

A graphic element of the ISU BioBus logo consisting of four overlapping squares: a yellow one on the top left, a light green one on the top right, a red one on the bottom left, and a white one on the bottom right.

ISU[®]
BIOBUS
STUDENT ORGANIZATION

Partnership Program

Sponsoring Hands-on Leadership in Sustainability





Our Mission

We educate tomorrow's leaders of a more sustainable world through hands-on practicality, experiential learning, and community involvement. Our motto is lead first by doing.



Who We Are:

ISU BioBus is an interdisciplinary entrepreneurial student initiative that recycles waste vegetable oil from ISU campus dining facilities into biodiesel fuel to power the city of Ames' CyRide buses. While the goal of the organization is to increase sustainability at Iowa State by recycling, the underlying emphasis is to create an experiential sustainable learning program to integrate students, faculty, and the community.



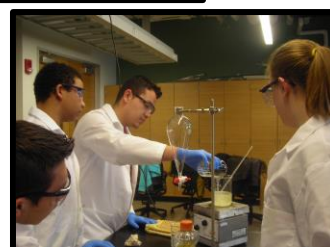


BioBus Outreach

One of ISU BioBus' key goals is to reach out to and educate future leaders about sustainability. We believe that educating our future leaders is important in creating a workable and efficient society. A few of the things we do:



- Teach students and community members of all majors and ages the concepts of sustainability by recycling used grease into biodiesel fuel.
- Share information about alternative fuels and renewable energy through on-campus events and volunteer opportunities
- Host student groups in our laboratory where they can do hands-on experiments and see our processor and process
- Visit local schools, other universities, and companies to teach about practical sustainable approaches



“Everyone wants to make their mark. Everyone wants to leave their legacy. Let’s make ours -- brilliantly green, and permanent.”

-David Correll, ISU BioBus Club Founder, Former President





Goals - Moving BioBus Forward

For over 8 years ISU BioBus has touched the lives of more than 3,000 individuals! Our current plans and approaches to address current needs will allow us to do so much more in the future. With collaborative partners can we achieve these goals and create a brighter greener future together. We hope that you will join us in this endeavor!

- **Regular membership is over 30 representing a wide variety of majors in engineering, science, and business requiring an increasing array of activities for engagement**
- **ISU BioBus has shifted from an experiential based model towards a project and team based model of member engagement and such a shift requires many more resources to sustain and develop projects**
- **Outreach and educational opportunities in the Ames area are successfully utilized expanding this area requires reaching statewide to our interested parties wishing to collaborate**



Over the next several years BioBus intends to increase production capacity to approximately 1000 gallons per year. We plan to increase outreach to the statewide community and add weekly social events to the club. Long term goals include going to sustainability conferences, doing volunteer work within the Ames community, and taking study abroad trips to developing countries. We also hope to partner with ISU research and corporate partners to become a test bed for biodiesel production technology and renewable fuels, incorporating senior design projects and independent studies.





Welcome to Our Lab

Our Process:

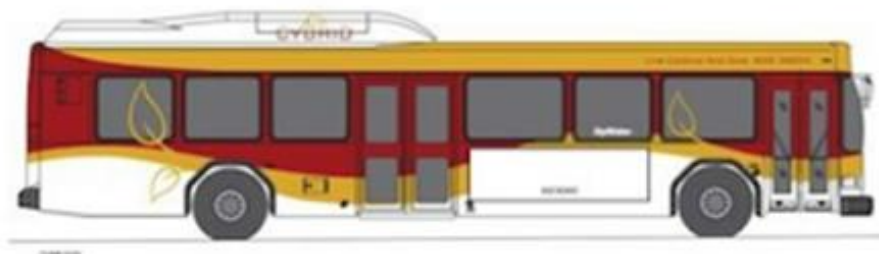
Overall, we recycle waste vegetable oil from the dining center by converting it into biodiesel.

The waste oil is mixed with methanol and a catalyst that breaks the oil into glycerin and biofuel. These two liquids separate by density in the reactor. Since glycerin sinks to the bottom, it can be emptied from the reactor and discarded as waste (due to its small quantity, we cannot use this byproduct).

Water is gently sprayed through the biofuel to remove any remaining impurities. Once drained of water and dried, the biodiesel is ready to be used.

We donate the biodiesel to CyRide, the community transportation system. Though any of the buses can run on pure biodiesel, our product is now mixed into CyRide's large reserve of diesel (blend percentage varies).

As of now, we produce about 3 batches per semester, averaging about 240 gallons in a year. Though we are proud of our current production, we aim to improve our quantity and quality.





Timeline

- **February 2008** - Idea launched by ISU graduate students and BioBus is born
- **February 2009** - BioBus partners with CyRide and ISU Dining
- **Summer 2010** - BioBus receives \$8,000 in grants from the Coleman Foundation and the ISU College of Business
- **March 2011** - Phase 1 production: small quantities (<10gal) of biofuel and oil collection from ISU Environmental Health and Safety
- **September 2011** - Phase 2 production: larger quantities (>40gal) and collection of own oil from UDCC Dining Center
- **Spring 2014** - BioBus becomes sponsored through College of Engineering
- **Spring 2015** - BioBus breaks 350 gallons of total production
- **Fall 2015** - BioBus affiliates with ISU Agricultural & Biological Systems Engineering Department and receives dedicated office space in Sukup Hall
- **Spring 2016** - BioBus plans for Phase 3 production of 1000 gal/year
- **January 2017** - “BioBullet” oil collection system completed
- **March 2017** - Oil cleaning system designed
- **May 2017** - Oil cleaning system implemented and fuel trailer purchased
- **May 2018** - New wash system and reaction tank installed
- **December 2018** - 1000 gal/year capacity reached & Phase 3 complete





Funding Needs

Priority 1 Goal: Cooking Oil Cleaning & Filtration

In response to increases in waste oil contamination, we have a senior design team working on a design for a faster water and particulate separation system. The filtration step would be performed before the biodiesel reaction, increase our throughput rate, increase reaction conversion efficiency. Decreasing the amount of time we spend cleaning oil is critical to producing more batches quickly and therefore keeping member interest and retention. It also helps to keep lab time usage expenses down.

Budget & Component Breakdown

Controls	\$1050
Various Piping	\$350.00
Oil Heaters	\$500
Flow Sensors	\$300
Pump	\$450
Total	About \$3,000



Priority 1 Goal: Biodiesel Drying

Decreasing the amount of time we spend separating water and biodiesel after washing is critical to producing more batches quickly and therefore keeping member interest and retention. It also helps to keep lab usage expenses down. We are therefore looking at a centrifuge to help us speed up water separation.

Budget & Component Breakdown

Filtermaxx Centrifuge	\$2400
Controls	\$1050.00
Heaters	\$600.00
Flow Sensors	\$140
Total	About \$4,000





Priority 2 Goal: BioOutreach Kits

BioBus is dedicated to educating young leaders in middle and high schools about biorenewables and sustainability. To do so we have made BioOutreach Kits focused on biodiesel, biochar, and their applications in renewable energy and products. The kit includes all chemistry ware and step-by-step instructions for how to perform each demonstration. An iPad with related biorenewable & sustainability apps is also included in the package for more hands on learning afterward. Sponsors logos will be graphed on the outside of the kits and also inserted with the instruction package.

Budget & Component Breakdown

250 ml Erlenmeyer Flask	\$38.00
Separatory Funnels	\$73.57
Ipad	\$199.00
Ipad Case	\$39.95
Hot Plate 4" * 7"	\$293.28
Portable Electronic Scale	\$14.00
Rollable Outreach Case	\$252.40
Padded Foam	\$95.83
Desiccant	\$11.13
Infrared Thermometer	\$24.50
Shipping	\$121.93
600 ml Beakers	\$10.00
Misc Components	\$30.23
TOTAL per Kit	About \$1,300





Priority 2 Goal: General Chemistry & Titration Supplies

We currently interchange the chemistry supplies we have with the outreach kits and for general use. This means things get misplaced or we can't do outreach demos and engineering activities at the same time. We are also looking at a autotitrator to assist our members in the titration process. Current titration is done manually with greatly varying results but great learning experience. This autotitrator would be used to check the manual titrations of the regular members and reduce incomplete or soapy batches of biodiesel.

Budget & Component Breakdown

Separatory Funnels (6)	\$441.42
Beakers (10)	\$100.00
Erlenmeyer Flasks(10)	\$380.00
Hach Auto Titrator	\$2689.95
Hot Plates & Stirrers (3)	\$879.84
Total	About \$4,500



Priority 4 Goal: Club Promotional Material

ISU BioBus is a continually growing organization. In order to promote our cause and gain attention within the Ames/ISU community, and across the state, we need high-quality promotional materials. These mainly includes branded club t-shirts, professional polos, and money for outreach travel. T-Shirts are worn at club outreach events on and off campus. Polos are worn at professional gatherings, conferences, competitions, and industry tours. Clothing will be kept within the organization and returned at the end of each event.

Budget & Component Breakdown

25 Club T-Shirts	\$2400
18 Formal Club Polos	\$1050.00
Travel Expenses	\$600.00
Total	About \$1,400





Future Projects:

Biodiesel Reactor: To make our goal of 1000 gal per year a reality, a better reactor must be designed, purchased, and constructed. Current components of the new reactor design include a larger catalyst tank, larger piping, easily cleaned manifold, more powerful heating components, larger mixing capacity, methanol condensation recovery, and safer catalyst delivery system.

Projected Cost: \$8,000-\$10,000

Loft & Regular Storage: In response to increasing material donations and property owned by BioBus and limited lab space a loft system will be designed to hold various BioBus property above our current space to make more room for processing components. A two level rack system for the BioBullet and Super Sucker will be designed as well. Along with this, space will be rented out at the Agricultural Engineering Farm.

Projected Cost: \$3,000 - \$5,000

Wash System Redesign: In response to future increased capacity and current problems with the current reactor, a separate and superior wash system will be installed in the new reactor. This system will be designed to wash the oil at a softer and thorough pace, improving our fuel quality and success rate. Current components of the new wash system include piping, pumps, holding and filtrate tanks, dry wash tower, and activated carbon wash water tower.

Projected Cost: \$2,000 - \$4,000





Sponsor Benefits

All contributions are processed by the Iowa State University Foundation and could be tax deductible.

	BioGreen \$0-\$249	BioCar \$250-\$499	BioTruck \$500-\$999	BioTractor \$1,000-\$2,499	BioBus \$2,500-\$4,999	BioCY \$5,000-\$9,999
Website	Logo & Link	Logo & Link	Logo & Link	Logo & Link	Logo & Link	Logo & Link
Club Info Board	Small Logo	Small Logo	Logo	Logo	Big Logo	Big Logo
T-Shirts		Small Logo	Small Logo	Logo	Big Logo	Big Logo
Outreach Posters			Small Logo	Logo	Big Logo	Big Logo
Lab Posters			Small Logo	Logo	Big Logo	Big Logo
Outreach Kits				Logo	Big Logo	Big Logo
BioBullet/ Super Sucker				Logo	Logo	Big Logo
TV Slide Show					Logo	Big Logo
Fuel Trailer					Logo	Big Logo
Polos						Logo
CyRide						Advertisement



BioWorld Sponsor (\$10,000+) - BioCy benefits, visitation, CyRide bus & fuel trailer photoshoot



Note: BioOutreach kits will be distributed to Iowa high & middle schools around the state. CyRide advertisement includes logo outside of CyRide bus alongside ISU BioBus logo and small personalized company advertisement on the inside as well.



If you would like to make a gift please contact isubiobus@gmail.com.



For More Information



<http://www.biobus.stuorg.iastate.edu/index.html>



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