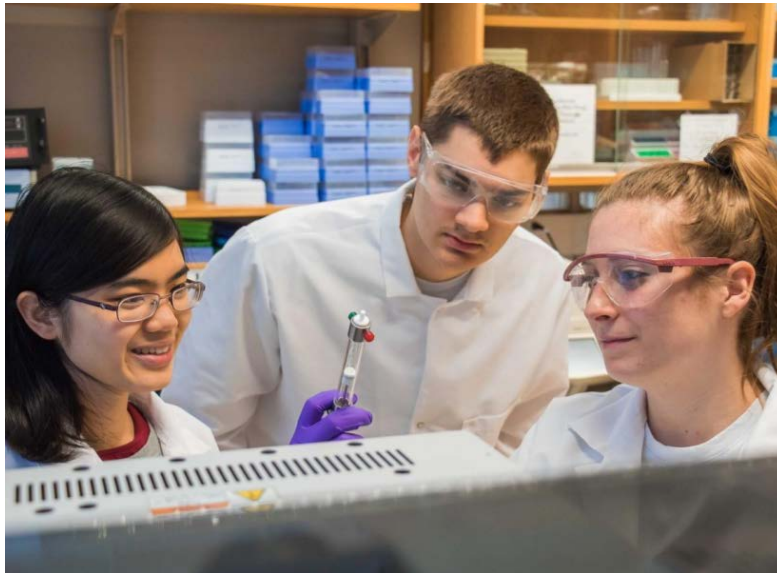




FOOD CONTAINERS: WASTE TO ENERGY

Alysha Helmrich
Environmental and Ecological Engineering (EEE)

Introduction



SENIOR DESIGN TEAM, EEE

Agenda

- Introduction
- Experiments
- Impacts
- Moving Forward

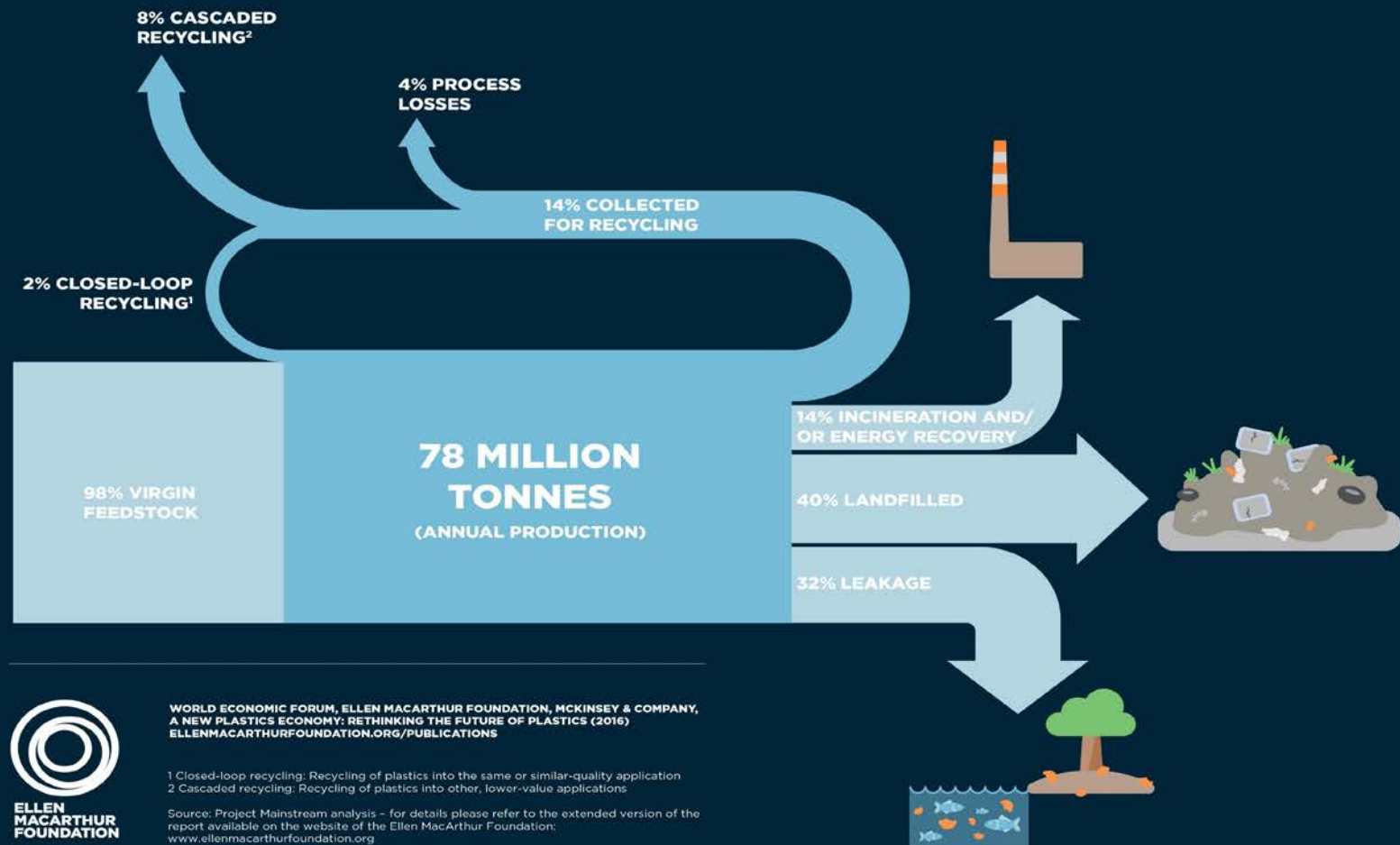
Introduction

Problem Statement

Ideally, discarded food containers could be collected, shredded and transported to an anaerobic digester where biodegradation with energy recovery would occur.



SENIOR DESIGN PARTNERS:
WEST LAFAYETTE GO GREENER COMMISSION



The flow chart maps the end of life cycle for food packaging, where landfilling is the most common option. Improper disposal can lead to plastic debris in surface water and oceans.

Introduction

Design Objectives

Primary

Identify a

- U
- S
- E

West Lafayette Wastewater Treatment Plant

Feedstock

- Purdue Dining Courts Food Waste
- Fats, Oils, and Greases

Environment

- 100°F with Constant Vertical Agitation

Turnover Time

- 21 Days

Products

- Fertilizer (Less than 20% Inert Output)
- Biogas (Methane and Carbon Dioxide)

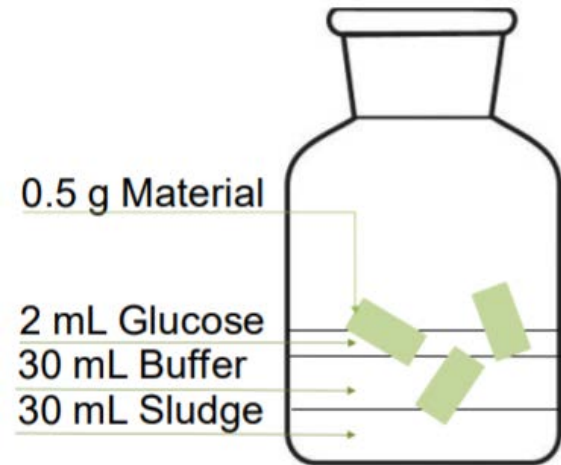
Experiments

Initial Experiment

MICROCOSM SCHEMATIC

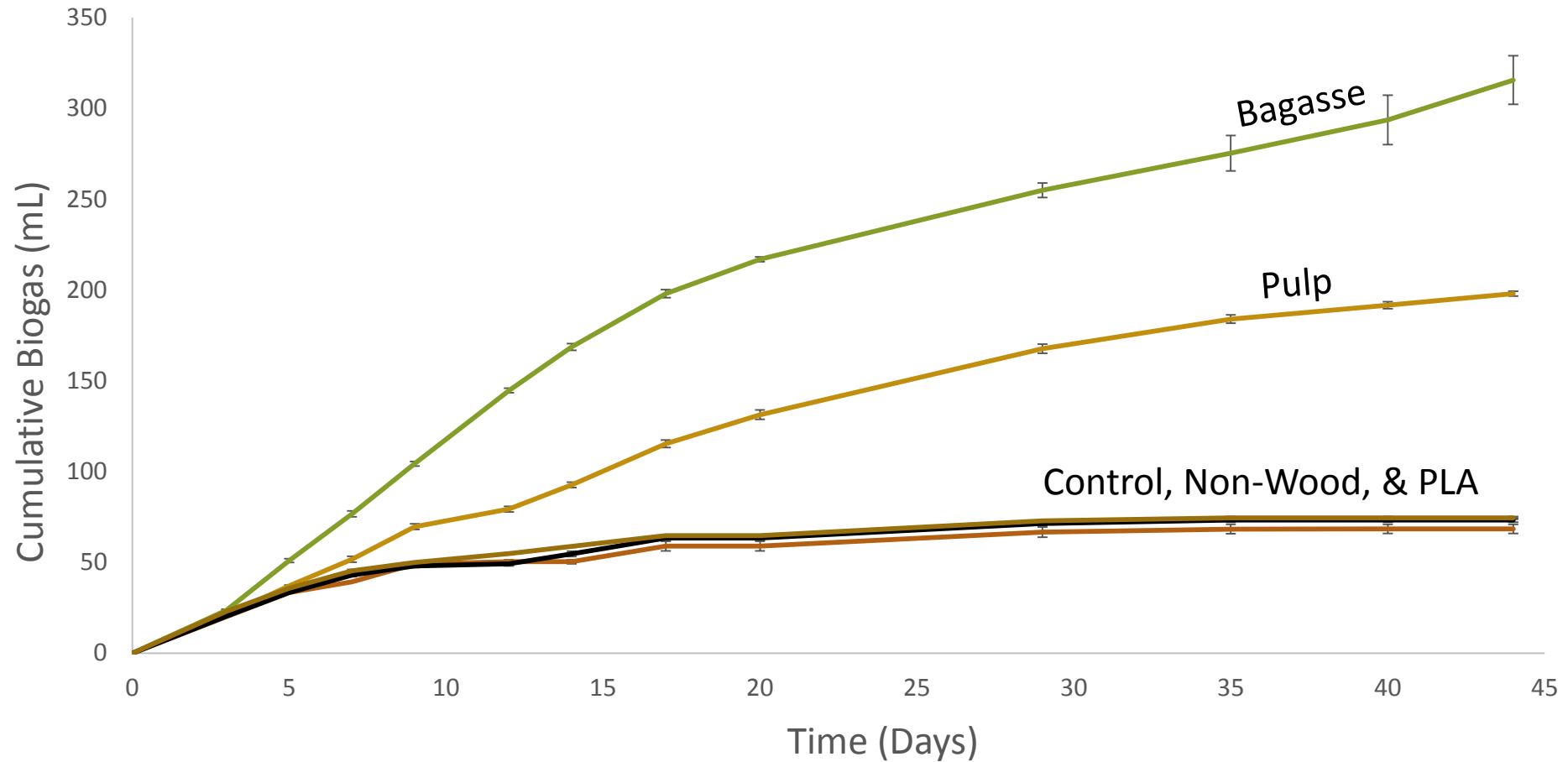
Materials

Pulp
Bagasse
Non-Wood
Polylactic Acid (PLA)



Objectives

1. Observe biogas production and composition
2. Measure reduction in mass as affected by material



Biogas production of four compostable food containers compared to a control. Pulp and bagasse-based materials had significant differences to the control.

Experiments

Estimated Price per Container (Environmentally Friendly Materials)



Experiments

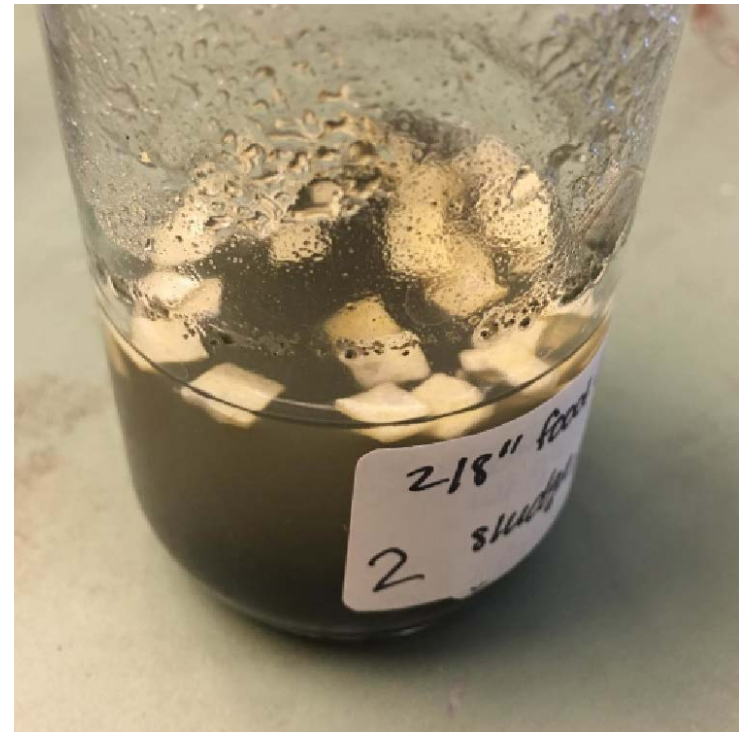
Follow Up Experiment

Objectives

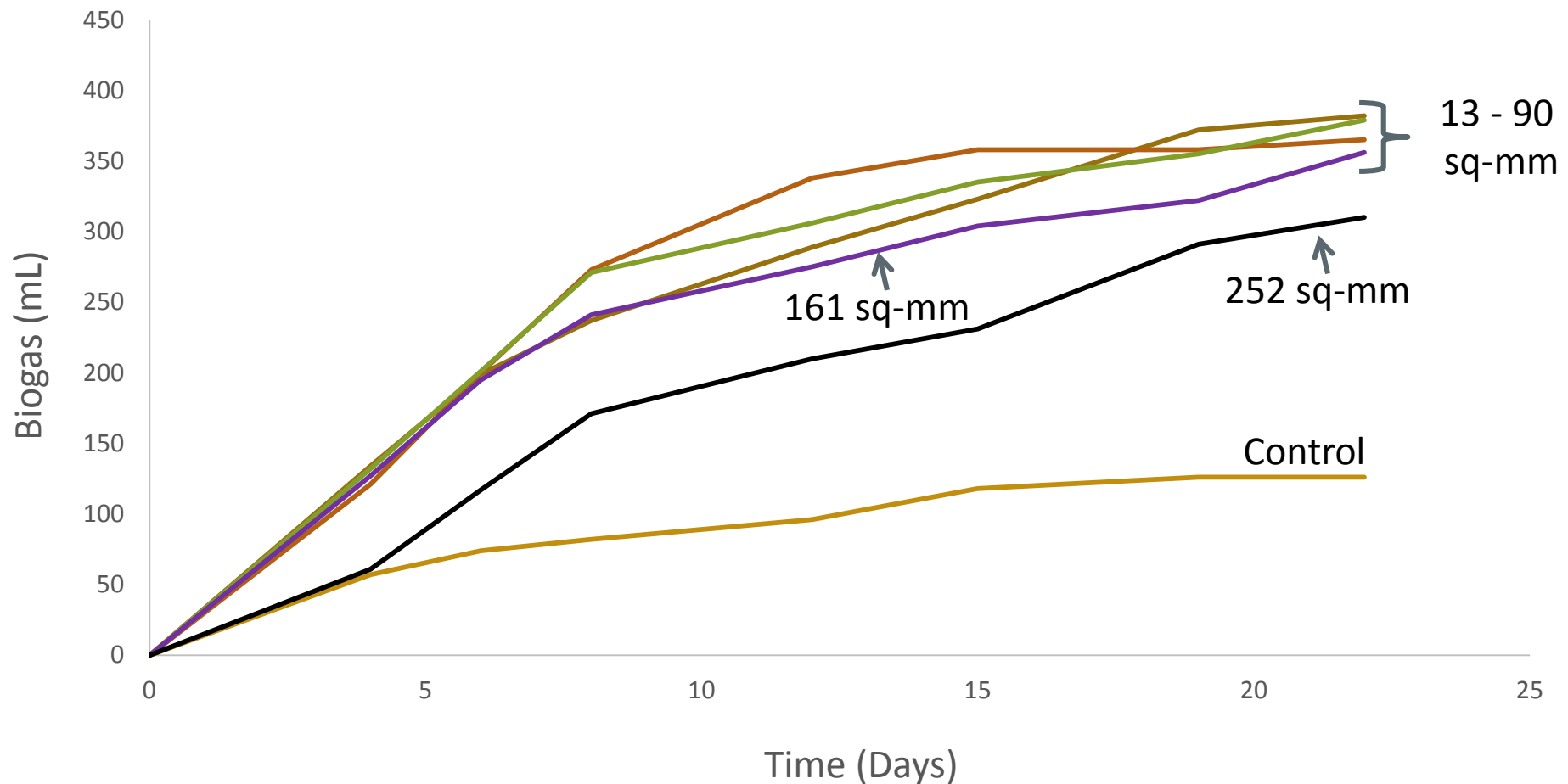
1. Observe biogas production and composition
2. Measure reduction in mass as affected by various sizes induced through shredding

Environment

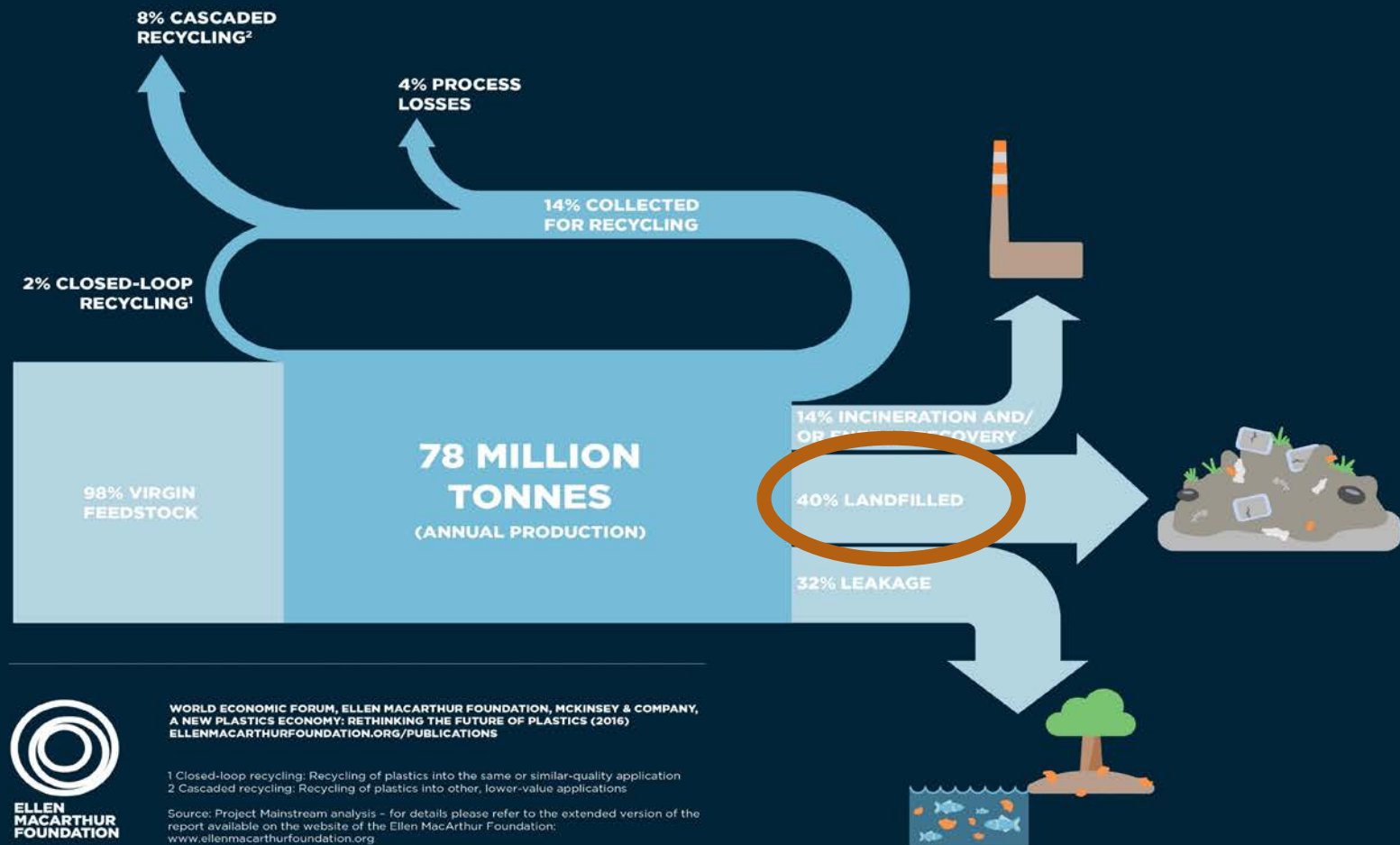
Maintained at 100°F
Agitated at 150 rpm
Operated for 21 Days



TWENTY-FOUR 150ML MICROCOSMS WERE
CREATED THROUGHOUT THE EXPERIMENTS



Biogas production of bagasse-based material showing varying sizes maintain biogas production, therefore size differentiation may not be a prominent factor of effective digestion.



The flow chart maps the end of life cycle for food packaging, where landfilling is the most common option. Improper disposal can lead to plastic debris in surface water and oceans.

Impacts

31.2 MILLION TONS
OF FOOD PACKAGING A YEAR
REACHES LANDFILLS

Impacts

Reduction in Pollution

Waste

- Less waste sent to landfills
- Less recyclables contaminated by food waste

Emissions

- Less CH₄ and CO₂ from landfills
- CH₄ and CO₂ captured and used for electricity at West Lafayette Wastewater Treatment Plant

Added Value

- Capture embodied energy of material

Moving Forward




MICROCOSM FROM
SECOND EXPERIMENT

Learning the Why & How

- Why did bagasse-based material break down and produce biogas efficiently?
- Why might size not be a distinctive factor in biogas production?
- How to encourage the public to segregate waste at generation.



THANK YOU



Alysha Helmrich
ahelmric@purdue.edu
Environmental and Ecological Engineering,
Purdue University

Sources

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