

P²AD



Waste Reduction for Colleges & Universities

Waste Types



*Hazardous
Waste*



Solid Waste



*Non-traditional
Waste*

HAZARDOUS WASTE

- Why Reduce?
 - Reduce financial, liability and regulatory burdens associated with pollution management & waste volumes
 - Save money
 - Reduce potential for spills
 - Improve image in community
 - Receive recognition



Reduce lost work time
Reduce risk of injury/illness

What makes labs so different from mfg; you have high number of chemicals (5,000-8,000); low volumes; not consistent training, no centralized inventory, great deal of variability in processes

Divide into 2 categories:

Reagent (50%)

These are expired, out of spec, contaminated, **unwanted samples**, surplus due to over purchase, cancelled projects, retired researchers; **inventory control**

Routine (50%)

Generated by repetitive process

Solvents from cleaning

Reduction Methods

- Micro and small scale chemistry
- Chemical substitution
- Mercury reduction
- Procurement changes
- Chemical inventory and tracking systems



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Solvents from cleaning

Testing samples; Prep waste

Gc samples

Spill cleanup

Micro & Small Scale Chemistry

- Reduces amount of chemicals needed in teaching and research, by as much as 100 times
- Reduces risk of fire and explosions and exposure to vapors



www.microscale.org

SB:

The basic idea is simple: scale down the volume of chemicals used in experiments

This means less material is purchased and less is disposed of as hazardous waste

Negatives

- Some plastic-ware may not be suitable for organics
- New equipment can mean a longish payback of <1 to 3 yrs

Positives

- Can reduce qty used by 10-100 fold
- May already have some equipment
 - o Capillary melting point apparatus ~ 1 mg of sample
 - o Digital balance
 - o NMR

Chemical Substitution

- When planning lab experiments, reduce or eliminate:
 - Oxidizers
 - Reactive chemicals
 - Halogenated chemicals
 - Highly toxic chemicals
 - Flammable solvents
 - Metals (As, Ba, Cd, Cr, Pb, Hg, Se, Ag)



SB:

Oxidizers – hyd peroxide, chromates, permanaganates, and nitrates

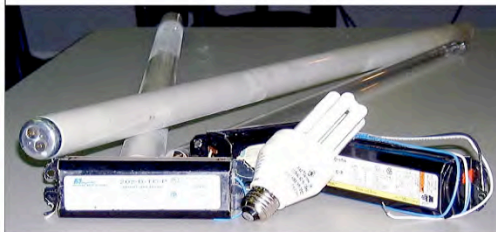
Reactive: reduce for Health and safety reasons

Halo; many are carcinogens or susp carcinogens; investigate distilling

Non-halo: use non-flammable

Metals toxic, all but 2 (silver and barium) are PBTs

Mercury Reduction



- Labs
- Plant operations
- Health center
- Student housing
- Housekeeping

UMich:

Energy star and green lights programs conserve energy, but in the process we generate a new waste stream - approximately 90,000 pounds of ballasts and 150,000 fluorescent light tubes annually. We found a way to go beyond just energy savings to improve our stewardship.

Both the bulbs and ballasts contain small amounts of hazardous materials that require proper disposal. Recycling meets both regulatory requirements and is more cost effective. The annual cost for disposal of the bulbs and ballasts would be approximately \$160,000. But, by recycling the metal and glass, we dropped the cost to only \$70,000.

Mercury in Labs

- Thermometers
- Preservatives
- Drain traps/pipes
- Lamps
- Sphygmomanometers
- Cleaning supplies



Hold a mercury thermometer exchange.

Thermometer-related mercury spill clean-ups cost University of Michigan \$30,000 per year (direct cost)

Plus the indirect cost of lab shutdown and lost research time

UMich:

One of the driving factors for getting rid of the mercury, outside the fact that it is a persistent bio-toxin in the environment, is the cost of responding to mercury spills. Before we started this program we were responding to approximately one spill a week from someone dropping a thermometer, at a cost to OSEH of around \$30,000 per year, plus the uncalculated cost of lost research time as labs were shut down during decontamination. Since the program has gone into place we have reduced our responses by at least half, and hope to do much better this year.

SB:

- Boiler gauge can contain 23 pounds of mercury
- Hg in pipes during renovation
- Discharge to POTW
- Costly to clean-up

Other Mercury Sources on Campus

- Plant Operations
 - Boilers
- Health Center
 - Thermometers
 - Sphygmomanometers
- Student Housing
 - Thermometers
 - Thermostats
 - Fluorescent bulbs
- Housekeeping
 - Cleaning supplies
- Campus-wide
 - Fluorescent bulbs
 - Thermostats

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Procurement Changes

- Negotiating with your vendors is the key to success
- Incorporate language into your purchasing specs
 - Non-toxic
 - Micro-quantity chemicals
 - Just-in-time delivery
 - Be provided with less packaging material or in bulk
 - Contain post-consumer recycled content
 - Meet a certification standard, such as [Green Seal](#)

SB:

Require they take-back out-of-date or unused chemicals, samples, and containers

Arrange to have supplier deliver small amounts of chemicals on short notice

Buy only what can be used in reasonable time period

Bulk chemical purchases can create waste by aging/drying, advent of new product, or spoilage.

Require that purchaser must review “list of preowned chemicals” before purchasing

Can be linked to CTS/HMMS

Others: Require vendors to show how they prevent pollution

Carnegie Mellon worked with supplier to remove inner packaging saving university \$.015/shirt

3) not cheaper to buy in bulk for chemicals

Disposal can be 20-50X cost of purchase

EPP Resources

- Environmentally preferable purchasing (EPP)
–www.epa.gov/opptintr/epp
- Mercury
–www.masco.org/mercury
- Hospitals for a Healthy Environment
–www.h2e-online.org
- Cleaning products
–www.westp2net.org/janitorial/jp4.htm
- Purchasing for waste reduction
–<http://www.ciwmb.ca.gov/EPP/>
- Certified products
–<http://www.greenseal.org/recommendations.htm>
- Writing EPP specifications
–http://www.swmcb.org/EPPG/2_3.asp

Establish criteria for selecting products

Environmental impacts/Life-cycle

Cost

Durability

Examples:

Require vendors take back out-of-date or unused chemicals, samples, and containers

Specify pallets and packaging; work to reduce packaging

Buy only what can be used in reasonable time period

Bulk chemical purchases can create waste by aging/drying, advent of new product, or spoilage.

Chemical Inventory & Tracking

- **Benefits**

- Encourages optimal chemical purchase/use
- Reduces amount of waste disposed
- Minimizes stockpiling of outdated chemicals
- Enhances lab safety
- Helps ensure compliance



SB:

Computer database designed to track chemicals from point of purchase to disposal.

Systems: many companies that offer software; can be customized; some are basic (look or use spreadsheet application; DOD is free – not compatible with MACs)

Benefits:

- Waste reduction: promotes reuse; reduces out of date materials, reduces chemical purchases
- Reduces time filling out reports, track use of chemicals, reduce purchasing
- Safety: know where chemical is, how it is being used, how old, and quantity, from health standpoint, since you know the room, ventilation in room, how it is being used; then you know how it is being released into the environment
- Costs: \$15 – over 500,000

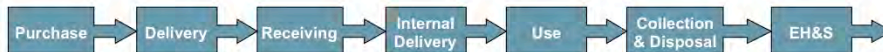
Features:

- Bar coding system to track: type, quantity of chemical in and out of campus
- Interfaced with purchasing; track purchases using computer
- Track location (by building, room) age of chemical
- Link to MSDS
- Set up reports or warnings to appear when chemical is about to expire and location of that chemical
- Reports – regulatory information

Problems:

- Decentralized purchasing, purchasing practices vary amongst department, funding external grant may not be tracked, how do you adapt to current practices) will you need to have new practice

Sample Guidelines



- Campus-wide chemical inventory audit
- Use inventory management software
- Set up procedure to track newly purchased chemicals
- Campus-wide education and outreach
- Develop follow-up audit schedule/procedures

The development of the system at UNH stemmed from an enforcement action due to RCRA violations.

1. During initial audit, found more than 42K chemical containers, barcoded, entered in db file

2. Initially purchased an off the shelf system, but found it did not meet their needs. Needed a web-based system

Developed their own... Chemical Environment Management System, CEMS
System tracks chemicals from the time they arrive on campus to the point of disposal

3. Set up 2 centralized receiving areas where newly purchased chemicals are barcoded and recorded into db

4. How to use: access own homepages, run queries on existing inventory, request haz waste pick-up, designate surplus chemicals, view info on different classes of chemicals, check training schedules, reg compliance module, door signs, msds, local fire and police have access, particularly haz chems, option to hide a chem,

5. Visit at least 10% of labs per year to ID rogue chemicals escaped barcoding

Also visit if researcher moves labs or leaves, if requested by researcher, prior to remodeling

Key Elements to Success

- Upper management support
- Minimal burden on individual chemical users
- User-friendly
- Cooperation from departments
- Ongoing training

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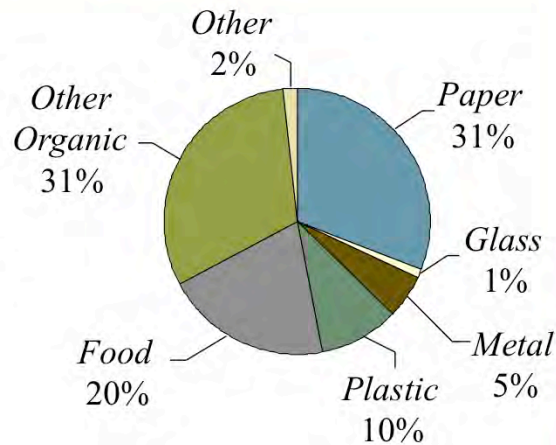
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SOLID WASTE

- Why Reduce?

- Save money
- Prolong life of landfills
- Promote environmental stewardship



- 640 pounds per student per year
- 2 largest wastestreams: food and paper
- Paper can be 50-60 of wastestream
- .8 - 3.55 pounds/per employee/day

“With approximately **14.5 million** students enrolled in colleges and universities across the U.S. ... campuses generate roughly **3.7 million** tons of waste (about 2% of the U.S. solid waste stream).”

--U.S. EPA

WasteWise Participants design program to reduce waste and purchasing and disposal costs

Ope

35 GA companies WasteWise

WasteWise - WASTEWISE HAS A PERSON TO ASSIST BUSINESSES FROM GOAL SETTING TO CONDUCTING AN AUDIT AND PRIORITIZING WASTE TO TRACKING SUCCESSES AND PROMOTING

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Solid Waste

- Why Reduce?
 - Conserve natural resources
 - Enhance image in community
 - Receive recognition

WASTE WISE
& EPA
 Preserving Resources,
 Preventing Waste

NATIONAL WILDLIFE FEDERATION

P²AD PARTNER YELLOW RIBBON 2005

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WasteWise - WASTEWISE HAS A PERSON TO ASSIST BUSINESSES FROM GOAL SETTING TO CONDUCTING AN AUDIT AND PRIORITIZING WASTE TO TRACKING SUCCESSES AND PROMOTING RESULTS.

EPA “ Could Some of Your University’ s Resources Be Hiding Here?” ...

18 schools

EMORY: 402 tons of paper; We divert about \$30,000-\$40,000 from the purchase of new office materials by reusing old office furniture

Seattle University has always attempted to be on the environmental

Management Options



- Reduce
- Reuse
- Recycle
- Compost
- Dispose

Reduce

- Products supplied with less packaging material
- Leasing programs for carpet, copiers, etc.
- Supplier take-back programs
- Double-sided copies
- Education
- Electronic vs. paper



Kodak

Tyvek

Printer cartridges

Unused chemicals

Double-sided copying; electronic employee benefits; registering/voting

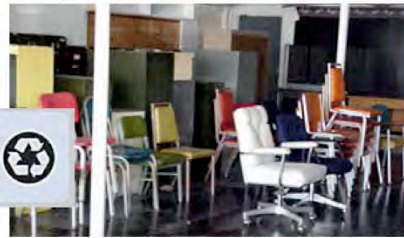
Education new employees on copier; Purchasing about EPP;

Shade grown coffee

Cleaner and Greener – provide assistance in estimating type of emissions, find credits, report offset
Work with suppliers to reduce packaging or take back containers

Reuse

- Dump & Run
 - www.dumpandrun.org
- Local salvage stores
- Local charitable organizations
nonprofits
- Reusable office supply
exchange
(ROSE)



Wireless foundation – crime prevention, education, and protect
Collective Good

Establish buy recycled policy to close the loop

Clearly label recycling containers; grant opt available

Use reusable shipping and moving containers

Establish central area for surplus items

Items that can be donated or reused are unlimited

Furniture, plastics, medical items, building materials, video tapes, electronics, office
supplies, books

Choose to Reuse by Goldbeck

Donate food to shelters

www.secondharvest.org

Partner with the campus volunteer organization

Food waste composting

Technical assistance

UGA pilot projects

Cell Phones

P2AD

Recycle

- Paper is the largest single waste stream on campus
- The average college student produces 640 lbs of solid waste each year, including 320 lbs of paper
- Other large generators: administration, purchasing, student records...



Recycle: Special Events

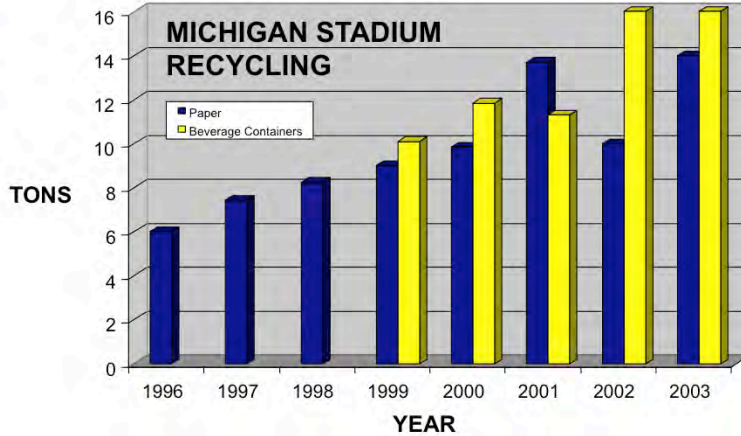


- Conferences
- Festivals
- Orientation

- Athletics/Homecoming
- Meetings/Workshops
- Graduation



Recycle: Special Events



UMich:

As we showed last year, the highly successful football stadium program spearheaded jointly by Athletics and John's department continues to make inroads in the waste stream. This season we saw a slight drop in paper recycled and a large increase in container collection, up to nearly 16 tons. We have little explanation regarding the drop in paper or cardboard being recycled, the material is not showing up in the regular garbage picked up after each game so we can simply assume folks are consuming less pizza's and other food packaged in paper products, and drinking more soda's which is indicative when we add an extra game to the schedule on a hot August afternoon.

At every football game there are PA announcements encouraging stadium visitors to use recycling containers, and the past two years we showed recycling statistics on the big screen. These efforts significantly increased participation each year. Our next major effort will look at capturing the waste stream generated at the tailgate parties in the parking areas.

Compost

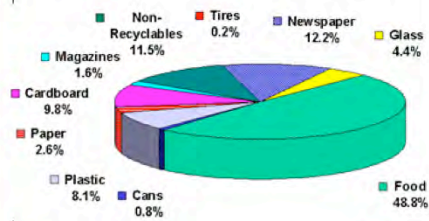
- Food waste and other organics accounts for more than 50% of the waste stream on campus



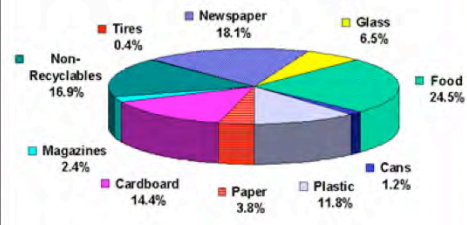
Compost

Ithaca College waste stream composition (average daily basis)

Before compost facility



After compost facility



Currently, the College is collecting and composting about 20 cubic yards (20,000 lbs) of food scrap per week, or approximately 20 percent of the total waste stream.

NON-TRADITIONAL WASTES

- Construction & Demolition
 - Wood
 - Ceiling tiles
 - PVC
 - Metals
 - Asbestos
 - Drywall
 - Carpet
 - Brick & concrete
 - Lead-based paint
 - Land-clearing debris
 - Asphalt pavement & shingles



Disaster Debris Planning

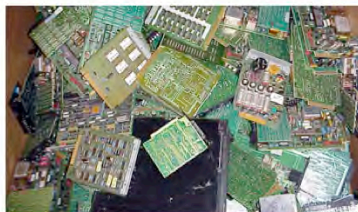
- Items to include in plan
 - Types of disasters likely to occur
 - Types/amounts of debris likely generated by each disaster type
 - Local resources to manage debris
 - Preferred debris management strategy
 - Contingency strategies
 - Communication strategy
 - Funding issues

Sources: <http://people.cecs.ucf.edu/reinhart/DDfinalreport.pdf>
<http://www.training.fema.gov/emiweb/IS/crslist.asp>

Pre-planning will greatly increase control of debris management and reduce costs.

Electronics

- Computers
 - PBTs: mercury, lead
 - Hexavalent chromium
 - Brominated flame retardants
 - Assorted plastic types
- TVs, VCRs, cell phones, PDAs, DVD players, computer peripherals, FAX, assorted wireless devices



How to Get It Done



Before you can see results like those pictured, you have to do a little planning.

Start small... office paper, OCC and aluminum are good bets for a new recycling program... you might even show a small profit

A mercury thermometer exchange is a quick way to remove a toxic PBT from campus

Get some early successes under your belt

Show that your ideas are feasible

Here are some specific steps to success...

Steps to Success

- Get campus-wide commitment and support
- Form cross-campus “green” team
- Establish environmental policy
- Plan waste reduction program and set goals
- Educate campus community about program
- Monitor & evaluate progress toward meeting goals
- Adjust & expand program as needed

How to Start

People are resistant to change habits of managing waste/procedures

ASK?? Who knows the problem?? People are always willing to tell you what is wrong or how you could do something better?

“too many disposables in cafeteria”

“Careless use of equipment”

“Departments are centrally located” “Remodeling is a big waste – people using space are not included in design discussions”

‘Grounds crew plants plants/flowers all summer and spring”

“temperature is not right where we work” Notice lots of space heaters”

Equipment/lights left on during vacation/weekends”

“ Worry about the fumes”

Who knows the answers?? Answers were there all along

Commitment & Support

- Administration
 - VP level
- Faculty and staff
- Student leaders and organizations
 - Student government
 - Fraternities & Sororities
 - Service organizations

Green Team

- Students
 - Environmental and service clubs
 - Student workers
 - Fraternities/Sororities
- Staff
 - EHS
 - Facilities
 - Housing
 - Purchasing
- Administration
 - VP level
- Faculty
 - Sciences
 - Engineering
 - Environmental club sponsor

Sample Environmental Policy

“The Board of Regents of the University System of Georgia is **strongly committed** to protecting the environment and human health in all of its operations... **pro-active efforts** must be taken to ensure that sound environmental, health and safety planning is **integrated** into every level of University System decision making.”

Sample Environmental Policy

“We, the Emory University community, affirm our **commitment** to protect and enhance the environment through our teaching, research, service, and administrative operations. We seek to foster a community that **sustains** ecological systems and **educates** for environmental awareness, local action, and global thinking. We seek to make environmentally sound practices a **core value** of the University.”

Plan Program & Set Goals

- Define parameters of program
- Set *measurable* goals
- Develop monitoring and tracking system
- Select a reliable service provider
- Establish a collection infrastructure
 - Placement of recycling containers
 - Collection methods and routes
- Plan for expanding program

Collection containers - Mail room, kitchen, copy centers, community space/ common areas, labs, dorms, desk side, laundry rooms,

Expanding – batteries, cell phones, packing peanuts/EPS, landscape debris, paperboard, Tyvek, used furniture, junk mail

food service: reusable dinnerware, charge extra for disposable containers (10 cents) and use money for program expenses, discount on beverages with reusable container

Communicate & Educate

- Include info in new employee and student orientation
- Feature articles in campus newsletters & other publications
- Advertise via posters, table tents, flyers
- Provide progress updates during other meetings
- Apply for awards and publicize them when you win
- Host an environmental fair in conjunction with a national event
- Tailor materials for specific audiences

Evaluate & Adjust

- Stick to the schedule for monitoring progress
- Enlist student workers to help
- Make changes if goals remain unmet
- When goals are met, set new ones
- Aim for continual improvement

How P²AD Can Help

- Technical assistance via phone, email, onsite
- Identify reuse, recycling options and markets
- Identify and develop best practices
- Host workshops or trainings
 - How to set up a recycling program
 - EMS
- Facilitate networking and community partnerships
- Conduct waste audits

Do they pick-up? (call or by set schedule); Is there a charge/revenue?
Do they provide containers (free?, size?); What are the terms of the contract?
ASK for references and/or tour; Easiest to target would be packaging waste
Best way to reduce packaging waste is to work with your vendors/suppliers
Really easy when working with new business

Recognition Programs

- P²AD Partnership Program
- EPA Waste Wise
- EPA Performance Track
- Presidential Green Chemistry Challenge
- National Recycling Coalition
- National Wildlife Federation's Campus Ecology Program

Waste Reduction & Recycling Organizations

- [Georgia Recycling Coalition](#)
- [National Recycling Coalition](#)
 - [College and University Recycling Council](#)
- [Campus Consortium for Environmental Excellence](#)
- [University Leaders for a Sustainable Future](#)
- [Sustainable Universities Initiative](#)
- [Campus Safety, Health and Environmental Management Association](#)

Have lectures by dept on BMPs for their profession– Bill MC doinough school of arch; post properties – xeriscaping to landscape students/grounds maintenance; phys for social repo – alternatives to Hg in healthcare; P3 partners

Contests, Marquee signs for football stadiums, E-mail alerts, Identify community partners

Sign-up as event sponsor, free posters/brochures/pledge cards

Ideas from Mondays session – Hg, battery, NIKE shoe, aluminum collection

National & International Events

- Arbor Day, Date varies by state/location
- Earth Day, April
- World Environment Day, June
- Pollution Prevention Week, September
- Clean Up the World, September
- America Recycles Day, November

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