



# Continuous Production of Dimethyl Ether from Methanol

Thomas Homer, Kayla Eckley, Benjamin Cullen, Jeremy Tilton

Department of Chemical Engineering, University of New Hampshire, Durham, NH 03824



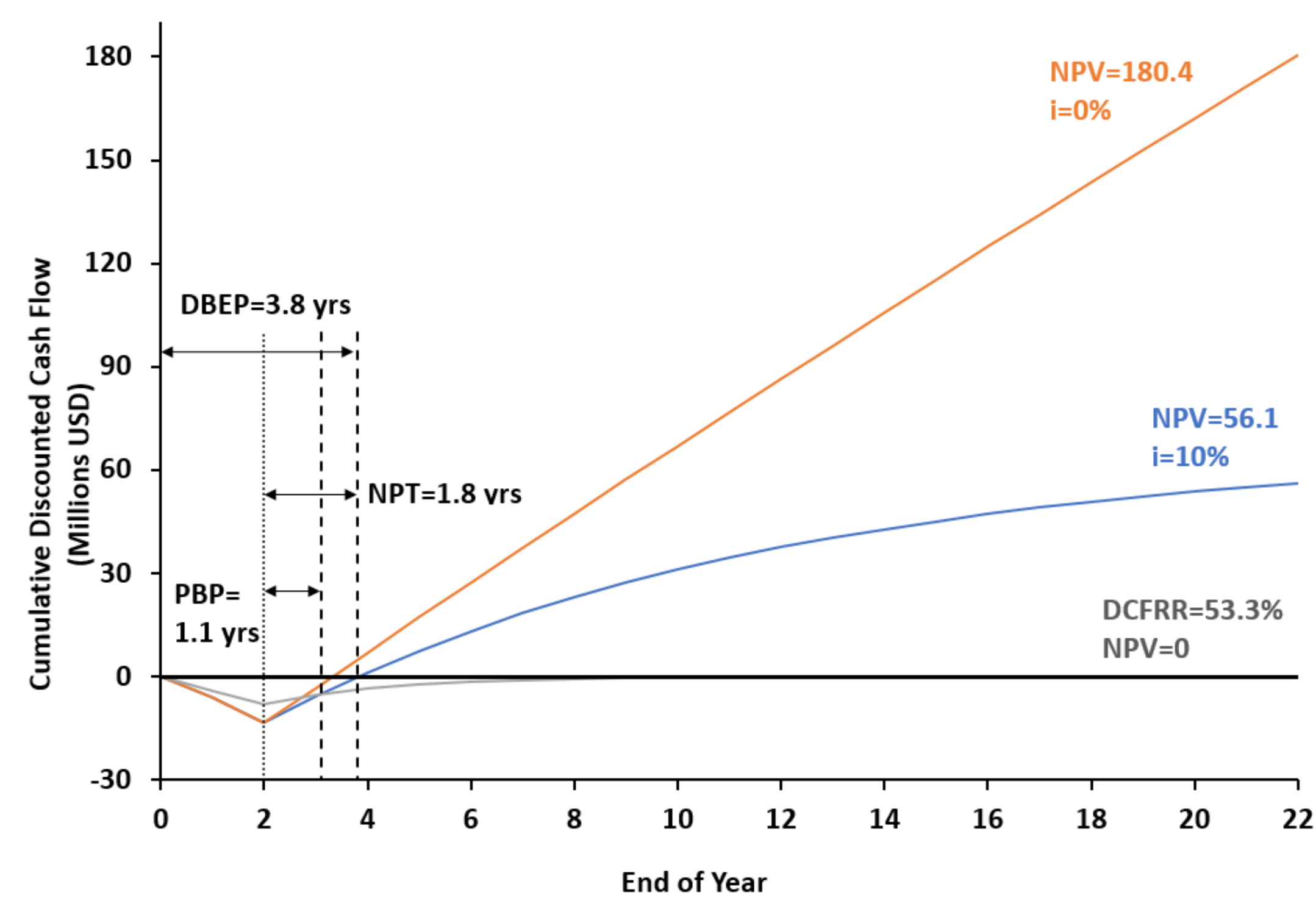
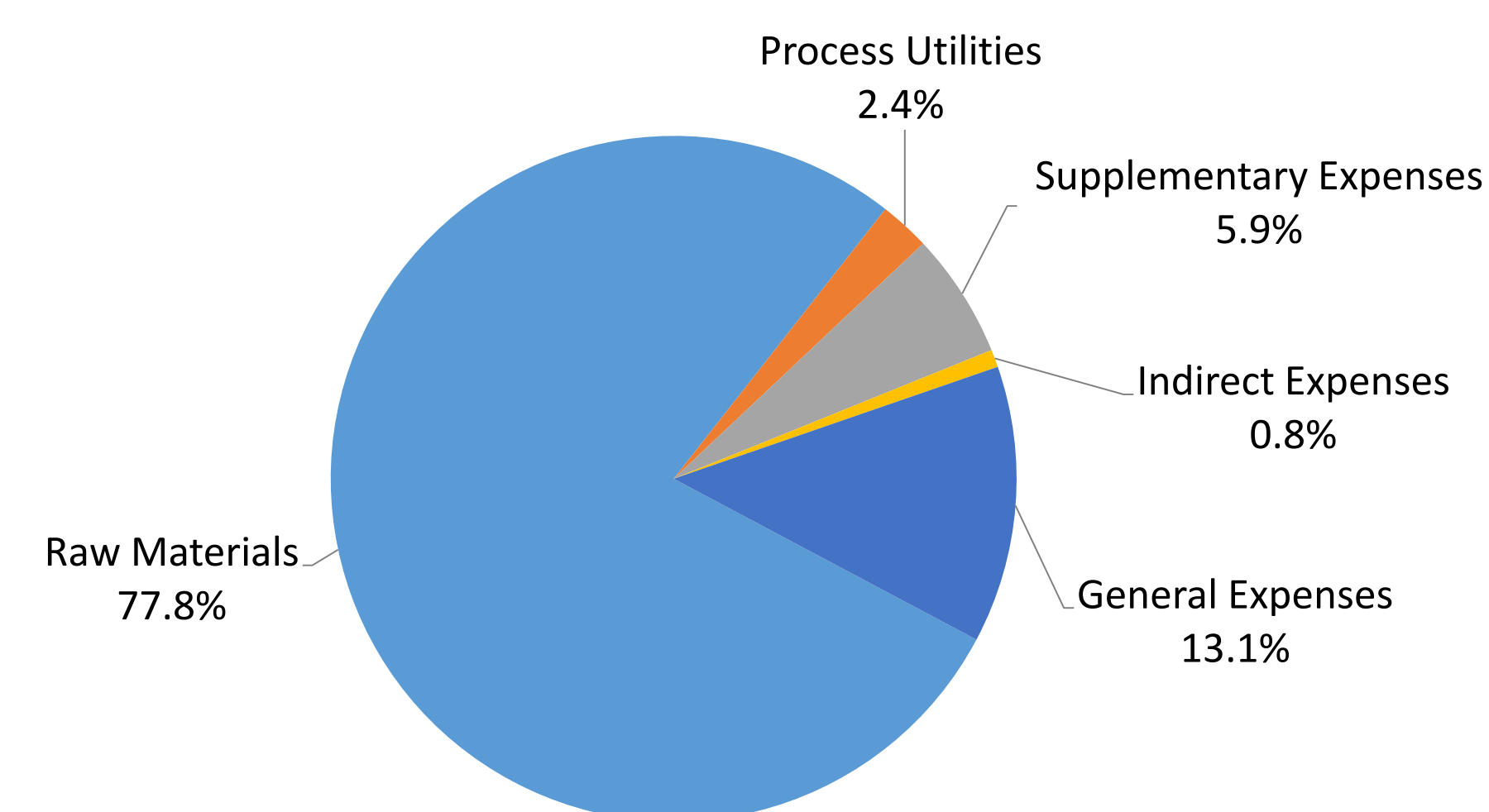
## Introduction and Objectives

- Produce 250,000 gal/day dimethyl ether in Lake Charles, Louisiana.
- Used in the automotive industry for transportation fuel.
- $2\text{MeOH} \rightarrow \text{DME} + \text{H}_2\text{O}$
- Selling price of DME is \$1025 USD/MT.

## Critical to Quality Variables

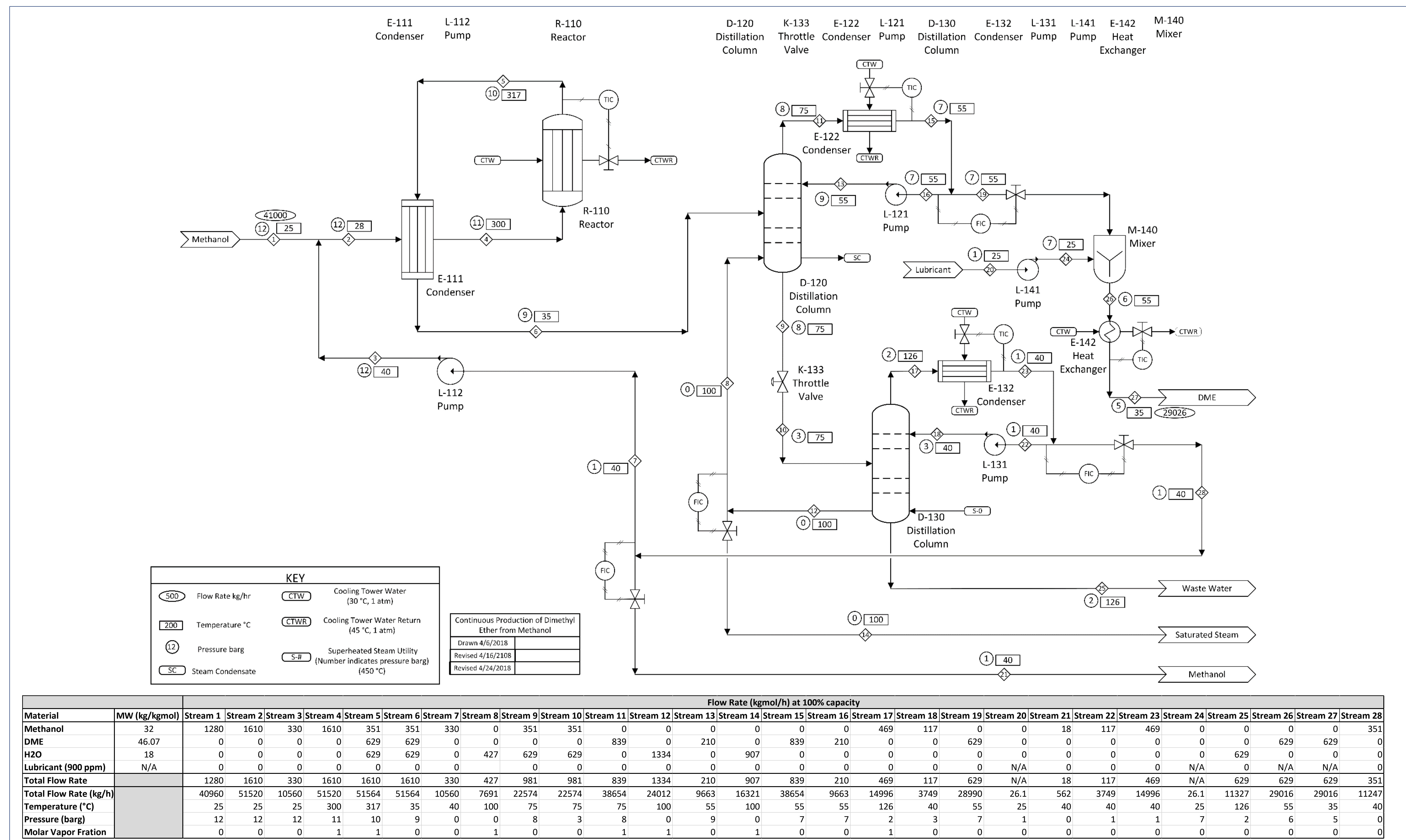
- Purity:** minimum of 98.5%.
- Density:** held to 735 kg/m<sup>3</sup>.
- Viscosity:** kept at 0.11 mPa-s.
- Additives:** lubrication must be 900 ppm (by mass).

## Economic Analysis



- Total bare module cost is \$8.78M USD.
- Total capital investment is \$15.6M USD.
- Net annual profit after taxes is \$8.78M USD.
- Total manufacturing cost is \$240M USD.
- NPV is \$56.1M USD when i=10%.
- After tax rate of return 84.5%

## Process Flow Diagram and Material Balances

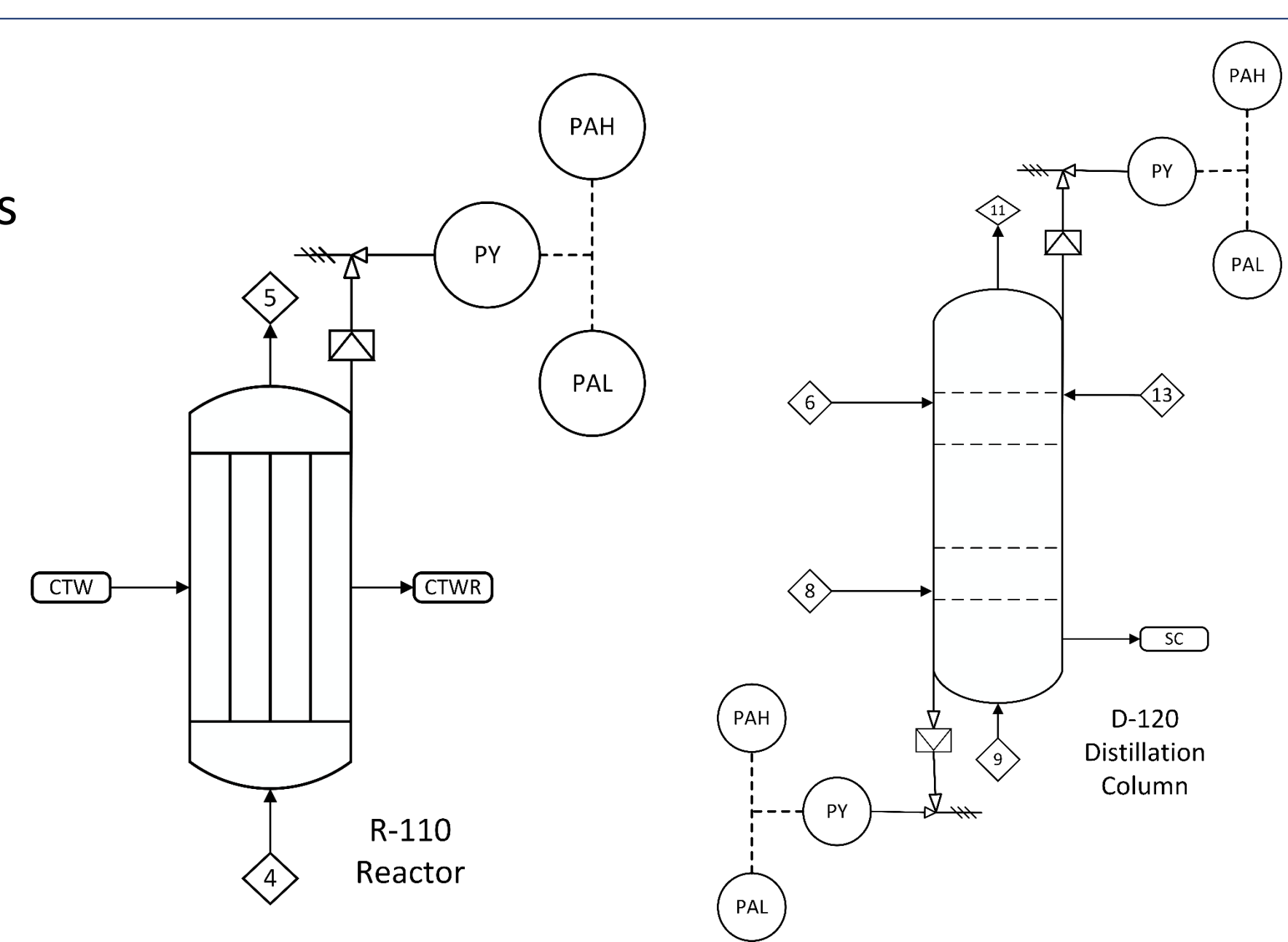


## Safety and Other Considerations

- Relief valves, temperature and pressure control loops used throughout the process for simplification of operation and increased safety.
- HAZOP report around fixed catalyst bed reactor (R-110).

### Health and Environmental Concerns

- Methanol and DME, potentially flammable.
- Minimal ecological and environmental harm.



## Conclusions & Recommendations

- Designed continuous process plant is determined to be safe and profitable, production is a GO.
- DCFRR=53.3%
- NPV=\$56.1M USD when i=10%.
- Net annual profit after taxes= \$8.78M USD.

## Acknowledgements

We would like to thank the entire UNH Chemical Engineering Department for teaching us the necessary information to complete this project.