







## Topics

- ✓ Aqueous cleaning
- ✓ Chemical selection
- ✓ Refillable spray bottles
- ✓ Used oil heater
- ✓ Shop spill cleanup
- ✓ Oil bottle draining
- ✓ Re-refined oil
- ✓ Oil filter management
- ✓ Snowmobiles
- ✓ Oxygenated gasoline
- ✓ Snowcat hydraulic line preventive maintenance



## Solvent Free Shops

- ✓ ASC replaced 9 solvent units and A-Basin 1 unit
- ✓ Aqueous spray cabinet
- ✓ Preliminary cost analysis: savings range from \$15,600 to \$19,800 per year, with payback of 4 to 11 months
- ✓ Total solvent use elimination: 815 gallons per year (ASC = 635 gallons, A-Basin = 180 gallons)



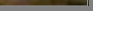
## Buttermilk Mountain

BUTTERMILK MOUNTAIN VEHICLE MAINTENANCE SHOP	
Types of Parts Cleaned: bearings, gear boxes, and hydraulic components	
<b>SOLVENT CLEANING</b>	
Number of Solvent Units:	1
Solvent Replacement Volume and Frequency:	17 gallons every 3 months
Part Cleaning Labor Hours:	20 to 25 hours per week for 6 months and 8 hours per week for 6 months
Solvent Unit Service Cost:	\$1,000/year (\$250 x 4)
Electricity Cost Per Year:	120 (\$0.07/kWh)
O&M Cost (including labor cost):	\$23,000 per year (labor cost = \$30 per hour)
<b>AQUEOUS CLEANING</b>	
Number and Type of Aqueous Units:	1 Landa S1 15 spray cabinet
Solution Replacement Frequency:	Every 45 days for 6 months (summer) and every 90 days for 6 months (winter)
Part Cleaning Labor Hours:	4 to 5 hours per week for 6 months and 1.5 hours per week for 6 months
Electricity Cost Per Year:	\$1,310 (\$0.07/kWh)
O&M Cost (including labor cost):	\$7,440 per year (labor cost = \$30 per hour)
Capital Cost:	\$4,245
Annual Savings:	\$15,560 (\$23,000 - \$7,440)
Payback Period:	Less than 4 months



## Refillable Spray Bottles

- Propellants are greenhouse gases
- Propellants: 10 to 15% of product by weight
- Hazardous waste if not empty when disposed (if contents are hazardous)
- Aerosol cans are a bulky, non-biodegradable waste

## Refillable Spray Bottles

Item	Snowmass Mountain Lift Operations	Snowmass Mountain Vehicle Maintenance	A-Basin Vehicle Maintenance
<b>BEFORE</b>			
Aerosol cans per year	48	216	120
Aerosol can product cost per gallon (per can)	\$26.36 (\$3.19)	\$30.63 (\$3.35)	\$17.98 (\$1.96)
<b>AFTER</b>			
Number and size of refillable spray bottles	6 16-ounce	4 1-quart	1 1-quart
Total purchase cost of refillable spray bottles	\$0 (provided by bulk product supplier)	\$160	\$40
Average refilling time	5 minutes	3 minutes	2 minutes
Bulk product cost per gallon	\$15.00	\$13.00	\$14.91
Annual savings	\$70	\$416	\$40
Payback period	Immediate	6 months	1 year

## Hydraulic Line Maintenance

- 1 large line break is 5 to 40 gallons
- Standard or typical response: ?
- All small breaks due to mechanic error
- Net PM labor < net spill clean up and repair labor



Arctic Basin



## ASC Hydraulic Line PM Program

Item	Before Preventive Maintenance	After Preventive Maintenance
Number of line breaks per season (drive and auxiliary)	2 to 4 major breaks (3 mountains) per month; 3 breaks/month x 4 months per season = 12 breaks per season	0 breaks per year per mountain after 1 year of preventive maintenance; 3 minor breaks after 2 years
Average size of hydraulic oil spill	5 to 35 gallons per spill (average of 20 gallons per spill)	< 5 gallons
Labor cost to repair a broken hydraulic line	2 people x 5 hours per person x \$22.50/hour (time+1/2) x 12 breaks = \$2,700	2 people x 5 hours per person x \$22.50/hour (time+1/2) x 3 breaks = \$675
Labor cost for preventive maintenance (unloaded labor rate)	\$0	1 person x 2 hours x \$15/hour x 31 snowcats = \$930
Cost of materials to replace hydraulic lines	\$150 (drive) x 7 = \$1,050 \$50 (auxiliary) x 5 = \$250	\$150 (drive) x 6 = \$900 \$50 (auxiliary) x 3 = \$150
Total annual cost	\$4,000	\$2,655
<b>ANNUAL SAVINGS = \$1,345</b>		



## 4-Cycle Snowmobile Demonstration



- Arctic Cat demonstration at ASC February 2001

### Pros

- Better gas mileage (from 9 or 10 mpg to 22 mpg)
- Less emissions (up to 95% reduction)
- Quiet
- Low odor
- Comfortable

### Cons

- Under powered
- Too heavy
- More expensive



## Oxygenated Fuel

- ASC uses about 110,000 gallons of unleaded fuel per year
- Sample and analyze fuel – not oxygenated
- Memo to environmental, purchasing and vehicle maintenance directors
- Oxygenated fuel reduces
  - Carbon monoxide 9 to 38 %
  - Unburned hydrocarbons 13 to 38 %
  - Fine particulates 25 to 55 %
  - Air toxics 22 %

