

## The Greening of Golf Facilities

The Environmental Choice  
Operational Alternatives  
Greening Your Operations

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### GCSAA Pesticide Use Survey

- GCSAA has collected data through three different surveys focusing on the physical characteristics of golf courses, water use/conservation and nutrient use.
- Bolstered by this data, superintendents as a whole, and GCSAA as an organization, will be in a stronger position to communicate and advocate on your behalf and that of golf courses.
- Your participation with the Pesticide Use Survey is important in helping GCSAA.

Visit [www.gcsaa.org](http://www.gcsaa.org) or [www.eifg.org](http://www.eifg.org) to take the Pesticide Use survey

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## Summary of Today's Objectives

- ✓ Better understanding of opportunities the golf industry has to save energy & prevent pollution.
- ✓ Learned more about your maintenance shop options and what make products environmentally preferred.
- ✓ Learned about the financial benefits of EPPs.
- ✓ Understand how to get started at your facility and where to find additional resources.

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## P2 = Material Use Efficiency

- ↑ **Efficiency**
- ↓ **Waste generation**
- ↓ **Material purchases**
- ↓ **Operating costs**

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## Introduction to Pollution Prevention

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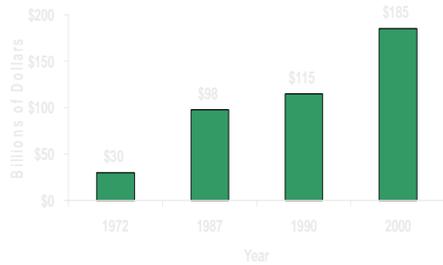
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# U.S. Cost of Pollution Control



Note: Costs presented in 1990 dollars

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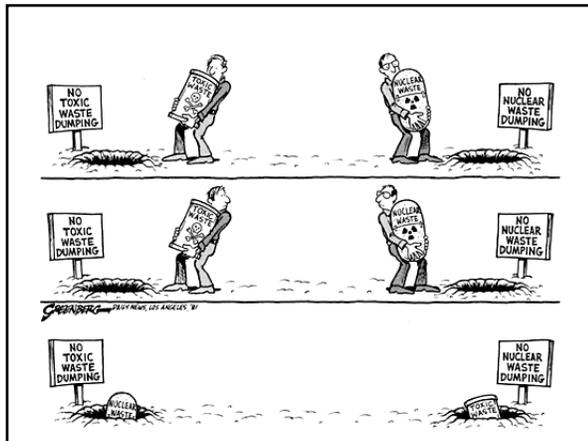
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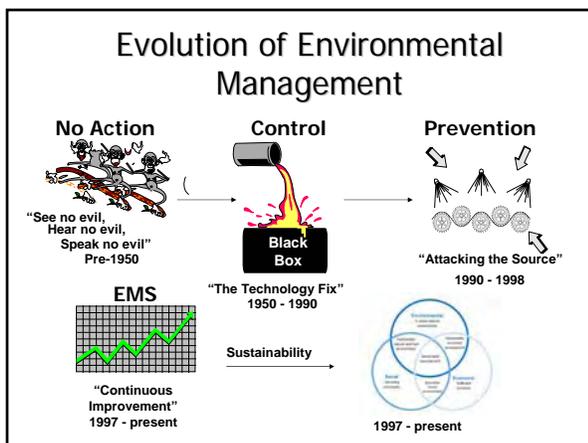
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# Pollution Prevention Act of 1990



This act established

- P2 as national policy and priority
- Office of Pollution Prevention
- A grant program for state P2 efforts
- A P2 clearinghouse
- P2 and recycling component in TRI reporting
- Waste management hierarchy

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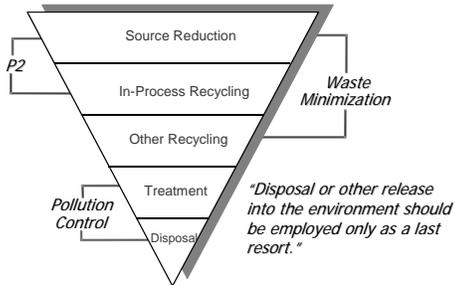
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# Waste Management Hierarchy

*"Pollution should be prevented or reduced at the source whenever feasible."*



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# Source Reduction Definition

Any practice which:



- reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment before recycling, treatment, or disposal; and
- reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants.

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## Types of Source Reduction

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## Product Redesign



- Redesign product such that it performs the same, but eliminates or reduces waste generated or resources consumed by its predecessor
- Example: refillable spray bottles (eliminate aerosol cans and propellants)

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## Raw Material Substitution

- Reduce or eliminate amount, toxicity, or raw material use in product formulation
- Examples
  - Score cards (less toxic inks and less trees)
  - Cleaning supplies (less toxic ingredients)



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## Equipment and Technology

- New equipment or technology that reduces or eliminates amount or toxicity of waste or resource consumption

- Examples

- Energy efficient lighting (less energy use)
- BOB (less plastic waste and oil in landfill)



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## Process and Procedure Modifications

Change manufacturing or operating process or procedure to reduce or eliminate resource consumption or volume or toxicity of chemical use



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## Good Operating Practices

- Operating practice that reduces or eliminates resource consumption or volume or toxicity of chemical use

- Examples:

- Hydraulic line preventive maintenance
- Integrated pest management



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### Potential Adverse Effects of Golf Courses

- . Surface water contamination
- . Chemical resistant pest populations
- . Negative impacts on non-target soils and organisms
- . Toxicity
- . Water resource use
- . Wetland resources degradation

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### Identifying P2 Opportunities

- . Quantities, types, and costs of wastes
- . Quantities, types, and costs of raw materials
- . Energy usage
- . Water usage
- . Process efficiencies
- . Treatment systems

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### Identifying P2 Opportunities?

Look at:

- . Waste disposal practices
- . Waste treatment practices
- . Utility bills
- . Regulatory and record keeping requirements
- . Storage practices and inventory records
- . Operational procedures of workers
- . Leaks and spill residues
- . Condition of equipment - repair records
- . Defects and damaged containers

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## Barriers for Industry

- Unaware of true costs associated with current practices
- Many facilities are predisposed to control technologies (proper disposal)
- Potential impact on product quality
- Worker habits
- Skepticism regarding new and/or unproven technologies
- "If it ain't broke, don't fix it."
- "It's not my job."

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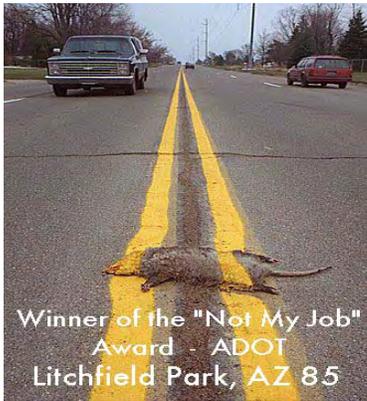
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Winner of the "Not My Job"  
Award - ADOT  
Litchfield Park, AZ 85

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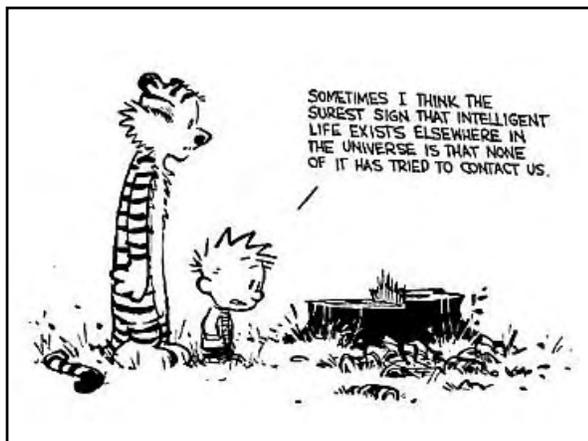
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## Energy Assessments

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## Energy Conservation & Efficiency

Goals

- Baseline Energy and System Performance
- Optimize Building Energy Usage
- Encourage Renewable and Alternative Energy Sources

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## Maximize Energy Performance



- Lighting
- HVAC
- Electrical/Energy Service
- Building Envelope
- Service Water Heating
- Irrigation

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## Lighting

- Energy-Efficient Lights
  - fluorescent lights
  - light-emitting diodes (LEDs)
- Occupancy Sensors
  - motion-detecting
  - heat-sensing (infrared)
  - sound-sensing
- Exit Signs/Christmas Lights – LEDs
- Outdoor Lighting
  - Low/High-pressure sodium
  - metal halide
  - directional



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## Lighting Ideas

- Replace T-12s with T-8s and electronic ballasts.
- Compact Fluorescents
- Install motion sensors/detectors/timers.
- Remove unneeded light fixtures (vending).
- Remove spot lamps.
- Replace all incandescent lamps.
- Replace exit sign lamps.
- Use of natural daylighting.
- Don't over-illuminate.

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## Heating/Cooling

- Energy-Efficient Equipment
  - HVAC systems
  - Central Air – Seasonal Energy Efficiency Ratio (SEER)
  - Regularly scheduled maintenance
- Programmable Thermostats
  - 7-Day Menu Operation
  - Average \$150/yr savings
- On-Demand Operation
  - Water heating (tankless)



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## Heating/Cooling Ideas

- Install gas-fired radiant heaters.
- Inspect air filters regularly and replace as needed (O & M Plan).
- Use “right sized” high efficiency HVAC equipment.
- Use economizers and other controls.
- Install “on-demand” heaters beneath wash basins or facility wide.
- Install 7-day programmable thermostats.

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## Energy Use

- Your Utility
  - Peak versus Off-Peak Billing
  - Demand charge
- Irrigation Pumps
- Energy Star Equipment
  - Copiers
  - Furnaces/Air Conditioners
  - Refrigerators
  - LCD/LED displays
- Alternative Energy – On/Off site
  - Solar & Wind Systems
  - Energy Credits



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## Energy Use Ideas

- Energy audit and assessment.
- Evaluate efficient transformer purchase.
- Install a demand meter on the irrigation pump house electrical service.
- Regulate energy input to desired energy levels.
- Investigate variable drive motors.
- Consider on-site renewable energy (solar/wind).
- Purchase Energy Star™ office equipment & appliances.

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Xcel Energy		PUBLIC SERVICE COMPANY OF COLORADO	
		P.O. BOX 440 DENVER, CO 80201 (303) 451-4700	
		Due Date	Account No.
		Jan 25, 2007	110504
			Amount Due
			\$1,477.87
<b>DEMAND CHARGE =</b>			
Monthly rate * billed demand			
Billed demand = highest kW used for a continuous 15 minute			
Measured Usage	240		
Kilowatt-Hours Used	19600		
Measured Demand	0.900	kW	Actual
Billed Demand	77	kW	
<b>Gas Service - Account Summary</b>			
Invoice Number	0072290527	Commercial	
Master No.	00002110504	Usage Charge	2314.00 x 0.09646 = \$223.71
Rate	CG-T Commercial	Interstate Pipeline	2314.00 x 0.06000 = \$140.89
Current Reading	11376	Actual	01/09/2007
Previous Reading	8674	Actual	12/01/2006
Measured Usage	2707	Natural Gas - Dec	1782.76 x 0.07350 = \$1,309.34
Therm Multiplier	0.005	Natural Gas - Jan	532.24 x 0.05490 = \$29.13
Therm Used	7214.00	Service & Facility	
<b>Comparison Information</b>			
Gas	\$1,898.11 per month	\$63.26 per day	This Year 13900
Electric	\$1,578.96 per month	\$49.44 per day	Last Year 20160
			Therm Usage 2314
			Avg. Daily Temp. 33°

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## The Demand Charge

- Utilities build plants and buy power to meet anticipated peak demand.
- If large users can reduce electricity consumption below a specified amount, the demand charge can be avoided
- Ratchet clause: Highest demand in a given time period sets demand charge rate for entire period
- Load management can help: pump stations during cooler months, golf car charging, air conditioners

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**Insulation**

- Windows
  - Thermopane - Low-e and Gas Filled
  - Double and Triple pane
- Entry & Overhead Doors
  - Solid core and insulated
- Sealants/Caulking
  - Weather sealing around windows and doors
  - Repair damaged areas
- R-Values
  - Insulation's resistance to heat flow



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## Building Envelope Ideas

- Purchase energy efficient windows & doors.
- Weather stripping around doors.
- Remove paint (or other obstructions) from the air intake vents under the eaves.
- Air locks at building entrance
- Repair damaged doors and windows promptly.
- Energy efficient walls, floors, roofs and windows (R-value).
- Eaves/Awnings to deflect sunlight.

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## Compressed Air Ideas

- Preventive maintenance program
  - Part of overall O & M Plan
  - maintenance equipment
  - compressed air system
- Minimize compressed air system operating pressure

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## Optimal Energy Performance

- LCD Flat Panel Displays
  - Use 30% Less Power than CRTs
  - Easier to Recycle
  - Requires Less Packaging
- LED Exit Signs
  - 2 watts (\$2/yr) versus 60 watts (\$53/yr)
  - 20 year operational life
- On Demand Water Heating
  - Low maintenance
  - Less energy requirement
  - Longer operational life

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## Energy Assessments

- Look for local and state resources
- Contact your local utility
- Hire a trained energy consultant



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## Low Impact Development

- Green Buildings
  - LEED certified buildings and landscapes
  - Energy Efficient
  - Water Conserving
- Stormwater/Non-Point Source
  - Porous pavement/concrete/pavers
  - Rain gardens/swales
- Brownfield Sites
  - Conserves green space
  - Benefits local community and businesses

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## Carbon Footprint

A measure of the impact human activities have on the environment in terms of the amount of greenhouse gases produced, measured in units of carbon dioxide

- Average American is responsible for 22 tons of carbon dioxide emissions each year
  - Home energy use
  - Personal transportation
  - All energy used to produce the items consumed
- US greater than any other country - world's average is 6 tons per capita
- US accounts for 25% of the world's total greenhouse gas emissions

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## A Golf Course's Carbon Footprint

The amount of carbon dioxide emitted during the production, delivery, consumption, and disposal of the materials required and byproducts produced during the annual operation of a golf course

What should be included in the calculation of a golf course's carbon footprint?

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## A Golf Course's Carbon Footprint

- What activities could reduce a golf course's carbon footprint?
- Do grass, trees, and other vegetation impact the carbon footprint of a golf course?
- Carbon sequestration research – how can golf benefit?
- "Are Golf Courses Holding the Carbon?"

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**Are Golf Courses Holding the Carbon?**

**Turfgrass As A "Sink" for CO<sub>2</sub>**

Not long ago, when Tiger Woods drove a golf ball into a hole, it was a triumph. Now, it's a test of a golfer's carbon footprint. The amount of carbon dioxide emitted during the production, delivery, consumption, and disposal of the materials required and byproducts produced during the annual operation of a golf course is a growing concern. But are you holding the green? That's because the turfgrass used for golf courses is a carbon sink, storing up to 100 pounds of carbon per acre per year. This is due to the photosynthesis and respiration of the grass.

Agropolitan Research Institute and scientist Donald F. Fisher and Charles H. Hovde recently published their study, "Carbon Sequestration in Turfgrass: A Review of the Literature and a Case Study of a Golf Course." The study found that carbon sequestration in turfgrass is a significant factor in the carbon footprint of a golf course. The study also found that carbon sequestration in turfgrass is a significant factor in the carbon footprint of a golf course.

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## More Resources

**Energy Savers**

<http://www.energysavers.gov/>

**American Council for Energy Efficient Economy**

<http://www.aceee.org/index.htm>

**Energy Star**

<http://www.energystar.gov/>

**US Department of Energy – Energy Efficiency and Renewable Energy (EERE)**

<http://www.eere.energy.gov/>

**Putting Energy into Profits: Energy Star Guide for Small Business**

[http://www.energystar.gov/ia/business/small\\_business/sb\\_guidebook/smallbizguide.pdf](http://www.energystar.gov/ia/business/small_business/sb_guidebook/smallbizguide.pdf)

**Building Upgrade Manual**

<http://www.energystar.gov/ia/business/BUM.pdf>

**The Energy Saver**

<http://hes.lbl.gov/>

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## Learning Activity 1

Interactive Activity and Group Discussion

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## Learning Activity 1

- Would implementing pollution prevention activities benefit your facility? How?
- What are the P2 opportunities at your golf courses?
- What are the barriers at your golf course?
- How can your facility decrease its carbon footprint?
- What will increase the footprint?

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The Shop and Elsewhere

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Aqueous Cleaning

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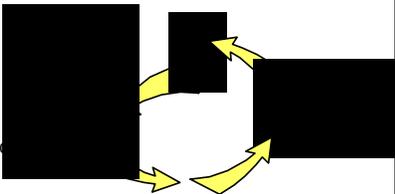
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Baseline: Mineral Spirits

- Pro's
  - Cleans well
  - Turnkey
- Con's
  - VOC emissions
  - Haz waste
  - Worker safety
  - Need-it-or-not servicing



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## How Aqueous Cleaning Works

Heat  
+ Mechanical Energy  
+ Chemical Action  
  
= Cleaning Performance

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## P2 Alternatives

- Microbial Sink-Top
- Immersion Unit
- Spray Cabinet
- Ultrasonic Unit

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## Microbial Sink-Top

- Same design as solvent unit
- Solution = 110 to 120° F
- Applicable for light-duty and quick cleaning jobs
- Microbes reduce waste generation
- Difficult to clean heavily soiled parts



\$850 to \$1,500

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## Immersion Unit

- Option to soak parts or manually scrub
- Solution = 110 to 120° F
- Applicable for light to moderate soil buildup
- Heavily soiled parts may require longer soak times



\$1,700 to \$3,500

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## Spray Cabinet

- Solution = 130 to 190 °F
- Pressures of 40 to 60 psi
- Applicable for heavily-soiled and large volumes of parts
- High level of cleaning
- Reduces labor by up to 80%



\$1,700 to \$11,500

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## Ultrasonic Unit

- Microscopic scrubbing action
- Solution = 130 to 190 °F
- High level of cleaning
- Cleans blind areas - transmissions and carburetors



\$5,000 to \$12,000

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## Summary of Aqueous Alternatives

- Microbial Sink-Top – light duty
- Immersion Unit – when soaking is needed
- Spray Cabinet – heavy duty/saves labor
- Ultrasonic Unit – transmissions/carburetors

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## Waste Management

- Spent Filters
  - Dispose as hazardous waste
  - Reusable filter
- Oils
  - Skim and recycle with used oil
- Spent Solution
  - Send off-site as hazardous waste (0 to 4 times per year)
  - Include sludge



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## Waste Stream Analysis

- Spent solution - 15 spent baths tested
  - Ten exceeded metals content (Cu, Pb, Cd, Zn)
  - Seven contained VOCs
  - Three exhibited fish toxicity
  - None met City of LA discharge limits (O&G, Cu, Pb, Zn)
- Spent filters - two tested
  - One hazardous due to metals

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**Case Study: Patty Jewitt Golf Course, Colorado Springs, Colorado**

- . Before: Safety Kleen Solvent Unit
- . After: Landa SJ-15
  - Immediate benefits
  - Timer
  - Oil skimmer
  - Sediment test
  - Maintenance
  - Performance

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**Cost Benefit Analysis**

- Solvent Costs:
  - Solvent Labor Cost: 5 hours per week, \$25/hour, \$6,500/year
  
  - Solvent Service Cost: \$38/service, 6 services/year, \$228/year
  
  - Total: \$6,728/year

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**Cost Benefit Analysis**

- Aqueous Costs:
  - Capital Cost: \$4,000
  - Cleaning Solution: \$36/year
  - Disposal Costs: \$0
  - Solution Testing: \$100/year
  - Labor Cost: 1 hour every 3 months plus negligible cleaning labor - \$650/year
  - Total: \$786 per year

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## Cost Benefit Analysis

- Simple Payback
  - Capital Cost: \$4,000
  - Annual Savings: \$5,942
  - Pay period: 0.7 years

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## Aqueous Cleaning Cost Analysis

	Your facility	Example
A	Number of solvent units leased	4
B	Current cost per service visit per unit	\$90
C	Number of times unit serviced per year	26
D	Total annual solvent service cost (AxBxC)	\$9,360
E	Loaded hourly labor rate for shop worker	\$30
F	Total number of cleaning labor hours per week	20
G	Total labor cost (ExFx52)	\$31,200
H	Total annual cost for solvent cleaning (D+G)	\$40,560

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	Your facility	Example
I	Number of spray cabinets to be purchased	1
J	Purchase price plus installation cost per spray cabinet	\$6,500
K	Total capital cost of spray cabinets (IxJ)	\$6,500
L	Cost per gallon of aqueous cleaner	\$6
M	Estimated aqueous cleaner used per unit per year in gallons	240
N	Aqueous cleaner purchase cost per unit per year (LxM)	\$1,440
O	Disposal cost per gallon of spent solution (including sludge)	\$5
P	Gallons of solution per spray cabinet	65
Q	Number of solution changes per unit per year	6
R	Total cost for spent solution disposal per unit (OxPxQ)	\$1,950
S	Number of cleaning labor hours per week (typically reduced up to 80 %)	4
T	Total annual labor cost (ExSx52)	\$6,240
U	Total spray cabinet O&M cost [(N+R)xI]+T	\$9,630

Payback Period Analysis		
V	Total capital cost of all units purchased (K)	\$6,500
W	Total annual cost savings (including labor costs) (H-U)	\$3,578
X	Payback period (years) (V/W)	1.8

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## Take Home Messages

- Aqueous cleaning works!
- Implement multiple units to meet all your needs
- Demonstrate units before purchasing
- Maximize solution life to lower waste management costs

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## Refillable Spray Bottles

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## Baseline: Disposable Aerosol Cans



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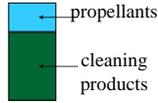
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## Environmental Concerns

- Propellants are greenhouse gases
  - CO2, propane, butane
- Empty cans
- Partially-filled cans



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## P2 Alternative: Refillable Bottles

- Metal Bottles: pressurized with shop air
- Plastic Bottles: pressurized with hand pump



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## Making It Work

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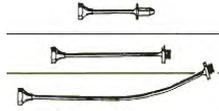
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## Purchasing

- Nozzle Type
  - Stream, spray, or adjustable
  - Extensions
- Canister Capacity
- Canister Type
  - Steel, aluminum, plated
  - Must be compatible with solution



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## Keep Small, Inexpensive Replacement Parts on Hand



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## Blow-Out Clogs



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Use Clean, Water-Free,  
Compressed Air



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Chemical "Tool Boxes"



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Use Funnels and Pumps to Minimize  
Spills When Refilling



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### Payback Threshold

If you use 20 aerosol cans per month or more:  
Payback < 1 year and annual savings = \$250

- 1) A shop uses 13-fluid oz. of aerosol cans at a cost of \$2 per can
- 2) No disposal costs
- 3) 5 refillable spray bottles are purchased at \$50 each
- 4) Bulk product costs \$10 per gallon



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### Take Home Messages

- Main issue is material use efficiency
- Bulk product is much cheaper
- Make filling easy and spill-free

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### Cleaning Practices at Saddle Rock Golf Course

- Blow off equipment daily
- Clean equipment once per week
- One day to wash and grease to save time, money, labor, and water

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## Shop Spill Cleanup

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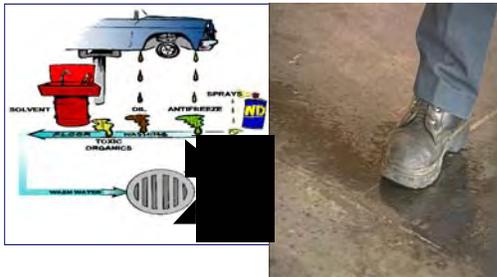
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## Baseline: Safety Hazards and Contaminated Wash Water



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## Environmental Concerns

- Sanitary sewer discharges
  - metals in treatment sludge
  - "pass through" contaminants
- Storm drains discharge directly to surface water
- Dry well discharges can contaminate groundwater

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P2: Use Roll-Around Drip Pans



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P2: Use Sloped Drum Covers



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P2: Secondary Containment



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## P2: Overhead Bulk Delivery



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## P2 Alternative: Dry Shop

- Use dry clean up methods
- Use launderable rags for small spills
- Segregate spill wastes (4-step method)
- Use absorbents sparingly
- Epoxy-seal floor to reduce cleaning needs

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## Making It Work

Q1: Gasoline or solvent spill?

If Yes → Absorbents

If No → Q2

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## Making It Work

Q2: Cleanup with  $\leq 3$  rags?

If Yes  $\rightarrow$  Use the rags

If No  $\rightarrow$  Four-step floor cleanup

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## Four-Step Floor Cleanup



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## Step 1: Oil Spill?



Use hydrophobic mop.

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### Step 2: Antifreeze Spill?



Use dedicated antifreeze mop.

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### Step 3: Dry Surface



Wipe up with rags.  
Do not saturate.

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### Step 4: Wet Mop



Use mild, non-caustic  
detergent.

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## Making It Work

### Minimize Absorbents

- Disadvantages:
  - Spilled oil and antifreeze cannot be recovered
  - Must be purchased repeatedly
  - May be a hazardous waste
  - Contaminants may be released to environment
- Reserve absorbents for large spills and emergencies
- Where possible, use reusable pads and pigs

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## Making It Work

### Epoxy-Seal the Shop Floor

- Won't absorb spills as a concrete floor does
- Makes spill cleanup easier
- Requires less time and water to clean
- Lasts for years and reduces long-term liability for floor contamination
- Looks great to customers and worker

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## Making It Work

### Power Washing

- Is wash water properly disposed?
- Even if a contractor power washes the floor, you can be held liable for illegal disposal.



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## Take Home Messages



- Stop if there's a drop!
- Source segregation
- Use absorbent sparingly
- Epoxy floors make this easy

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## Oil Bottle Draining

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## B.O.B.



[www.bob2000.com](http://www.bob2000.com)

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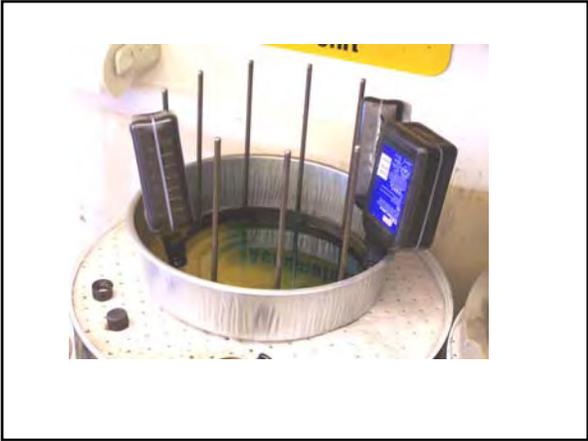
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Oils

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## Diesel Alternative BIODIESEL

- Clean burning and biodegradable fuel.
- Produced domestically from renewable materials.
- Used in existing engines with no major modifications.
- Blended in any percentage (B20 – most common).
- Substantial reduction of unburned hydrocarbons, carbon monoxide, and particulate matter.
- Biodiesel specification (ASTM D 6751-02).

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## B20 Blended Biodiesel

B20 is 20% Biodiesel, 80% petroleum diesel

AVERAGE BIODIESEL EMISSIONS COMPARED TO CONVENTIONAL DIESEL, ACCORDING TO EPA		
Emission Type	#100	#20
<b>Regulated</b>		
Total Unburned Hydrocarbons	-57%	-20%
Carbon Monoxide	-48%	-12%
Particulate Matter	-47%	-12%
Hg <sub>x</sub>	+10%	+2% to -2%
<b>Non-Regulated</b>		
Sulfates	-100%	-20%*
PAH (Polycyclic Aromatic Hydrocarbons)**	-85%	-13%
nPAH (nitrated PAH)***	-90%	-50%***
Ozone potential of speciated HC	-50%	-10%*

\* Estimated from #100 result  
\*\* Average reduction across all compounds measured  
\*\*\* 2-nitrofluorene results were within test method variability

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## Biodiesel Distributors




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## The Meadows Golf Club Biodiesel Case Study



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### The Meadow's Experience

- With the University's support, Ron was interested in trying a new fuel.
- Began using B20 about three years ago.
- Motive was to be more environmental & reduce emissions....not to save costs.
- B20 used in: tractors, backhoe, fairway mowers, utility carts, sprayers and triplex mowers. (John Deere, Toro, New Holland)

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### The Meadow's Experience

- 1<sup>st</sup> step was to check with manufacturers regarding equipment warranties.
- Warranties were not voided.

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## Warranty Investigation

- Equipment manufacturers warranty the engine, parts and workmanship.
- Equipment manufacturers do not warranty any fuel.
- It is the users responsibility to use fuel that meets appropriate specifications.

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## The Meadow's Experience

- B20 was added directly or "splash blended" to existing tanks.
- Biodiesel acts as a solvent and will clean the engine.
- Changed filters on older equipment after initial switch to B20.
- No additional maintenance required.

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## The Meadow's Experience

- Ron uses B20 throughout the golf season and adds a conditioner in the fall to winterize the last delivery and prevent "gelling" until first delivery in April.
- Like petroleum diesel, Biodiesel will begin to gel under cold temperatures (around zero degrees Fahrenheit)
- To avoid gelling, add a conditioner that serves as a pour point depressant.

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## A Word About Algae

- Like petroleum diesel, biodiesel can develop algae in the tank at the water/fuel interface if stored over 6 months.
- Solution – Add an algaecide designed for this purpose to fuel tank.

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## A Word about Power

National Biodiesel Board

- 1 gallon petroleum diesel - 129,800 BTU
- 1 gallon B20 - 129,500 BTU

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## The Meadow's Experience

Biodiesel cost comparison:

- Petroleum diesel \$2.24/gallon\*
  - Biodiesel (B20) \$2.27/gallon\*
- \* January 2008

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## Biodiesel (B20) Summary

1. Substantially reduces emissions – Healthier for humans & the environment.
2. Does not require engine modifications.
3. Increases engine lubricity –Increases engine life.
4. Runs cleaner than petroleum diesel and extends intervals between oil changes.
5. Is similar in price to petroleum diesel.
6. Typically made from soybeans – A renewable resource that degrades 4 times faster than petroleum diesel.
7. Domestically produced - Reduces reliance on foreign oil.

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## Synthetic Motor Oils

- Synthetic lubricants consist of synthetic base oils/stocks and special purpose additives.
- Available since 1972
- Fuel efficient, provide improved overall performance characteristics when compared to conventional petroleum oils.

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## Synthetic Motor Oils

- Can be used in any mechanically sound gas or diesel fueled engine
- Many choices: AMSOIL, Mobil Synthetic, Royal Purple, Red Line
- Synthetic oils will not void a manufacturers' warranty. Warranties are based upon the use of oils meeting specific API Service Classifications.

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## Benefits

- Synthetics are highly resistant to the destructive effects of heat, and do not break down like petroleum oils. They can provide *much longer drain intervals* than conventional lubricants.
- Synthetics reduce friction and drag better than petroleum oils, resulting in *significant fuel economy increases*. (4.5% to 15 % increase in gas mileage.)
- Synthetics flow readily at extremely low temperatures and provide *easier winter starting* and significantly reduced engine wear.

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## Benefits

- Uses less oil – *save money*.
- Increases fuel efficiency – *save money*.
- Reduces mechanics time changing oil – *save money*.
- Extends engine life – *save money*.
- Store less oil, *reduced risk* for potential environmental impact.

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## Before you make the switch...

- Begin to use synthetic oils in pieces of equipment that are in good condition.  
(Leaky engines will leak more with synthetics.)
- Run a cleaner through the engine once and clean the oil filter.
- The oil filter may be initially changed a couple times to remove old "sludge".

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## Arcadia Bluffs Golf Club



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## Arcadia Bluffs Experience

- Superintendent began using synthetic oil 6 yrs ago in all of his equipment: trucks, tractors, mowers, sprayers, utility vehicles
- Two stroke engines: string trimmers, back pack blowers, augers
- Motives:
  - Save Time
  - Reduce Waste
  - Save Money

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## How do Synthetics Save Time?

- The mechanic will change oil twice a year. Once in the summer and again in the fall.
- Fairway mowers (liquid cooled engines)
  - Was 100 hours / Now 400 to 500 hours
- Triplex (air cooled engines)
  - Was 25 to 50 hours / Now 300 to 400 hours
- Spray rig – summer and fall
- Truck
  - Was 3,000 to 5,000 miles / Now 30,000 miles

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## How do Synthetics Save Money?

- Time is Money - The mechanic can significantly reduce the time spent on changing oil.
- Since much less product is used, costs will be reduced over the course of a year when compared to regular oil.

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## Cost comparison

- 55 gallon drum regular oil (1540) costs  
≈ \$350 - \$450
- 55 gallon drum synthetic oil (1540) costs  
≈ \$800 - \$1,000

Synthetic oil costs about 2.5 times more than regular oil but will last 4 to 5 times longer.

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## Arcadia Bluffs Experience

"I've never heard of someone who has switched to synthetics and then gone back. They're great!"

Paul Emling  
Arcadia Bluffs Superintendent



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## More Resources

- Greenseal  
[www.greenseal.org/](http://www.greenseal.org/)
- EPA's toolbox on EPP  
[www.epa.gov/opptintr/epp/](http://www.epa.gov/opptintr/epp/)
- EPPNet Listserv  
[www.nerc.org/eppnet.html](http://www.nerc.org/eppnet.html)
- NPPR EPP Webpage  
[www.p2.org/workgroup/epp/](http://www.p2.org/workgroup/epp/)
- Green Industry Purchasing Guide  
[www.deq.state.mi.us/documents/deq-ess-p2-turf-purchasingguide.pdf](http://www.deq.state.mi.us/documents/deq-ess-p2-turf-purchasingguide.pdf)

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## 15 minute break

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## Recycling Programs

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Recycling one ton of paper saves:

- 17 trees
- 6,935 gallons of water
- 463 gallons of oil
- 587 lbs of air pollution
- 4,077 kilowatt-hours of energy

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Saddle Rock Golf Course  
Recycling Programs

- Waste oil and antifreeze
- Oil filters
- Aluminum
- Plastic
- Cardboard
- Tires
- Steel
- Concrete and Asphalt
- Golf course organic waste



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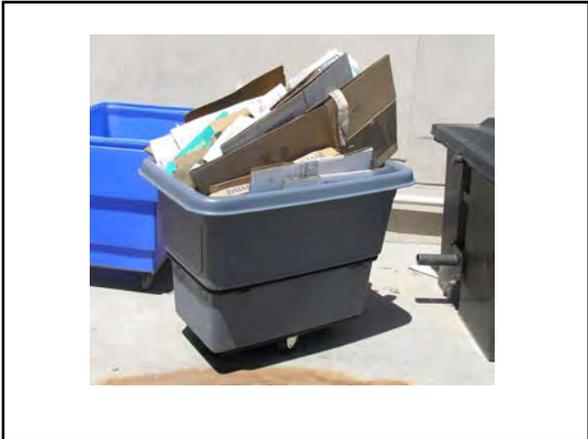
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**Aluminum Recycling Revenues**

<b>2005</b>	<b>\$341.05</b>
<b>2006</b>	<b>\$564.19</b>

- In three months, Americans throw away enough aluminum to rebuild the US's entire commercial air fleet.
- Recycling one aluminum can saves enough energy to run a laptop for 4 hours.

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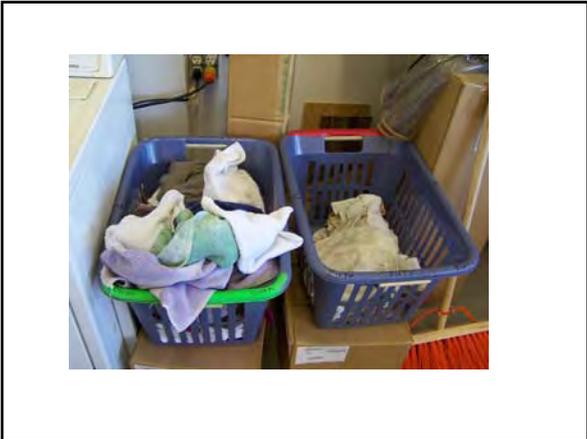
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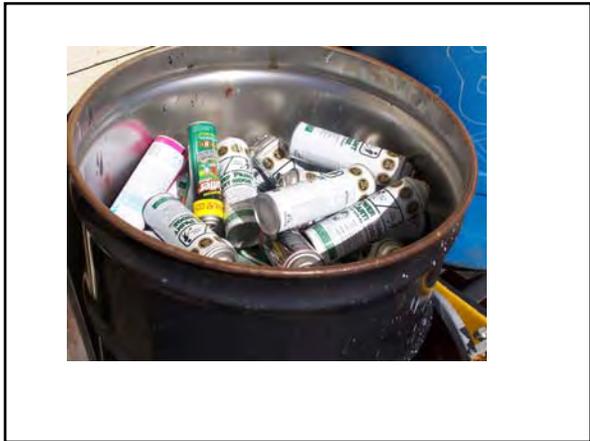
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Christmas trees and tree trimming mulch

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## BENCHES: Wood or Trex

- Wood
  - Splintering and breaking
  - Refinish every year
  - Replace after 8 years
- Trex
  - No refinishing, splintering or breaking
  - Significantly longer useful life
  - Lumber not available in correct size, rip into proper size and router edges

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## Cost Analysis: 20 benches

- Wood
  - Refinishing = \$800/year
  - 5 years = \$4,000
- Converting to Trex
  - 1.25" x 6" x 12' = \$35
  - Conversion cost (labor & materials) = \$1,200
  - 5 year savings = \$2,800+

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- Mark areas without paint
- Identify sod/seed limits and mowing limits
- Locate sod pins for future removal
- \$95 / 1000 stake chasers

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## Composting

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### Compost Research at CSU

Grant A. Johnson 2005

'Effect of Topdressing Established Kentucky Bluegrass with Composted Manure'

- 0.8 cu yd/1000 sq ft
- 6-10% higher quality
- Retained color longer in fall
- Faster spring green up
- Greater soil moisture retention during 10-day dry down periods, average of 14%

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## Getting Started

1. Decide who will be responsible.
  - the 'energy action team'
2. Establish the facts.
  - How much energy is consumed?
3. Compare the course's performance
4. Plan and organize
  - Define policy, set objectives, involve golfers/members and staff, and assign responsibilities
5. Evaluate, control and monitor
  - Energy audits

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## Areas to Evaluate

- Management policies
- Purchasing practices
- Buildings
- Greenkeeping & other equipment
- Electric & lighting
- Heating & cooling
- Water
- Fuels

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## Purchasing Programs

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## EPP Purchasing Contracts

- Put it in writing
- Give preference to environmental bidders
- Consider life-cycle costs of products,
- Refillable, returnable, or recyclable or NO packaging

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## Environmentally Preferable Purchasing

is the practice of purchasing products that have a [lesser or reduced](#) effect on human health and the environment when compared with competing products or services that serve the same purpose.

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## EP Products

- Recycled content products
- Less toxic products
- Water/Energy conserving products
- Biodegradable products
- Products with less packaging
- Renewable materials

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## Examples of EP Products

Recycled-content products, such as recycled plastic furniture



Energy conserving products, such as fluorescent lights



Less toxic products, such as "greener" cleaners



Bio-based products, such as soy printing inks, oils and greases



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## Learning Activity 2

Conduct Activity with the People  
at your Table

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## Learning Activity 2

- Read the question on the index card
- 20 minutes:
  - Discuss the question among your group
  - Write down answers on paper provided
- 10 minutes:
  - One person explain their groups findings to the class

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**Learning Activity 2  
Implementation**

- What are the top five pollution prevention projects that you would consider?
- What people should be involved for successful implementation?
- What are the five resources and tools do we need to move forward?

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**Q&A**

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