	74.611	1.67E-65	kg/h
2,2,2-Trichloro-1-ethoxy ethanol	13.0416	1837.16	91.8582	91.8581	91.8581	6.47E-47	kg/h

## Reference:

Abraham Brothman (1949), MANUFACTURE OF CHLORAL, US2478741A, US patent, <https://patents.google.com/patent/US2478741A>