Benoxacor Waste Recovery at St. Gabriel

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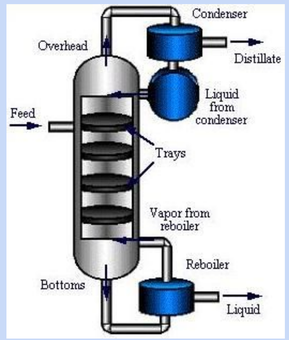
1. Objective

- Benoxacor is a crop safener produced by Syngenta at their site in St. Gabriel, Louisiana. The process to make Benoxacor produces a total of almost 1600 MT of waste each year
- The team was tasked with the goal of identifying a main waste stream and determining a solution to reducing and recycling this waste
- This is in accordance with the Syngenta Good Growth Plan which strives for more environmentally friendly agriculture

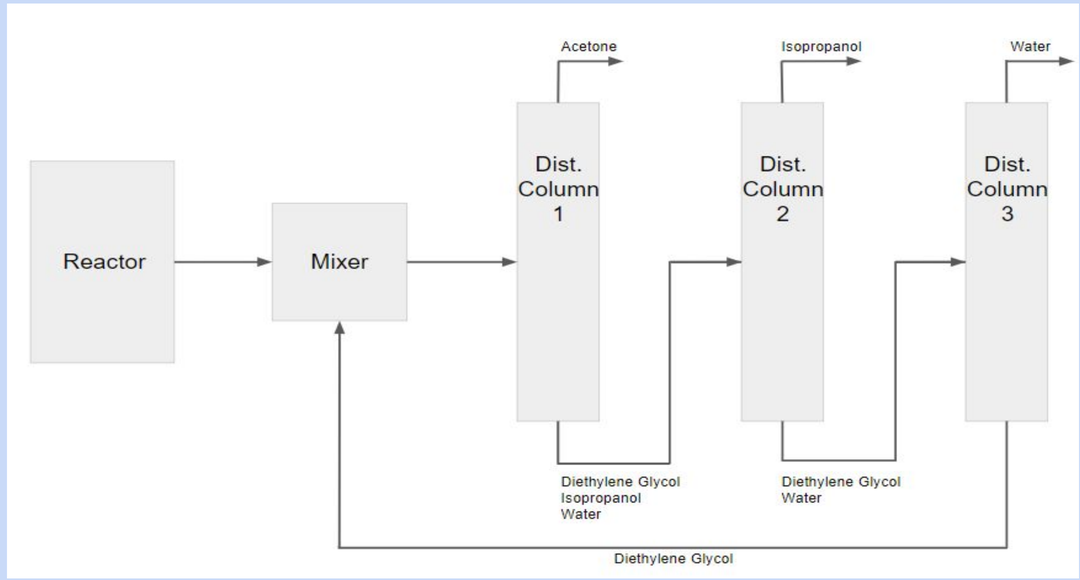
2. Background

- Extractive distillation is required because the components of the selected stream have similar boiling points and an azeotrope forms between water and IPOH
- Diethylene glycol is added as an entrainer to increase the relative volatility of the mixture to break the azeotrope



Michigan Engineering. (n.d.). Visual Encyclopedia of Chemical Engineering Equipment. Retrieved from https://encyclopedia.che.engin.umich.edu/distillation-columns/.

3. Process Flow Diagram



4. Economic Analysis

Equipment	Price
Distillation Column (3)	$900,000
Vacuum Pump (3)	$600,000
Reboiler Stage (3)	$300,000
Packing (3)	$150,000
Total Capital Investment	**$1,950,000**

Type of Savings	Price
Waste Disposal	$53,500
Recycled Material	$2,000
Total Annual Payback	**$55,500**

$$\text{Payback Period} = \frac{\text{Total Investment}}{\text{Annual Payback}} = 35 \text{ Years}$$

5. Environmental Considerations

- This waste recovery solution works toward the Good Growth Plan pillar of striving for carbon neutral agriculture
- Recovering the selected stream will reduce solvent waste and carbon emissions associated with the transportation and disposal of organic waste
- Eliminating the transportation of organic and aqueous waste could reduce carbon emissions by 31,000 lbs

The Good Growth Plan. Syngenta. (n.d.). Retrieved April 23, 2023, fromttps://www.syngenta.com/en/sustainability/good-growth-plan

6. Recommendations

- The proposed solution should not be implemented on the chosen stream without further investigation into the azeotrope
- Other forecut streams should be investigated for this process to be applied
- Syngenta could perform small scale experiments on separating isopropanol from water to confirm the ASPEN results
- The third column could be replaced with a flash drum to more be more energy efficient
- It is recommended that Syngenta investigates waste to energy operations as an alternative to waste recovery

7. Conclusions

- The team recommends that further investigation be done into using this type of process to reduce waste elsewhere in the plant
- The proposed solution would not be effective for the chosen stream without further investigation

8. Acknowledgements

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