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University of Wisconsin Oshkosh – Sustainability Accelerator: Integrating methane digesters with energy efficiency for a smarter campus

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Representing Sustainability on Higher Education Campuses

Universities and colleges are, and must continue to be, national leaders in the sustainability and renewable energy movements

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Representing Sustainability on Higher Education Campuses

- American Colleges and Universities President's Climate Commitment
- Assessments and Footprint Inventories
- Sustainability Councils and Directors
- Student Groups and Research

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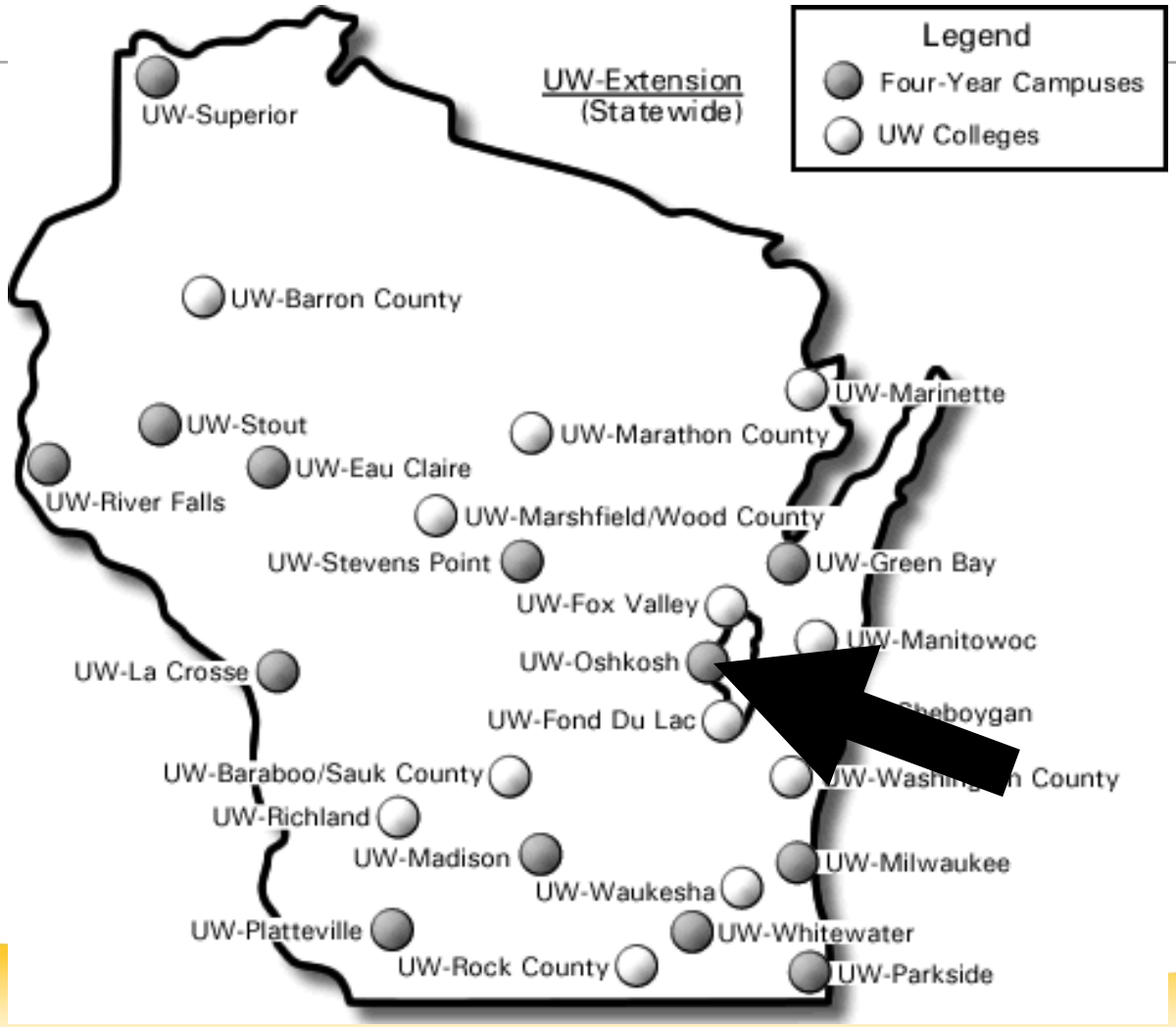
University of Wisconsin System



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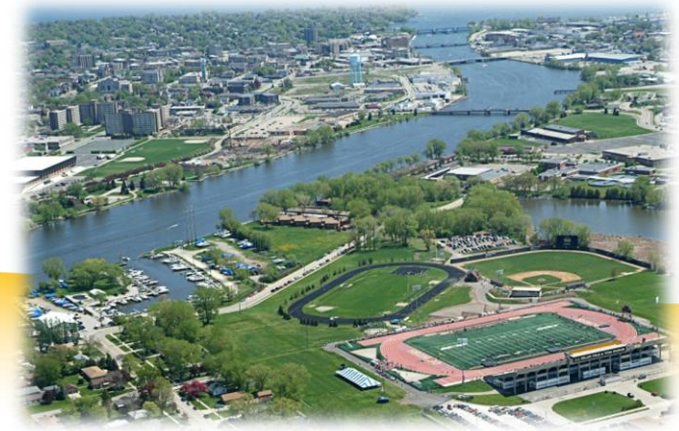
UWO Interesting Facts

- Third largest university in Wisconsin
- Comprehensive campus
- Founded in 1871
- 14,000 Students, 1,700 faculty and staff
- 74 associate, baccalaureate, master's and doctoral programs



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Leading by Example: University of Wisconsin Oshkosh

- **UW Oshkosh was ranked #3 in Sierra Magazine's "Cool Schools" rating.**
- **BestColleges.com ranked UW Oshkosh #5 in the nation in its green school rating system.**
- In 2013, UW Oshkosh was one of only 21 schools listed in Princeton Review's "Green Honor Roll" and also earned Gold in the AASHE STARS program
- In 2011, the University installed a dry fermentation anaerobic biodigester, the first of its kind in the country, and earned the 2011 Silver Waste-to-Energy Excellence Award from the Solid Waste Association of North America.
- UWO's three biodigesters are rated to generate nearly half of the university's electricity needs
- UWO purchases 16% of its electricity from green energy
- As the first designated Fair Trade Campus in the country, UWO offers an increasing variety of socially and environmentally responsible products including coffee, tea, chocolate, clothing, and household and decorative items
- UW Oshkosh has been designated a "Tree Campus USA" school every year since 2011, by the National Arbor Day Foundation for its tree canopy, diversity, and educational programming
- In 2015, campus was designated a Monarch Butterfly Waystation for its monarch-friendly landscaping

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UWO History of Environmental Attention

- Environmental curriculum
- Early adopter of statewide lighting retrofiits
- Performance contracts for energy and water efficiency
- Renewable energy purchases
- Environmental Audit
- Green Building Goals
- Governor’s Energy Independence campus
- Campus Sustainability Plan
- Presidents Climate Commitment
- Public/private partnerships

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2008 Campus Sustainability Plan

Sustainable Energy: independent of fossil fuels for electricity, heating and cooling

Electricity: Reduce consumption 20% from 2005 to 2012

Heating: Reduce fossil fuel use 50% from 2000 to 2012

Facilities Planning, Renovation and Construction: Energy efficient and sustainable design standards on all new construction and renovation projects … meet or exceed a LEED "Silver"

Transportation: Reduce automobile trips to campus 20% by 2012

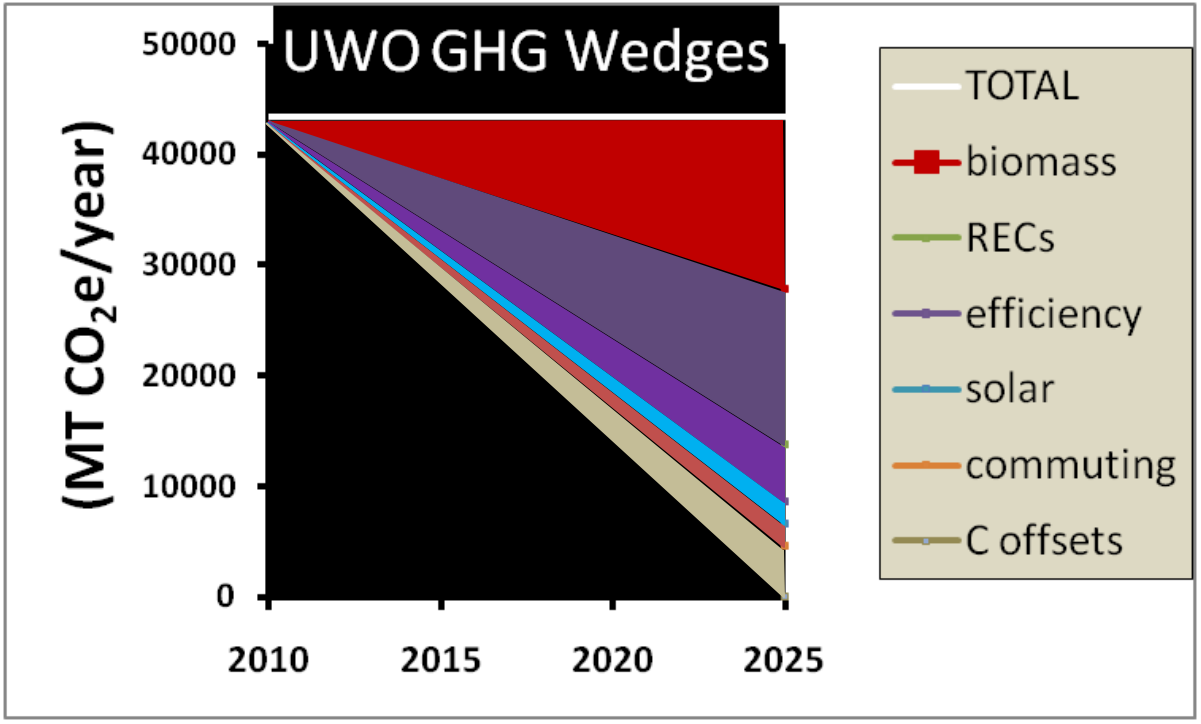
Assessment: Establish the means to assess campus sustainability and provide information to students, staff and community.

A Roadmap to Carbon Neutrality: Develop a Plan

Develop a Structure | Create a Baseline | **Develop a Plan** | Progress Reports

What's Needed?

- Emissions today **and** **a forecast into the future**
- Management plan and tools that allow for updating, tracking and auditing
- Strategies for dealing with supply side and demand side for energy



Reducing Our Carbon Footprint

The University of Wisconsin Oshkosh is committed to cultivating a more just and durable world. To that end, we are embedding sustainable building and learning into our daily living and producing the equivalent of > 50% of campus electrical consumption through renewable energy.







2000-2003

- Student requested environmental audits completed

2004

- Earth Charter "respect and care for the community of life" signed
- EPA Leadership Award received
- National Wildlife Federation Award

2005

- Taylor Hall renovated, inspired by LEED
- Energy Star Award for energy efficiency

2006

- Green Power purchases increased from 4 to 11%

2007

- Oshkosh Sports Complex partnership created with water saving turf
- "Green" Student Recreation Center opens, funded by and designed for students

2008

- First designated Fair Trade campus in U.S.
- Student Success Center (LEED Silver) renovation begins, includes geothermal
- Sustainability director hired
- 1st Campus Sustainability Plan Approved

2009

- Campus facilities repurposes large grocery store for headquarters

2010

- EPA Green Power Partner Award
- Horizon Village Residence Hall work begins (LEED Gold)
- Tree Campus USA (2010-2014)

2011

- Sage Hall (LEED Gold) dedication
- Urban dry digester (BD1) dedication
- Winnebago Project - teaching sustainability workshops

2012

- Partnership reinvigorates ailing waterfront hotel
- "Feed the Beast" food waste diversion research project
- AASHE STARS "Gold" Rating received
- Sustainability embedded into general education curriculum

2013

- Collaborative Sustainable Management master's program begins
- Princeton Review's "Green Honor Roll"
- Sierra's Top "Coolest Schools"
- Mixed small farm digester prototype begins production

2014

- Environmental Engineering Technology students accepted
- Alumni Welcome and Conference Center (LEED Gold) dedication
- Sierra's Top "Coolest Schools"
- Large Farm Digester kWh production equals ~35% of campus consumption

2015

- National - Top 10 in RecycleMania Food Waste Diversion
- Sierra's Top 10 "Coolest Schools"
- Contract to sell methane destruction credits signed
- Titan Gold compost closes loop in organic waste recycling
- Student managed Green Fund launched

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Construction begins at UW Oshkosh

September 15, 2010

<u>University goal</u>:

Increase the use of energy from renewable sources.

UW Oshkosh Biogas Systems

City – Dry Fermentation

Small Farm – Plug Flow

Large Farm – Complete Mix

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Facility Type

	BD1	BD2	BD3
Location	City of Oshkosh	Rosendale Dairy	Allen Farm
Size/animal type	NA	9000 Cattle Dairy Farm	130 Cattle Dairy Farm
Feedstock	Bedding – 55% Food Waste - 32% Yard Waste – 12% Curbside MSW – 1%	Manure	Solid Manure – 56% Wash Water – 24% Bedding – 13% Co-Substrates – 7%
Pre treatment	Mixing via Loader	Sand Separation	Mixing via direct feed and/or Loader

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Digester System

	BD1	BD2	BD3
Technology	BIOFerm - Dry	Schmack - COCCUS	Schmack - EUCOlino
System Type	Dry Batch	Complete Mix	Plug Flow
Target Temp	Mesophilic (38°C or 100°F)	Mesophilic (38°C or 100°F)	Mesophilic (38°C or 100°F)
Target Internal Solids Content	25 – 35%	10 – 12%	10 – 15%
Target HRT	28 days	21 days	30 days
Tons per Year	10,000	110,000	4,000

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Biogas Use / Digestate Management

	BD1	BD2	BD3
CHP Size	370 kW	1426 kW	64 kW
Electric Use	Export – PPA (WPS)	Export – PPA (Alliant)	Export – PPA (WPS)
Revenue Blended Rate ($/kWh)	$0.08	$0.09	$0.08
Digestate End Use	Composted	Current – Separated Fiber Future – Further Processing	Sent to Manure Pit
Digestate Vale	Organic Compost or Soil Amendment	Current – Farm Use Future – Bedding, Bagged Fertilizer, compost product, etc.	Fertilizer – On-Site Farm Use

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BDI: The First Commercial Scale Dry Fermentation System in the Nation!


Oshkosh Northwestern

2010 www.thenorthwestern.com 50¢

DEBATES

FREE & OPEN TO THE PUBLIC

Oshkosh Seniors Center, 200 N. Campbell Road, south building

ELECTION 2010

UWO plant 1st in nation

Biodigester will turn food waste to energy

BY JEFF BOLLER


THE BADGER HERALD

Search

Updated Tuesday, September 14, 2010, at 10:50 a.m.
Madison, Wis.: A Few Clouds and 68.0° F

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News

UW-Oshkosh to be 1st in nation to use energy from food

One-of-a-kind biodigestor will be constructed beginning in fall 2010, will use left-over campus waste, expired groceries, yard waste to power 5 percent of campus

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BD1: The First Commercial Scale Dry Fermentation System in the Nation!

University of Wisconsin–Oshkosh Case Study: Biodigester 1

Dry Digester

- Processes 10,000 tons of organic waste
- Produces up to 370 kW of continuous electrical power and 495 kW of continuous thermal energy
- Waste water treatment plant collaboration
- Private/public collaboration

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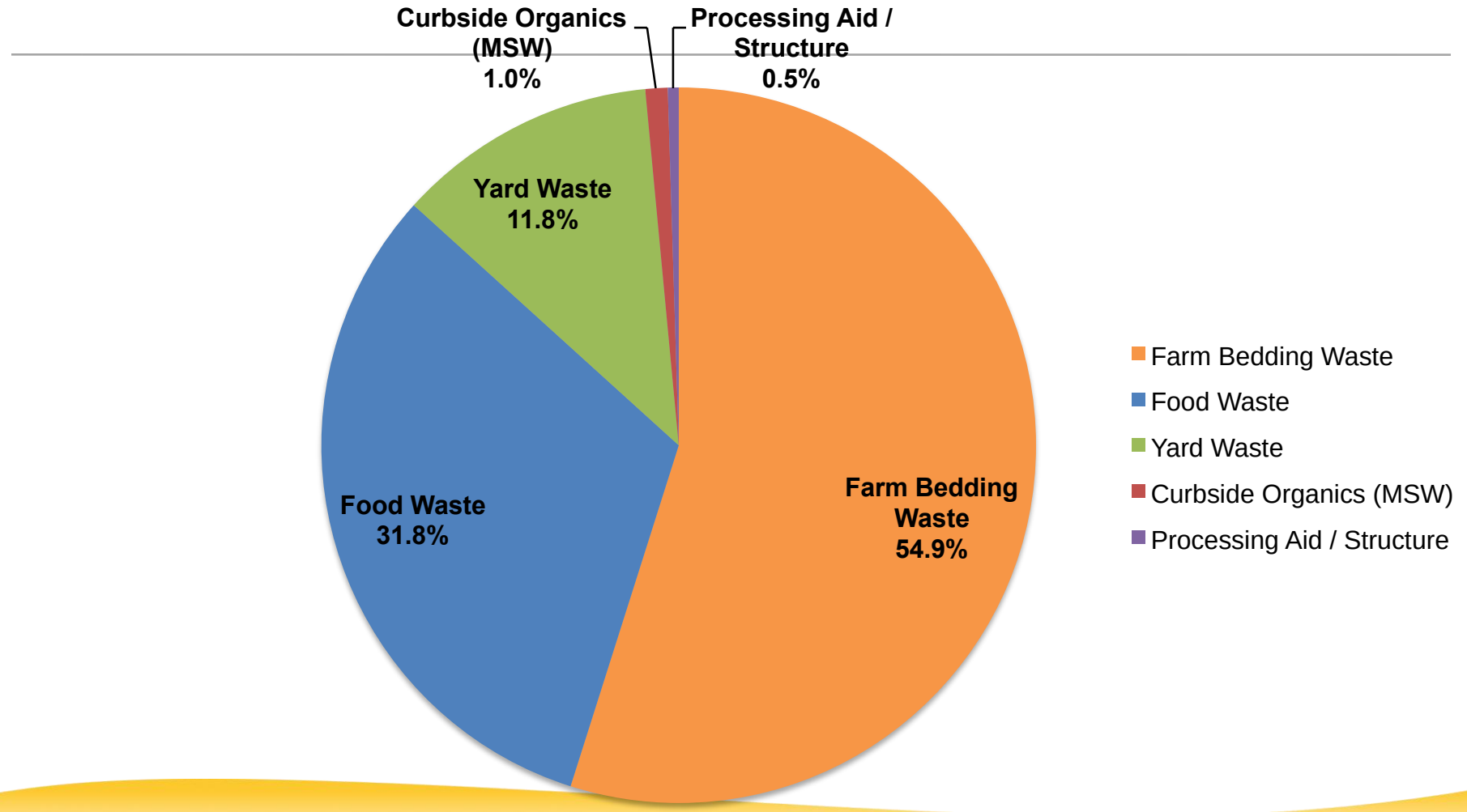
BD1 – Average Feedstock Totals



Annual Organic Material Processed = 10,000 tons per year

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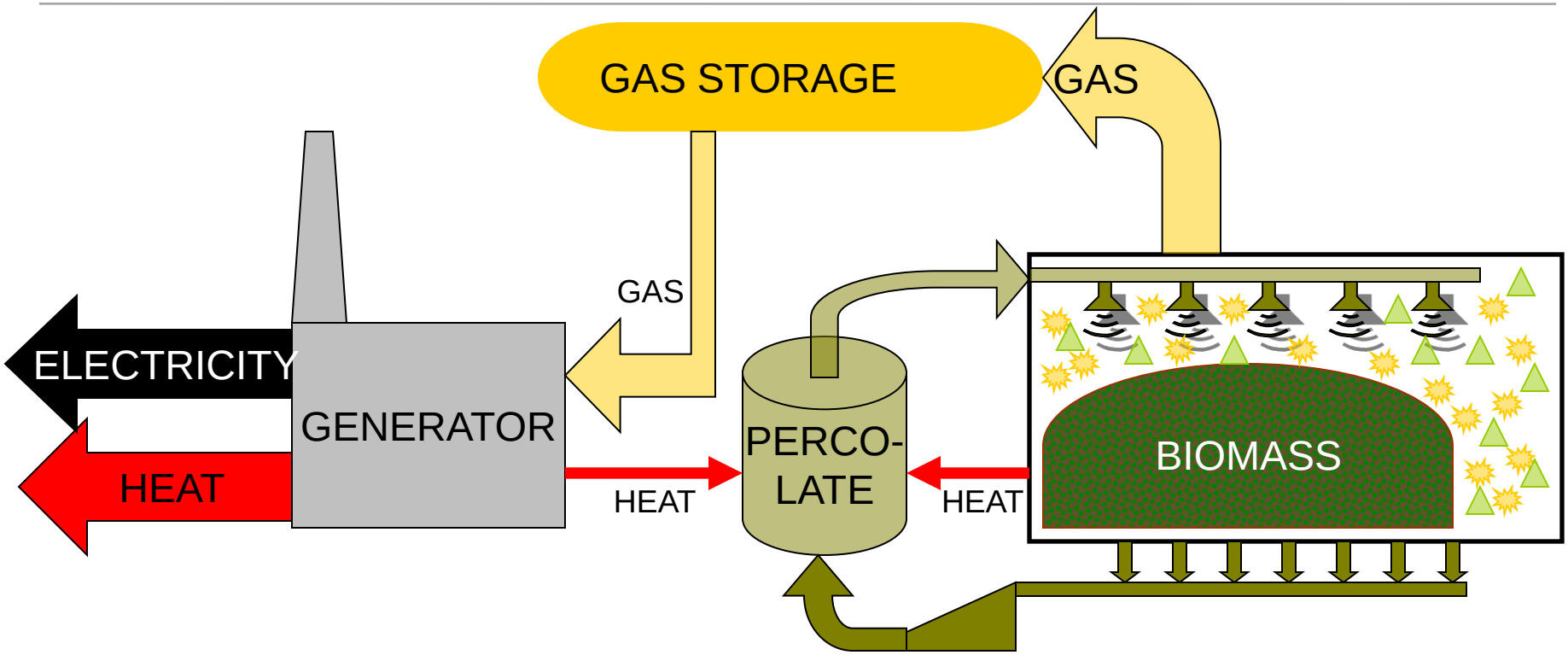
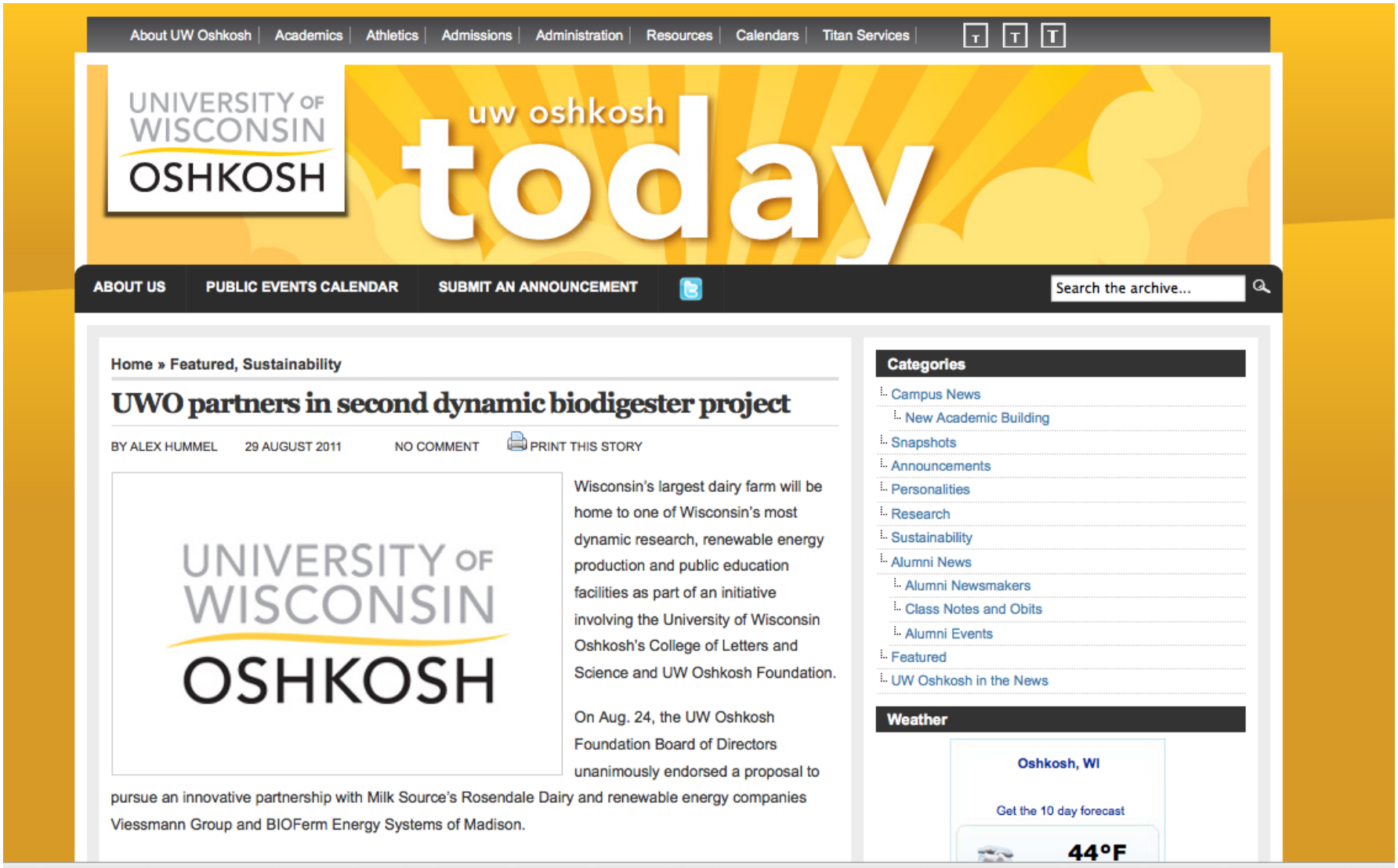
Electricity and Heat are generated…



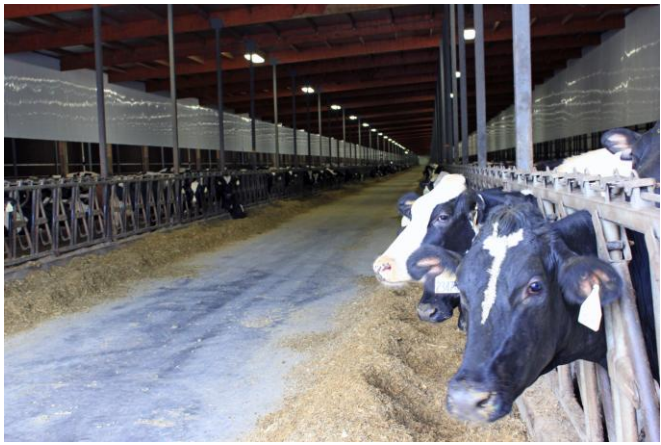
Solid “digestate” → aerobic composter site

UW Oshkosh Biodigester II Renewable Energy Facility



University of Wisconsin–Oshkosh Rosendale Digester (BD2)

- Wet digester – Complete Mix
  - Largest dairy farm in WI
    - 9,000 cows
  - Provides manure management
  - Construction began June 3rd, 2013
  - 110,000 tons annually
  - 1426 kW electrical



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Small Farm Applications

University of Wisconsin–Oshkosh Case Study: Allen Farm

- Small scale prototype, plug flow digester
  - Small scale digester installation
  - Designed for limited waste steam
  - Processes up to 4,000 tons of cattle manure and bedding from ~130 cows
  - Produces 64 kW continuous electrical power and 101 kW of continuous thermal energy


2G
BIOFERM
VIESMANN Group

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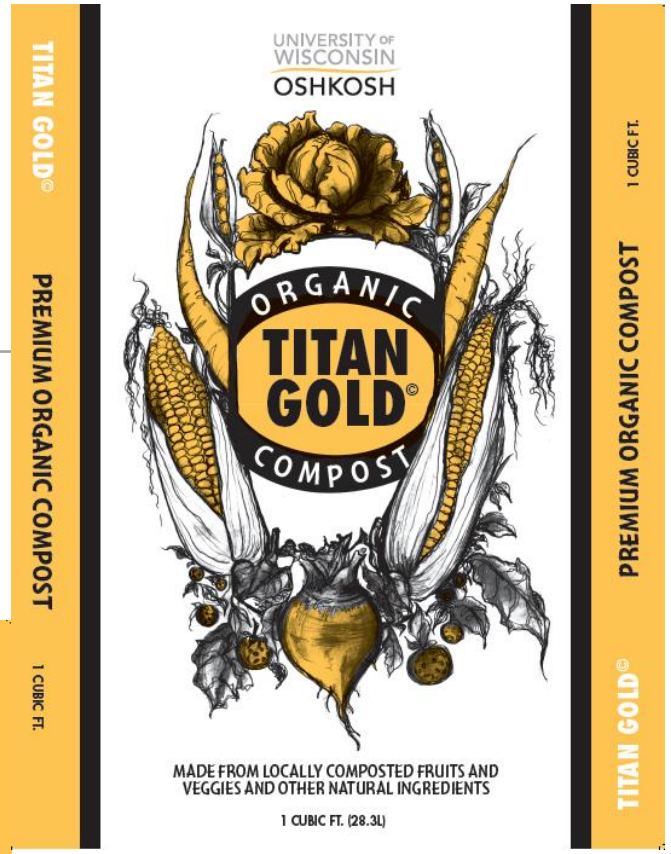
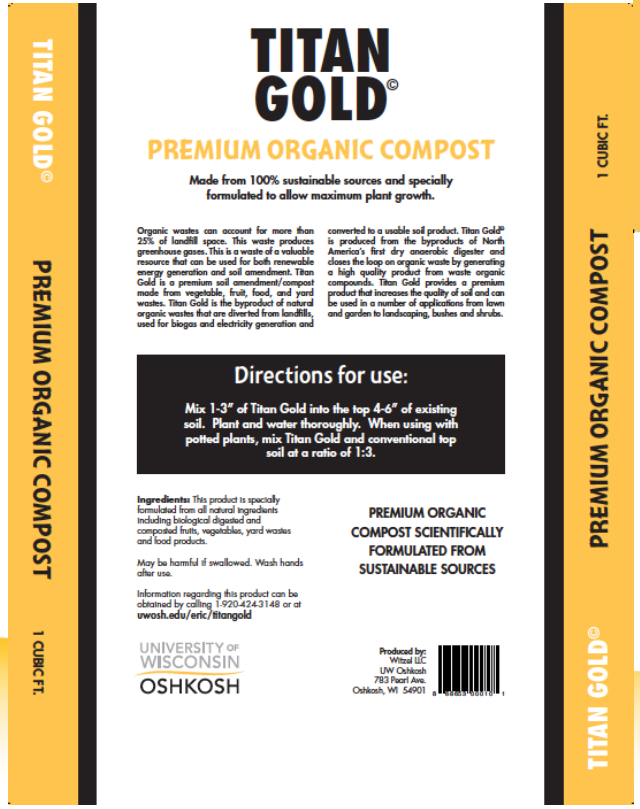
Titan Gold

- Titan Gold™
- Available from regional retailers and UW Oshkosh at:
  - **http://www.uwosh.edu/eric/titangold/purchase-titan-gold**
- Value-added product from digester ‘waste’





Community Collaborations for a Sustainable World

The University of Wisconsin Oshkosh is committed to cultivating a more just and durable world. One of three signature questions in our core curriculum asks students: "How do people understand and create a more sustainable world?"

Wet Anaerobic Biodigester (2014) –

A rural, renewable energy biogas facility is created through a partnership with Wisconsin's largest dairy farm, international experts and area communities.

Removes harmful methane gas ad kills pathogens in 110,000 tons of manure each year

Great Lakes Beach Restoration Projects (2003-today) –

UW Oshkosh's EnvironmentalResearch and Innovation Center redesigns 20 Wisconsin beaches.

Creates healthier water resources

Restores natural areas along shorelines

Oshkosh Sports Complex (2007) –

Titan Football Field is updated and re-imagined to be a city-wide football, soccer, baseball and track facility.

Eliminates the need for four separate facilities

Includes new turf that saves 850,000 gallons of water per year

Hotel Partnership (2012) –

An ailing waterfront hotel in Oshkosh is revitalized by pooling municipal, foundation and community resources.

Revitalizes a seven-story city riverfront building

Suppts the city's and UW Oshkosh's conference and tourism needs

"Top Coolest School"
— *Sierra Magazine*

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First U.S. Fair Trade Campus

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What is the advantage to a comprehensive campus?

- **Responsiveness**
- **Ability to directly connect with top administrators and faculty at the same time.**
- **Ability to utilize campus for 'community-scale' demonstrations of efficiencies and technologies.**
- **Increased time for faculty and staff to work on targeted projects.**
- **Better integration between facilities, operations, and academics.**

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Next steps in energy and sustainability?

- JCI/UWO Collaboration
- Battery Storage
- Development of nutrient extraction technology
- Next generation digesters
- Training next generation of workers

Questions