

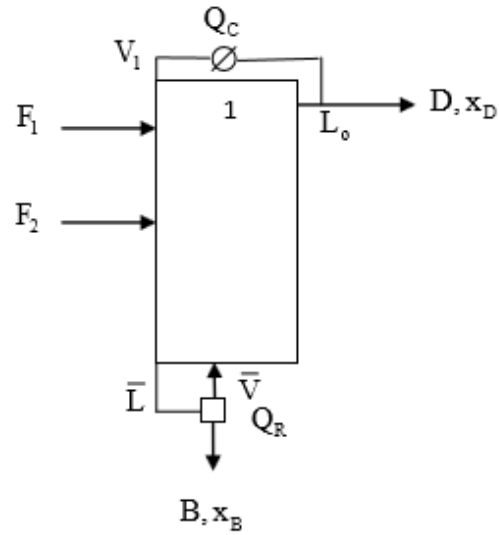
A Student Perspective

COURTNEY MCKELPHIN

Background

- ▶ Missouri native, started conducting research in high school
- ▶ Junior Chemical Engineering Student at the University of Kentucky
- ▶ Vice President of the National Society of Black Engineers
- ▶ Undergraduate Research Assistant since May 2015 – Biofuels and Environmental Catalysis Lab





$$F_1 + F_2 = B + D \quad x_B = 0.0001 \text{ (0.01\%)}$$

$$F_1 z_1 + F_2 z_2 = B x_B + D x_D \quad x_D = 0.85$$

$$\text{Solve } D = \left(\frac{z_{\text{avg}} - x_B}{x_D - x_B} \right) F_{\text{total}}$$

$$F_{\text{total}} = F_1 + F_2 = 1500 \text{ kg/h}$$

$$z_{\text{avg}} = \frac{F_1 z_1 + F_2 z_2}{F_{\text{total}}} = \frac{(1000)(.60) + 500(0.10)}{1500} = 0.43333$$

$$D = \frac{0.43333 - 0.0001}{0.85 - 0.0001} (1500) = 764.62 \text{ kg/h}$$

$$B = F_{\text{total}} - D = 1500 - 764.62 = 735.38 \frac{\text{kg}}{\text{h}}$$

Mass balance calculation is valid for parts a & b for problem 3G1.

$$\text{a) } \frac{L_0}{D} = 3, \text{ Eq (3-14)} \quad Q_C = (1 + L_0/D) D (h_D - H_1)$$

h_D is a saturated liquid at $x_D = 0.85$ wt. frac. From Fig. 2-4, $h_D \sim 45$ kcal/kg

H_1 is saturated vapor at $x_D = y_1 = 0.85$, $H_1 \sim 310$ kcal/kg

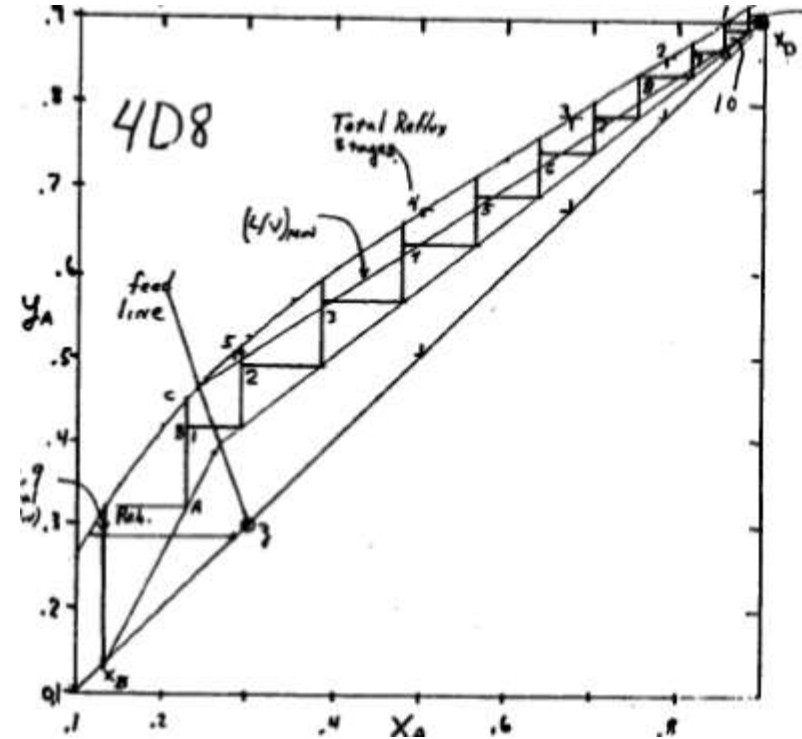
$$Q_C = (1 + 3)(764.62)(45 - 310) = -810,497 \text{ kcal/hour}$$

$$\text{EB around column.} \quad F_1 h_{F_1} + F_2 h_{F_2} + Q_{\text{col}} + Q_C + Q_R = D h_D + B h_B$$

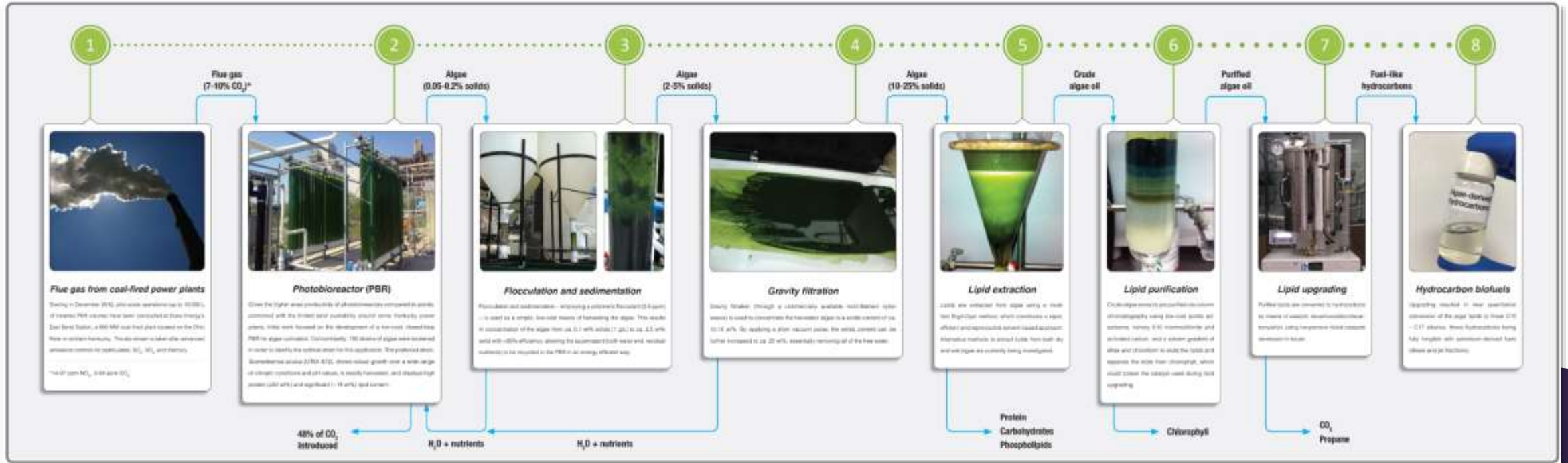
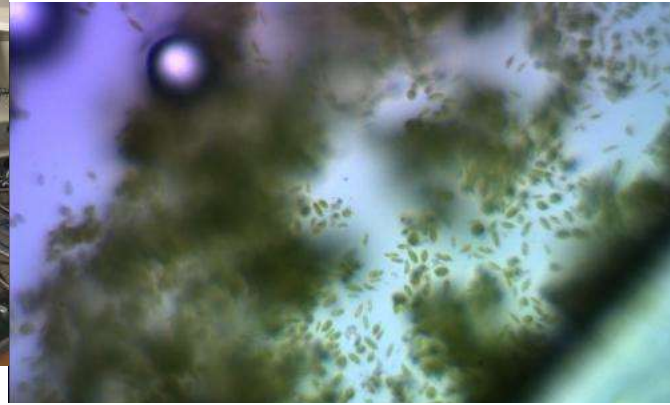
h_{F_1} (81°C, 60 wt% ethanol) ~ 190 kcal/kg; h_{F_2} (20°C, 10 wt% ethanol) ~ 10 kcal/kg

h_B (sat'd liquid - leaves equil contact, ~ 0 wt% ethanol) ~ 100 kcal/kg, $Q_{\text{col}} = 0$ (adiabatic)

$$Q_R = (764.62)(45) + (735.38)(100) - 1000(190) - 500(10) - (-810,497) = 657,259 \text{ kcal/kg}$$



Engineering in the Classroom



Engineering in the Lab: Optimization of Algal Extracts for the Production of Fuels

Because of CAER

Awards

- ▶ Undergraduate Summer Research and Creativity Fellow
- ▶ NSF EPSCoR Research Scholar
- ▶ Best Poster Award – 5th Annual Sustainability Forum

Publications

- “Extraction, purification and catalytic upgrading of algae lipids to fuel-like hydrocarbons ” co-authored submission to Applied Energy.
- Extractions paper in preparation for submission to Fuel.
- NSF EPSCoR Highlight video

Presentations

- University of Kentucky Academy for Undergraduate Excellence Open House
- 5th Annual Sustainability Forum
- Posters-at-the-Capitol

Indirect Effects and Future Plans

- ▶ American Chemical Society Conference – San Diego!
- ▶ Internship at Colgate
- ▶ Summer research in Iceland
- ▶ Amazing mentorship
- ▶ Expansive network

