



EnPRO 352

A Recyclables Business Model for IIT

"A self-sustaining educational enterprise that OmIITs waste by converting it into profits and learning"

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Mission Statement - Need

Our sponsor Joe Clair, director of the IIT Office of Campus Energy and Sustainability charged our group with the task of creating a business model for a student run recycling business on campus.

The main purpose of this business would be to increase the currently 33% recycling rate, which is in the 75th quartile of reporting universities.

Awareness



Product Development





Survey





Critical & Ethical Issues

-  The team members did not have a complete understanding of recycling practices at IIT
-  Obvious sources (aluminum, plastic, & glass) unavailable due to existing contracts



Team Organization





Financial Summary

SUMMARY of the ANNUAL BENEFITS by the NEW RECYCLING PROGRAMS

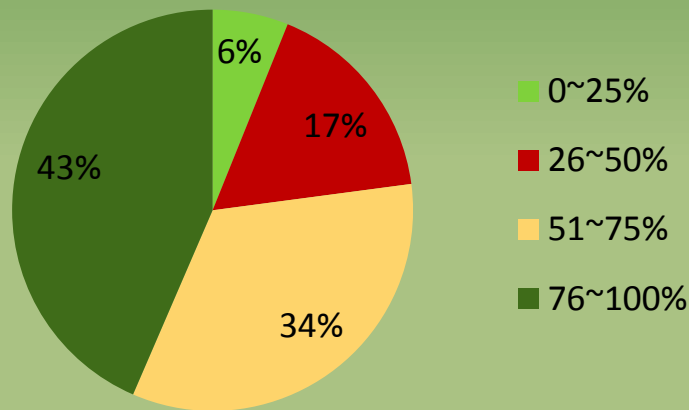
	Paper Recycling Program	Salvage Store Program	Composting Program	Bio-Diesel & Hand Soap Program	TOTAL
Program Savings	\$60,000	\$20,000	\$10,350	\$945	\$91,295
Program New Revenue	<i>n/a</i>	\$20,000	\$4,600	\$75,618	\$100,218
TOTAL REVENUE and/or Savings	\$60,000	\$40,000	\$14,950	\$76,563	\$191,513
Number of Students Employed	1	2	2	2	7
# of Supervisory Personnel (<i>New-- for programs</i>)				1	1
Total COGS & Operating Expenses	\$8,000	\$21,000	\$9,000	\$60,000	\$98,000
OPERATING PROFIT	\$52,000	\$19,000	\$5,950	\$16,563	\$93,513
ASSETS (<i>Incremental for Program Operations</i>)	\$3,500	\$1,288	\$5,000	\$40,000	\$49,788
ROA (<i>Modified for context -- no "net" profit available</i>)	1486%	1475%	119%	41%	188%



Student Organization & Awareness

What percentage of paper do you place in recycling bins?

Students



Linnea Fraser



Marketing / Awareness

-  Incorporated throughout the Organization
-  Ensures Participation
-  Maintains Focus on the Target Audience
-  Prolongs Successful Business Endeavors

**OmniIT Waste
Recycle**





Research Methodology

Recycling Education

- Approaching the provided information as an average student

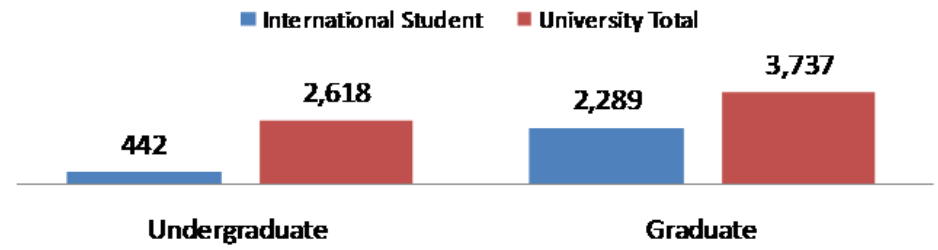
College Demographic

- Significant Diversity
- Large Age Range

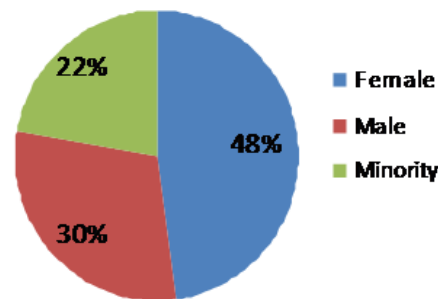
Survey Analysis

- Enthusiasm for Recycling
- Limited Knowledge about Recycling

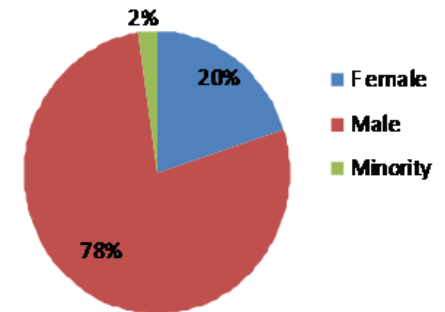
Diversity of Students



Diversity of Staff



Diversity of Faculty



Quick Facts at IIT (http://www.iit.edu/about/pdfs/quick_facts_2009-10.pdf)



Testing Our Demographic

- ♻️ Standardized Labels
- ♻️ Consistent and Definitive Recycling Containers
- ♻️ Continuous Training
(from College Freshmen to Seasoned Staff)
- ♻️ Formal and Informal Events
(Calendar)
- ♻️ Effective Marketing for Future Developments
 - ♻️ Website Design/Accessibility
 - ♻️ Promotional Advertisements





Pilot Program Proposal



 Primary Material Recycled
(Paper)

 Prospects for Improvement

 A Necessary Benchmark

 Comparative Analysis

 Leads to Profit/Diversion of
Waste





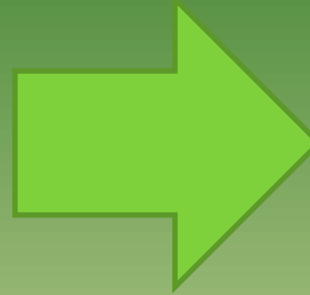
Revenue Model

Paper Recycling Program

Program Savings	\$60,000
Program New Revenue	<i>n/a</i>
TOTAL REVENUE and/or Savings	\$60,000
Number of Students Employed	1
# of Supervisory Personnel (<i>New-- for programs</i>)	
Total COGS & Operating Expenses	\$8,000
OPERATING PROFIT	\$52,000
ASSETS (<i>Incremental for Program Operations</i>)	\$3,500
New Labels : \$1,000	
Extra Paper-Only Bins: \$2,500	
ROA (<i>Modified for context -- no "net" profit available</i>)	1486%



Biodiesel & Liquid Soap



Bill O'Toole



Waste Vegetable Oil

- ♻️ One revenue stream that was identified was Waste Vegetable Oil (WVO)
- ♻️ WVO has the potential to be converted into biodiesel and biosoap which can be sold to outside consumers or used on campus to save money



Research



BYU Coconut Oil to Loyola Biodiesel Lab



WVO to Biodiesel

1.0 gal WVO



Methoxide (0.2
gal Methanol +
32.78g KOH)



0.95 gal
biodiesel, 0.18
gal glycerin



Glycerin to Biosoap

0.18 gal
Glycerin







13g KOH, water,
additional WVO



4-6 gal liquid
Biosoap



Registration, Reporting & Testing

-  National Biodiesel Board
-  Environmental Protection Agency
-  Internal Revenue Service
-  Illinois Department of Revenue
-  American Society of Testing and Measurement



Potential Biodiesel Partners





Biosoap

recycle
omiiit
waste

www.TechSalvageStore.com

BioSoap

produced by iit students

Lavender

This soap is made from recycled "waste" products from biodiesel production in IIT's Facilities Campus Energy and Sustainability (FCES).

Ingredients: water, filtered and purified waste vegetable oil (WVO), glycerin, potassium hydroxide, isopropyl alcohol, essential oil





Revenue Model

BIO-DIESEL & LIQUID SOAP PROGRAM

Number of Operating Months

	<u>Monthly</u>	<u>Annulized</u>
Number of Operating Months	1	10

Revenue and Productions Assumptions

Number of "base" Bio-Diesel production run batches per month

16

Costs of Goods Sold per BATCH (material costs only) --" CONVERSION PROCESS "

Number of gallons of Waste Vegetable Oil (WVO) per batch

16

Bio-Diesel Production

cost/unit

1 Gallon of WVO	\$0.00
0.2 Gallons of Menthanol	\$0.65
32.78 Grams of KOH	\$0.36
<i>Material Only COGS Subtotal</i>	\$1.01 <i>per gallon of WVO used</i>

Extensions based on above drivers		
\$0.00	\$0.00	\$0.00
\$10.40	\$166.40	\$1,664.00
\$5.76	\$92.16	\$921.60
\$16.16	\$258.56	\$2,585.60

Output from Base Bio-Diesel Production

Gallons of Bio-Diesel produced per gallon of WVO	0.95	15.2	243.2	2,432.0
Gallons of Glycerin per gallon of WVO prod. Run	0.18	2.9	46.1	460.8

Liquid Hand Soap Production -- per "base" Bio-Diesel production Run

0.18 Gallons of Glycerin	\$0.00	<i>from base production</i>
13.0 Grams of KOH	\$0.14	
Water Added	\$0.00	
Additional WVO	\$0.00	
<i>Material Only COGS Subtotal</i>	\$0.14	<i>per gallon per base prod. Run</i>

\$0.00	\$0.00	\$0.00
\$2.24	\$35.84	\$358.40
\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00
\$2.24	\$35.84	\$358.40

Gallons of Liquid Hand soap produced per "base" run	5	80.0	1280.0	12,800.0
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Revenue Model Cont.

Production Labor

Student Labor; Number of	2	
Hours worked per month	40	
Wage rate per hour (gross)	\$10.00	
Subtotal Direct student cost	\$800.00	\$8,000.00
Lab Manager Salary (annual)	\$40,000	\$40,000.00

BIO-DIESEL & LIQUID SOAP PROGRAM

NEW REVENUE and/or EQUIVILANT SAVINGS

Annual Est.

Bio-Diesel Sales

Estimated gallons of Bio-Diesel produced annually (<i>see above</i>)	2,432.0	
Annual average price of Bio-Diesel Sold	\$3.85	\$9,363.20

Liquid Hand-Soap Savings

Est. of gallons of liquid hand soap used (annually) by IIT	180	
Annual average price paid by IIT per gallon	\$5.25	\$945.00

Liquid Hand Soap Sales

Est. of gallons of soap available for sale (<i>annual PROD. - used by IIT</i>)	12,620	
Average annual selling price per gallon of hand soap	\$5.25	\$66,255.00

TOTAL REVENUE AND SAVINGS

\$76,563.20



Revenue Model Cont.

COST OF GOODS SOLD (COGS) -- annual estimates

Student workers	\$8,000.00	
Lab Manager	\$40,000.00	
Estimated on-campus facilities rent and utilities (annualized)	\$6,000.00	
Depreciation of Production Equipment Only (straight-line; 10 yr life)	\$500.00	\$54,500.00
		<hr/>
GROSS PROFIT from OPERATIONS		\$22,063.20

Other Overhead Expenses -- Annual Fees

National Diesel Board -- health & administration regulations	\$2,500	
American Society of Testing and Measurement -- biodiesel tests	\$1,000	
Annual cost of bond with Illinois Department of Revenue	\$2,000	\$5,500.00

OPERATING PROFIT

\$16,563.20

ASSETS PURCHASED

Leasehold Improvements

Blast Curtain	\$15,964
HVAC System	\$19,036

Production Equipment

Microprocessor (bought from Loyola Univ; includes training)	\$5,000
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Total Assets		<hr/> \$40,000.00
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ANNUALIZED RETURN ON ASSETS (ROA) -- formula modified for context; no "net" calculation available

ROA estimated using the formula of " $\text{Operating Profit} / \text{Total Assets}$ " 41%



Next Steps

- 🔄 Grow in scale
 - 🔄 Maximize efficiency
 - 🔄 Profitability
- 🔄 Create strategic partnerships with government, corporate, and learning institutions to allow Chicago, Illinois, the United States, and the whole world to become more sustainable
- 🔄 Seeking potential grants for funding & future EnPROs






Salvage Store

A screenshot of the Tech Salvage Store website. The page features a dark blue header with the site logo and navigation links. A red navigation bar contains links for HOME, ABOUT US, CONTACT US, and ASSET DISPOSAL FORMS. The main content area is divided into three columns: a left sidebar with category and price filters, a central "Featured Products" grid, and a right sidebar for "NEW RELEASES". The featured products include a BlackBerry phone, a Dell laptop, an office chair, an office desk, a table, and a wood bookshelf. Each product listing shows an image, name, price, and an "Add To Cart" button. The footer contains links for Asset Disposal Forms, Terms and Conditions, Product Index, and Category Index, along with a copyright notice for 2010 Tech Salvage Store.

Eddie Shin



Purpose – Maximize Utilization

-  Create a central location for all recyclable and reusable items on-campus
-  Establish a central point of contact for all university staff, faculty, and students
-  Allow for a more streamlined and efficient process to benefit the campus sustainability goals



Methodology




Research @ IIT

-  Kelly Schaefer
-  Brian Laffey & Frank FioRito

Benchmarking Other Universities

-  DePaul University
-  Northwestern University

Follow up with IIT Departments

-  Campus & Conference Centers
-  Architecture Buildings
-  Other Departments



Our Project Design

Hybrid model including items being sold internally as well as to the public.

Salvage Store website



Revenue Model

Revenue Model

SALVAGE STORE

Number of Operating Months

Monthly

1

Annulized

10

REVENUE and/or SAVINGS

Revenue Estimates (monthly average of revenue from sales)

\$2,000

\$20,000

Savings Estimates (monthly average of new purchases avoided)

\$2,000

\$20,000

Total SAVINGS & REVENUE ESTIMATES

\$4,000

\$40,000

OPERATING EXPENSES

Number of Students

2

Number of hours/month

80

Gross Student wage/hour

\$10.00

Subtotal of Student Payroll/mo.

\$1,600.00

\$16,000

Related Operating Expenses

Other Expense Items (i.e., on-campus storage facility rent)

\$500

\$5,000

Total Operating Expenses

\$2,100

\$21,000

OPERATING PROFIT

\$1,900

\$19,000

ASSETS

Camera

\$200

Moving Equipment

\$414

Website/Software (annual fees)

\$674

Total Assets

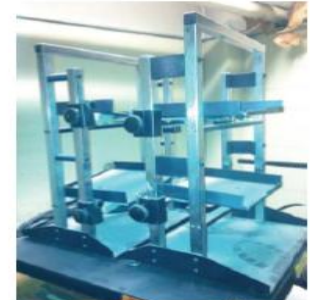
\$1,288

ANNUALIZED RETURN ON ASSETS (ROA)

formula modified for context; no "net" calculation available






ROA estimated using the formula of " = Operating Profit / Total Assets "

1475%










Benefits

-  Increased utilization of assets
-  Less waste
-  Better buying by departments
-  Increased communications among departments
-  Revenue generated by purchasing used items



Next Steps

-  Find a space to house this program
-  Awareness about the program & website
-  Hiring and training staff
-  Identify additional items beyond those previously mentioned
-  Adopt a local school to donate unused items



Composting Program



Hugo Ramirez



Composting Information

What is composting?

Composting is the controlled biological decomposition of organic material in the presence of air to form a humus-like material.

Why Compost...

1. Helps your local Environment
2. Reduces the amount of garden and kitchen waste going to Landfill
3. Saves you money
4. Helps your garden grow naturally

What can you compost?

Grass Cuttings
Hedge Cuttings
Vegetable Peelings
Tea Bags
Coffee Grounds
Ripped Cardboard & Paper
Fruit Cuttings

What can you not compost?

Meat, Fish or Cheese
Coal ash
Cooked Left Overs
Metals, Glass or Plastic
Nappies



Organic Material

Sodexo plans to take initiative and separate organic waste if a composter is made available on site. Here is current data of organic waste flowing through IIT's Main Campus:

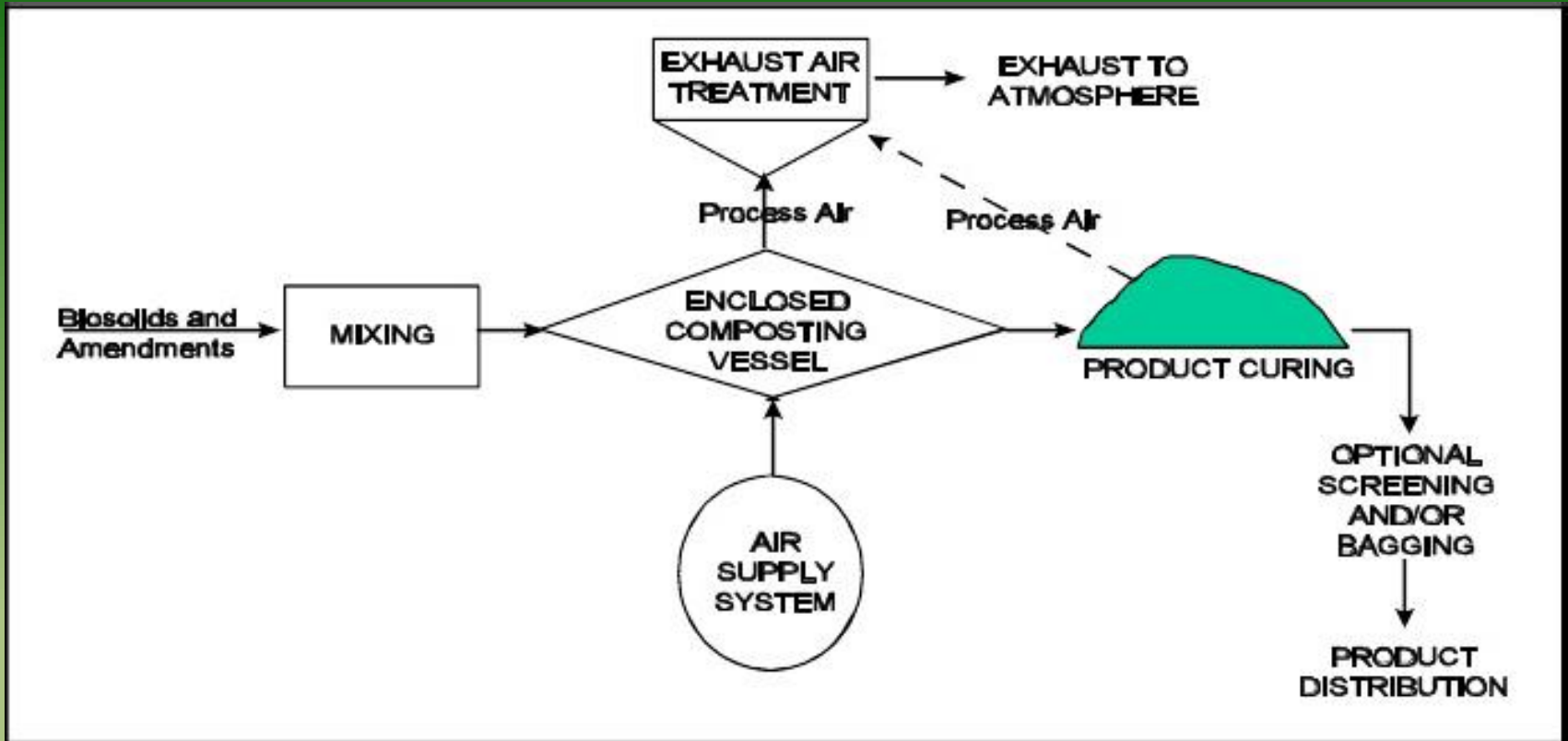
- ♻️ **FOOD WASTE:** 1,360 cubic yards/year
- ♻️ **YARD WASTE :** 30 cy waste x 8 months= 240 cubic yards waste/year (April – November)
- ♻️ **SAWDUST :** 350 gallons x 32 weeks= 11,200 gallons/ year



*Special thanks goes to IPRO 312 from Spring of 2010 for making data available.



Process

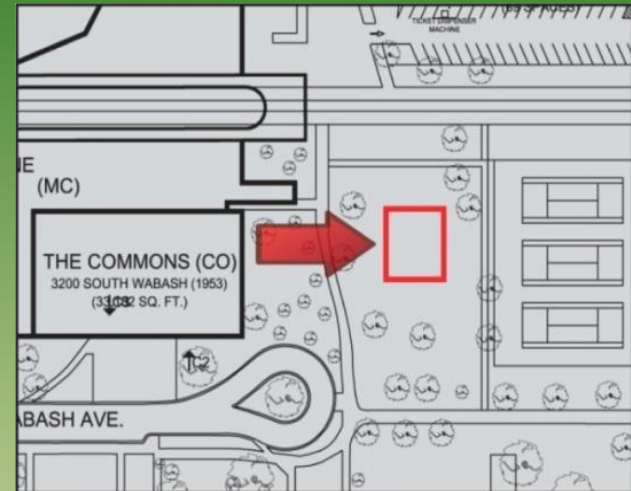




Next Steps



A-900 In-Vessel Composting Unit



Proposed Location for the In-Vessel Unit on IIT Campus



Revenue Model

COMPOSTING PROGRAM

	<u>Monthly</u>	<u>Annual</u>
Number of Operating Months	1	10

REVENUE and/or SAVINGS

Savings Estimate Calculation

Compost Used by IIT (Yds ³)	450
Price paid by IIT (per Yds ³)	\$23.00
Savings Estimate	\$10,350

Revenue Estimate Calculation

Excess Compost available for sale (Yds ³)	200
Net Revenue of Compost Sold (Yds ³)	\$23.00
Revenue Estimate	\$4,600

Total SAVINGS & REVENUE ESTIMATES	\$14,950
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Revenue Model Cont.

OPERATING EXPENSES

Number of Students	2	
Number of hours/month	40	
Gross Student wage/hour	\$10	
Subtotal of Student Payroll/mo.	\$800	\$8,000
<u>Related Operating Expenses</u>		
Other Expense Items (Est., gas, etc...)	\$100	\$1,000
Total Operating Expenses	\$900	\$9,000
<u>OPERATING PROFIT</u>		\$5,950

ASSETS

Composting system (<i>Donated -- no cost charged</i>)	\$0	
"Bobcat" - type tractor -- <i>estimated cost</i>	\$5,000	
Total Assets Needed / Purchased		\$5,000

ANNUALIZED RETURN ON ASSETS (ROA)

formula modified for context; no "net" calculation available

ROA estimated using the formula of $\text{ROA} = \text{Operating Profit} / \text{Total Assets}$ 119%



Conclusion

SUMMARY of the ANNUAL BENEFITS by the NEW RECYCLING PROGRAMS

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Questions

