

Production and Separation of 1,2-Diphenylethane

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ChE 432: Chemical Plant Design II

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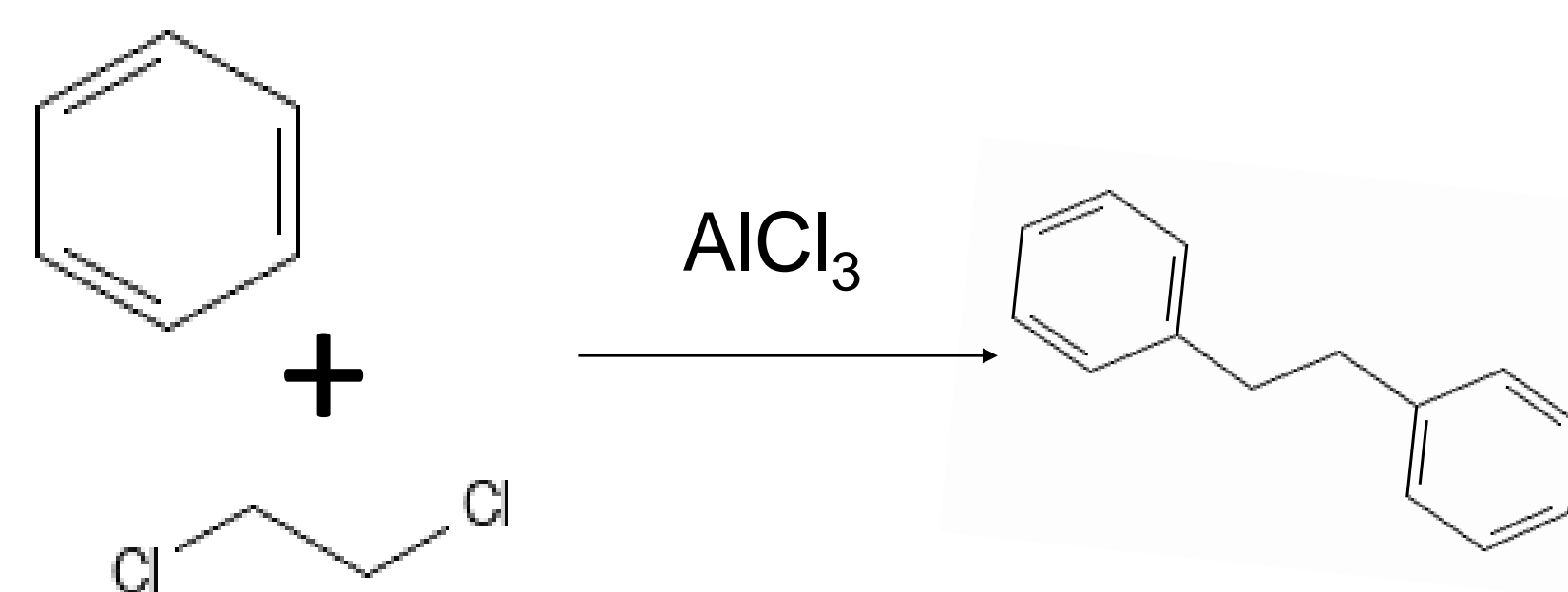
Purpose

- Create 1,2-Diphenylethane (DPE) for brominated DPE production (used for flame retardant in plastics)



Background

- DPE is produced using a Friedel-Crafts reaction between benzene and dichloroethane using an aluminum chloride catalyst
- Separation of DPE is currently carried out by a toiler and Albemarle would like to bring the process in-house.

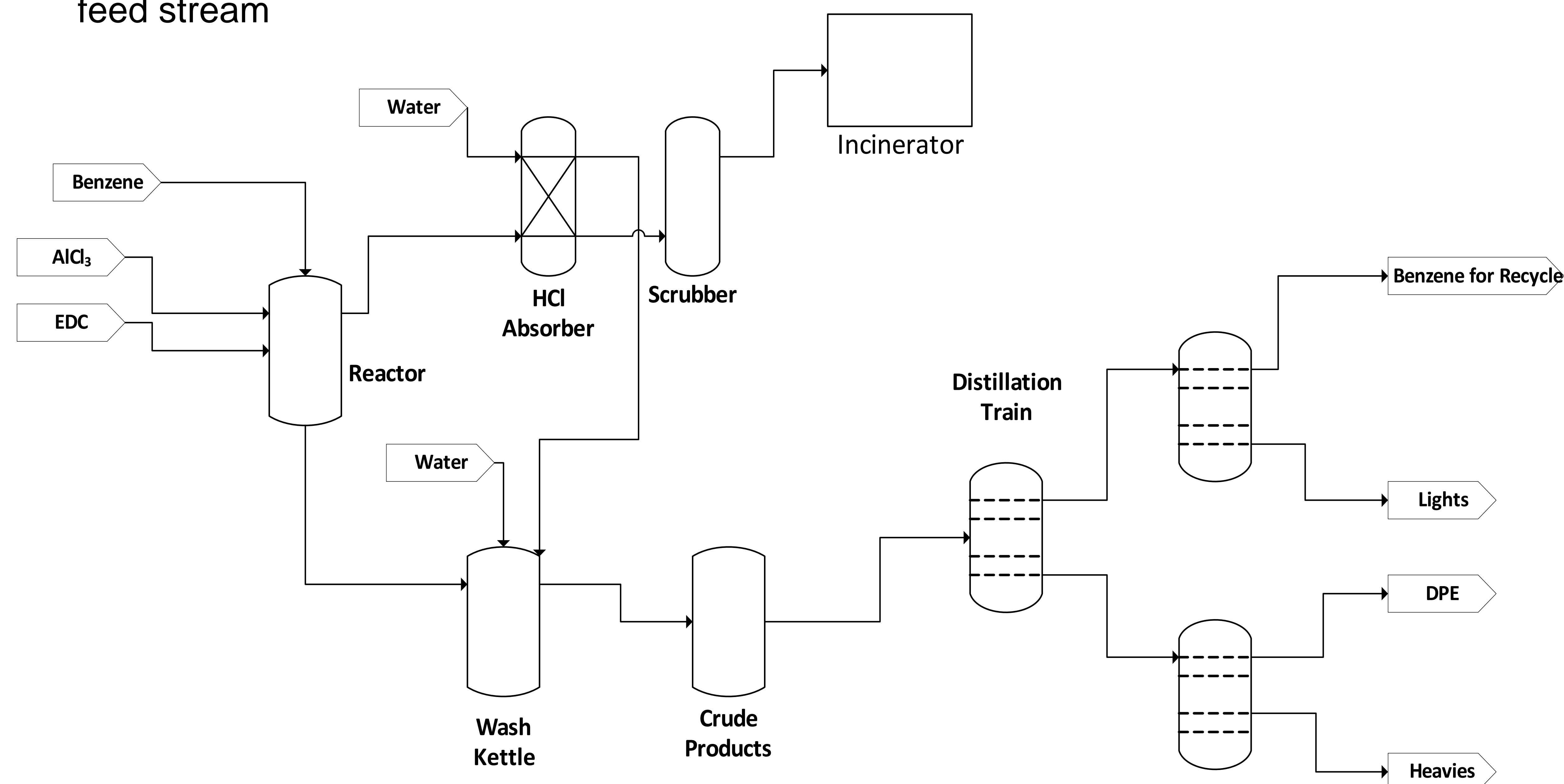


Goals

- Produce 5,000 metric tons per year of >99% purity of DPE
- Design distillation train that meets purity requirements
- Size and cost all equipment in the process

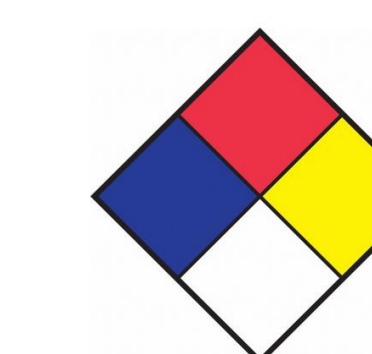
Design

- 5,000 metric tons of 99% purity DPE is produced per year
- Distillation Train also separates excess benzene at 99% purity to recycle back into the feed stream



Safety

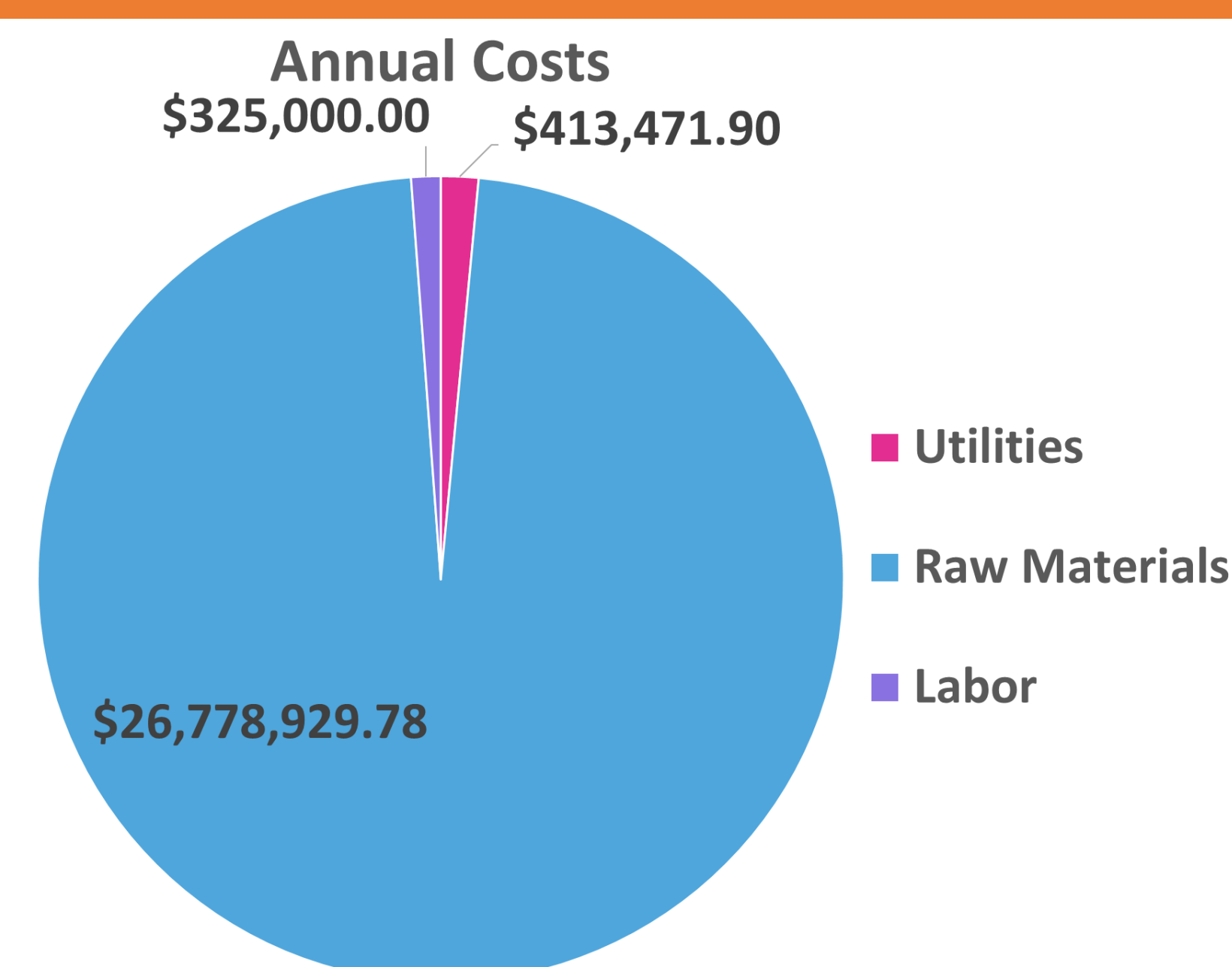
- Potential process hazards include fires and explosions
- HCl is the most toxic chemical in the system but all appropriate personal protective gear should be worn during all parts of the process



Conclusion

- Three distillation columns are necessary to create 99% purity DPE and to purify benzene for recycle
- 4000 batches are to be run a year to reach a goal of 5000 metric tons of 99% DPE.

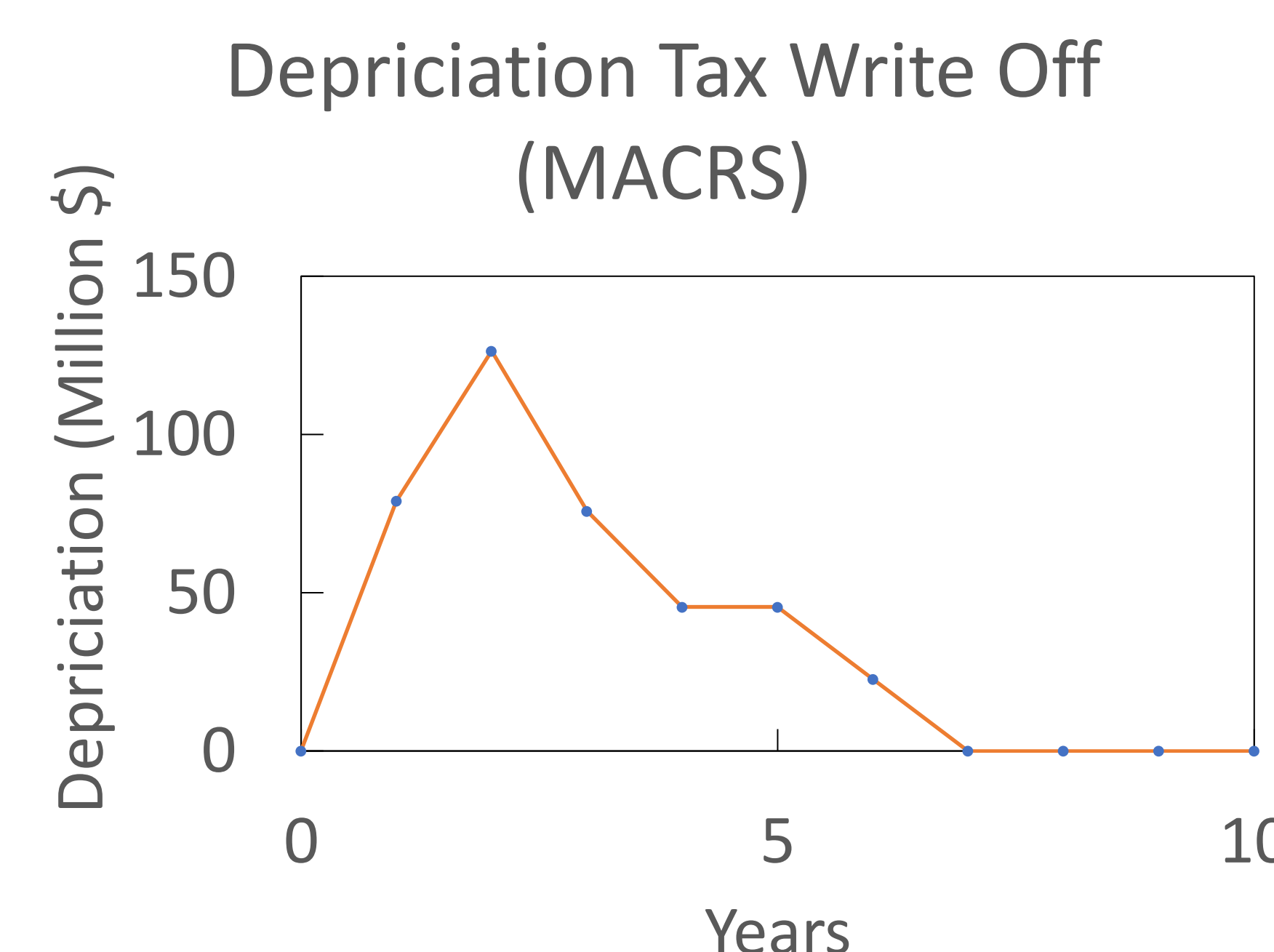
Economics



IRR: 28%

Project lifetime: 10 years

Capitol Cost	\$ 394,958,451.81
Annual Cost	\$ 27,517,401.68
Income Tax	21%
Selling Price of DPE	\$32/kg
Annual Profit	\$ 132,000,000.00



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