PREPARATION OF ACETIC ACID BY OXIDATION OF ACETALDEHYDE

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Background:

Acetic acid is the second, simplest carboxylic acid (after formic acid). It consists of a methyl group attached to a carboxyl group. It is an important chemical reagent and industrial chemical, used primarily in the production of cellulose acetate for photographic film, polyvinyl acetate for wood glue, and synthetic fibres and fabrics. In households diluted acetic acid is often used in de-scaling agents.

Description of the flowsheet:

This flowsheet is used for the production of acetic acid by oxidation of acetaldehyde, consists of a mixer to mix the recycle stream with the feed streams, conversion reactor, the cooler to cool the products, complex column to separate the product (acetic acid) and unreacted feed, followed by absorption column to separate Nitrogen from unreacted feed using water as an absorbent. Complex column is used to separate water from recycle stream.

***Reaction*:**

$CH_3CHO + 0.5O_2 \text{ ---> } CH_3COOH$

Description:

The products from the reactor are then sent to the cooler unit where the products are cooled. Then acetic acid is separated from unreacted acetaldehyde and air component using complex column based on the volatility of the compounds. The product acetic acid is

obtained from bottom stream of the complex column. The unreacted stream obtained from complex column is sent to a heater to vaporize for better absorption of acetaldehyde in absorption column to separate nitrogen gas from the unreacted part to minimise the nitrogen content in recycle stream. Water is used as an absorbent which is separated using a complex column from unreacted acetaldehyde and recycle back and some make-up water is added with recycle stream and cooled using a cooler for better absorption of acetaldehyde. Top product form complex column is heated to make the top effluent at room temperature. The stream, contained acetaldehyde and oxygen, is sent to a mixer through a recycle block to increase the overall yield.

Results:

	Water	Nitrogen	Air	Acetic Acid	Acetaldehyde
Temperature(C)	25	-42.2879	25	119.91985	25
Pressure (bar)	1.01325	1.01325	1.01325	1.01325	1.01325
Mass flow (kg/h)	1	540.67982	624.74538	332.4699	247.186
Molar flow (kmol/h)	0.055509298	19.036869	21.653279	5.5362785	5.6111558

References: Chemical Process industries volume II By S.C. BHATIA, Distributors New Delhi- 110002, ISSN NO 81-239-0762-1