

CME 381 Optimization Project Report for Dr. Wilkens

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Questions & Answers

1) In order to maximize Operating Profit, how many tons of A and B must be purchased and how many tons of C, D, and E are made?

- 2000 tons of both A and B should be purchased.
- 2000 tons of C and D should be produced via Reaction #1.
- No tons of E should be produced via Reaction #2.

	A	B	C	D	E
Initial Purchases	2000	2000	N/A	N/A	N/A
Reaction #1	-2000	-2000	2000	2000	N/A
Reaction #2	0	0	0	0	0

- Choosing these options results in an operating profit of \$2,270,000.

2) In order to minimize waste (i.e., minimum amount of Material D produced), how many tons of A and B must be purchased and how many tons of C, D, and E are made?

- 2000 tons of A and 1178.57 tons of B should be purchased. Depending on the design of the reactor(s), the amount of B purchased could change to match the input conditions.
- Running 1178.57 tons of B through Reaction #1 results in 1178.57 tons of C forming.
- Reacting the remainder of A with D produces 1648.86 tons of E produced.
- This nets 357.14 tons of D produced.

	A	B	C	D	E
Initial Purchases	2000	1178.57	N/A	N/A	N/A
Reaction #1	-1178.57	-1178.57	1178.57	1178.57	N/A
Reaction #2	-821.43	N/A	N/A	-821.43	1648.86

- Choosing these options results in an operating profit of \$1,247,321, or the minimum allowed operating profit under these initial conditions.

3) What external forces (in broad strokes) might affect the decision and why? List 3.

- Environmental regulations regarding the legal amount of D produced and dumped during an operating period could constrain the ability to produce maximum profit.
- Influence from stakeholders. For example, in 2025, British Petroleum massively cut back on their renewable energy investments and focused on drilling more oil due to pressure for higher profit margins from stakeholders.
- Supply/Demand. Producing nothing but C could drive the price down for C, and the price of getting rid of D could go up over time. E could also go up over time if no other companies are running that reaction, which would make the environmental option more viable.

4) What if Reaction 2 has high personnel safety risks?

- If Reaction #2 has high safety risks, it would require the company to invest in PPE and take proper process safety measures to prevent accidents, which would incur higher costs for running Reaction #2. In addition, higher risk could mean higher amounts of accidents which the company has to pay out for.
- Options to avoid this while still considering any external forces could include exporting product D to another company instead of dumping it or searching out another reaction that would still react D away without having high safety risks.