Nature of Invention: Process design

Applicant: Ultraviolet Chemicals

Inventors: Milan Rastogi, Jatin Rastogi, Rohan Virmani

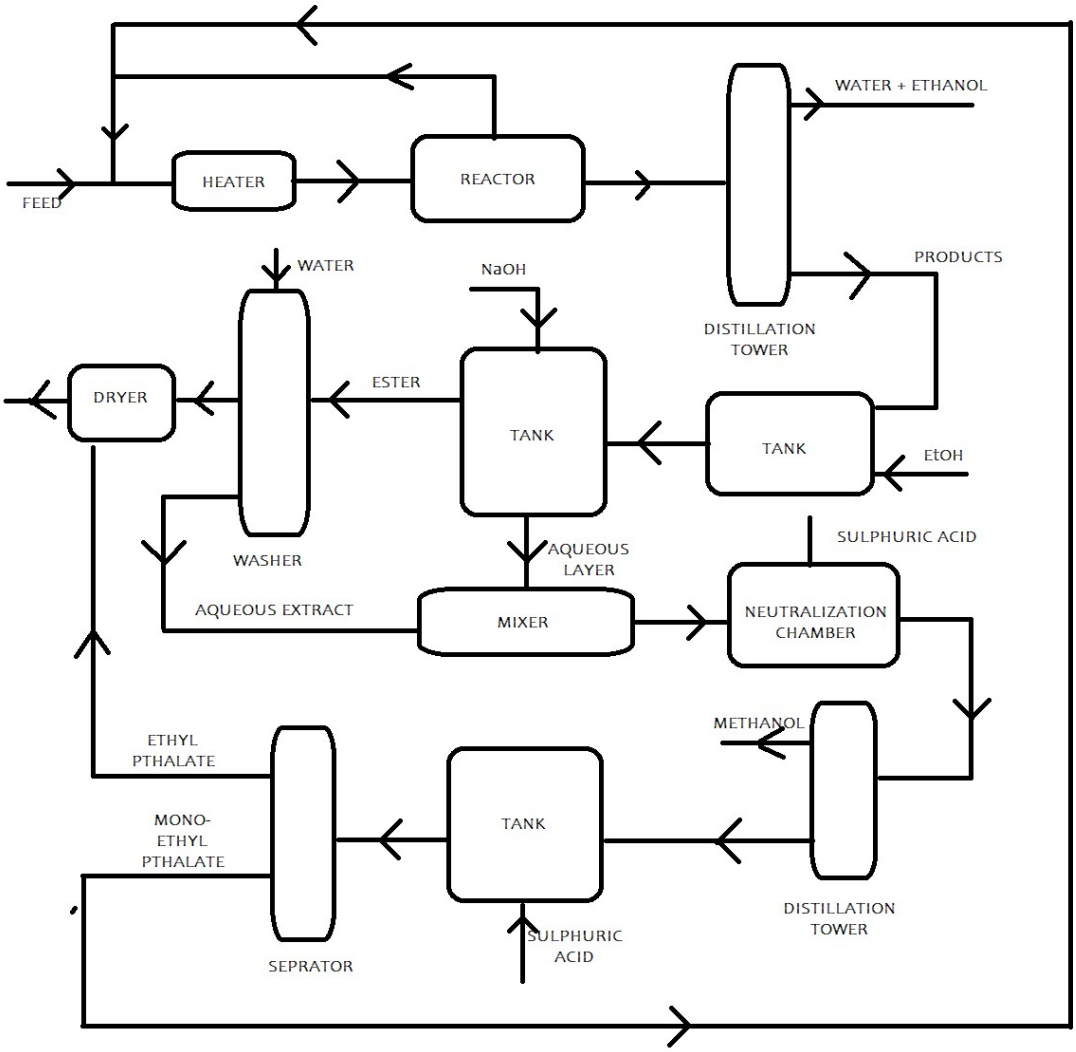
Chemical Formula: $C_{12}H_{14}O_4$

Chemical Name: Diethyl Pthalate

Process Title:

Process Description:

a. Give the block diagram for the feasible process (as determined in market analysis report). List all unit operations and process conditions.

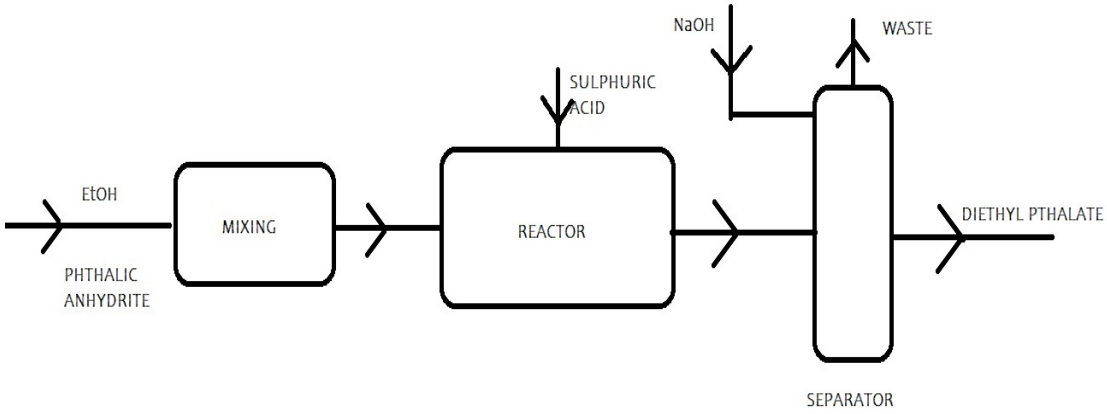


b. Give the material balance for a scaled-up process plant with capacity of 1000 kg/day. (If needed, simplify the calculations by stating assumptions)

Assumptions:

1) 100% conversion of **Phthalic Anhydrite** to **Diethyl Phthalate** in the reactor.
2) We take **Phthalic Anhydrite** and **EtOH** in the ratio of 1:2.

A simplified process design for the same reaction is:



Let the number of moles of Phthalic Anhydrite be **x,** then by the principle of 100% conversion,

x = 1000kg

Phthalic Anhydrite: 1000kg

EtOH: 2000kg (density: 789kg/m^3)

Amount of H_2SO_4 used is 2% of Phthalic Anhydrite being produced so, H_2SO_4 used: 20kg (1757.4 kg/m^3)

Amount of NaOH used is 5% of Phthalic Anhydrite being produced so, NaOH used: 50kg(1930kg/$m^{3)}$

c. List the capacity of reactors needed and evaluate the cost. Use Glass lined Carbon steel (GS lined CS) as the material of construction (MOC). Use the pressure according to reaction conditions. You will use only 70% of the total volume. If you design a 1000 L reactor, you can only fill 700 L reaction mixture.

Capital cost (only for the reactor):

example:

Equipment	Design Capacity (L)	No. of units	Cost/unit ($ for year 2014)	Total Cost ($ for year 2014)
Reactor 1 (Jacketed reactor, agitated, Carbon steel, atm. pressure)	900	1	35,500	35,500

References: Provide reference for a research paper or an actual patent.

1. http://www.matche.com/equipcost/Reactor.html
2. https://patents.google.com/patent/CN104945260A/en

List the contributions of each author:

- (Example) Author 1 and 3 carried out the literature search and find the reaction steps, and product yield. Author 1 also evaluated the reactor cost.
- Authors 2 and 3 found necessary separation steps to achieve desired product purity.

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