

Increasing Sustainability: PCR Resin Use in Film Packaging

Linh Tran, Honors Capstone

- **MDP Team:** Kellie Chu, Kate Holt, Jenny Park, Katie Wei
- **Faculty Sponsor:** Dr. Zhan Chen
- **P&G Daily Coaches:** Norman Broyles, Marc Mamak, Amy Waun
 - **Manager:** Leonard Tse
 - **Sponsor:** Ben Clare



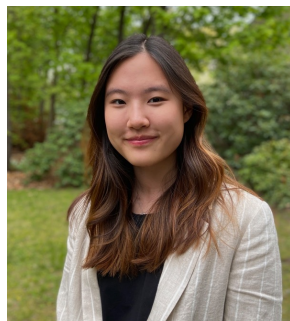
Meet the Team



Kellie Chu
Senior
Materials Science and
Engineering



Kate Holt
Senior
Mechanical
Engineering



Jenny Park
Junior
Chemical Engineering



Norman Broyles
Daily Coach
Procter & Gamble



Marc Mamak
Daily Coach
Procter & Gamble



Amy Waun
Daily Coach
Procter & Gamble



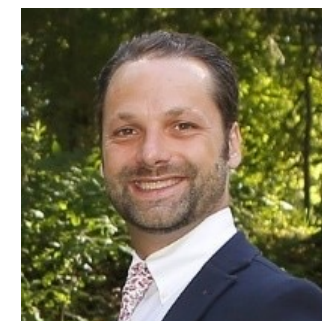
Linh Tran
Senior
Chemical Engineering



Katie Wei
Senior
Chemical Engineering



Prof. Zhan Chen
Faculty Mentor
Chemistry



Ben Clare
Sponsor
Procter & Gamble



Leonard Tse
Manager
Procter & Gamble



How did I get involved?



Research



Sustainability



Collaboration



Procter & Gamble – Ambition 2030



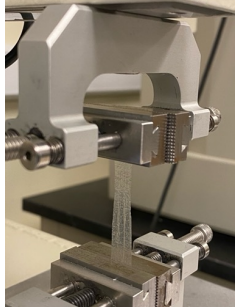
- 100 percent of our leadership brands will enable and inspire responsible consumption.
- 100 percent of our packaging will be recyclable or reusable.
- **P&G will reduce global use of virgin petroleum plastic in our packaging by 50%.**
- We will build even greater trust through transparency, ingredient innovation, and sharing our *safety science*.



Project Timeline

Winter 2022

University of Michigan
Ann Arbor, MI



- Background research
- Preliminary testing

Summer 2022

P&G Site
Cincinnati, OH



- On-site testing
- Individual test method development

Fall 2022

University of Michigan
Ann Arbor, MI

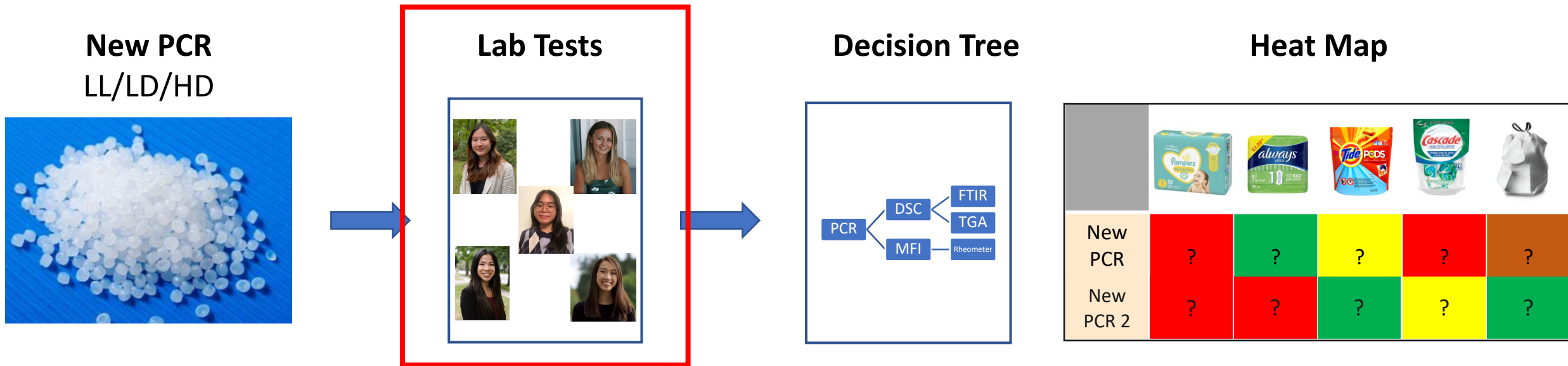


- Additional testing
- Refining final deliverables



PCR Film Fingerprinting

- **Quick evaluation** of new film post-consumer recycled(PCR) materials for P&G/Glad JV applications
- **Contaminant identification** for downstream & upstream opportunities



Desired (Business) Outcome

- Time and cost-efficient PCR selection
- Accessible PCR data
 - Greater incorporation of PCR into packages in BU (Ambition 2030)
 - Identify shortcomings of PCR to make upstream/downstream recommendations
 - Upskill community on key polymer properties to consider for film packaging performance



Film PCR Fingerprinting Plan

Phase 1: Pellet Characterization



1. Blend Production
2. Rheology
3. Thermal Analysis
4. IR
5. Optics
6. Chemical Contamination



Phase 2: Film Characterization



1. Film Production
2. Mechanical Properties
3. Heat Sealability
4. Defects by Optical
5. Defects by IR



Phase 3: FLEXLOOP™

Side Bar



1. Constitutive modeling
2. Process Improvement

Phase 4: Consumer Understanding



Team Contributions

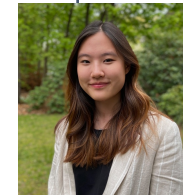
Pellet
Characterization

**Polymer
Characterization**
(Kellie Chu)



Kellie Chu

Polymer Analysis
(Jenny Park)



Jenny Park

**FLEXLOOP™/Consumer
Understanding**
(Linh Tran)



Linh Tran

Processability
(Kate Holt)



Kate Holt

Defect Analysis
(Katie Wei)

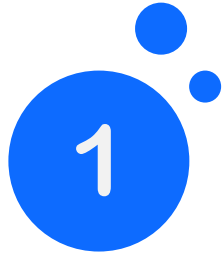


Katie Wei

Film Characterization



Team Deliverables



- **Decision Tree**
- Test method refinement



- **Heat Map**
- Evaluation of relevant properties to identify applications



- **Technical Data Sheets**
- Compilation of key properties and observations

What I Learned

- Technical skills
 - Material Science: tensile testing, DSC, optical microscopy, rheology
 - Analytical: LC/MS, FTIR, IR
 - Product Research: Consumer Study
- Research from industry perspective – much faster and more business/optimization focused
- Teamwork – collaborating and holding each other accountable
- Confidence – taking ownership of your work
- Speak up for yourself!



PCR Resin Digital Portal

- **Rigid PCRs:**

- Launched June 2022
 - Gate 1: purchasing qualifications
 - Gate 2: resin technical testing
 - Gate 3: operating unit qualifications

Film PCRs:

- Expected prototype page: December 2022
- Launch date: June 2023



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 - *Lijuan Li*
 - *Inyce Byrd*
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 - *Marc Mamak*
 - *Amy Waun*
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 - *Leonard Tse*
- Thanks to Enabling Technologies:
 - *Melissa Heard*
 - *Tammy Lue*
 - *Tammy McGuire*
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 - *Vicky Borchert*
 - *Candace Beach*
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 - *Professor Zhan Chen*
- *And MDP Staff*



Thank you!

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