Paint Gun Cleaning
Solvent Recycling
Current Practices

- Thinners and organic solvents provide effective cleaning
- Acetone and Methyl acetate blends
  - exempt VOCs, not regulated by air districts
  - less toxic than other organic solvents
- Manual cleaning
- Automatic equipment
- Combination manual/auto
Solvent Use Concerns

- Largest hazardous waste stream – mixture of waste gun cleaning solvent and waste paint
- Worker health and safety and environment
  - Toxic – toluene, xylene
  - Flammable
  - Smog forming Volatile Organic Compounds
- Recordkeeping requirements
- Solvent cost
  - Solvent loss from evaporation increases product cost
P2 Strategies

- 2-stage cleaning
- Enclosed automatic equipment
- Disposable cup liners
- Alternative technology cleaning systems

- Waterborne coatings
  - water-based cleaners
# Solvent Comparison

<table>
<thead>
<tr>
<th>Cleaning Solvent Comparison</th>
<th>Solvent Type</th>
<th>VOC Regulatory Restrictions</th>
<th>Health Concerns</th>
<th>Manage as Hazardous Waste</th>
<th>Flammable Fire Dept Regulated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traditional Cleaning Solvents</strong></td>
<td>Organic Solvent and Lacquer Thinner</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td><strong>EPA Exempt Solvents</strong></td>
<td>Acetone</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td><em>If exemption has been adopted in specific air district</em></td>
<td>Acetone and methyl acetate blend</td>
<td>no</td>
<td>yes</td>
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<td>yes</td>
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<tr>
<td></td>
<td>PCBTF* (Parachlorobenzotrifluoride)</td>
<td>no</td>
<td>unknown</td>
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<td>yes</td>
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<tr>
<td></td>
<td>TBAC* (Tertiary-Butyl acetate)</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td><strong>Pollution Prevention (P2) Alternatives</strong></td>
<td>Citrus based</td>
<td>yes</td>
<td>no</td>
<td>filter waste</td>
<td>yes</td>
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<tr>
<td></td>
<td>Aqueous based</td>
<td>yes</td>
<td>no</td>
<td>filter waste</td>
<td>no</td>
</tr>
</tbody>
</table>
Two-stage cleaning

- Empty paint pot thoroughly
- First stage uses dirty solvent
  - remove most of paint
  - paint cup requires most cleaning
- Second stage uses clean solvent
  - flush out spray gun
  - remove remaining paint
- Replace 1st stage solvent with 2nd stage, when it stops cleaning effectively
- Conserves solvent, saves money
Enclosed Automatic Cleaning

- Solvent is forced through spray gun
- Minimizes solvent loss during cleaning
- Reduces worker exposure
- Filtration system
  - extends solvent life
Calibrated Paint Cup Liners

- Eliminates most cleaning - paint cup

- Disposable
  - Stores left-over paint
  - Clean in water based system for limited reuse
Gravity feed spray guns

Spray gun and disposable cup liner system
Alternative Paint Gun Cleaning Systems
Alternative Cleaning Systems

- **Water-based**
  - Used in automotive refinishing shops
- **Citrus-based (d-limonene)**
  - Used for military vehicle & equipment painting
- **Cleaning solution features**
  - low toxicity
  - low vapor pressure
  - contain regulated VOCs
- **Paint solids are removed from cleaning solution by circulating solution through filters**
Alternative Paint Gun Cleaner – Citrus Based Solution
Solvent Recycler/Distillation Units
Why Recycle Solvent?

- Protect the environment
  - Primary source of hazardous waste
  - Major contributor to air and water pollution
- Reduce time and money spent on managing hazardous waste
- Achieve regulatory compliance
- Reduce future liability (through on-site recycling)
Solvent Recycling Options

- **On-Site Recycling**
  - Recover spent solvent using shop owned equipment

- **Off-Site Recycling**
  - Recover spent solvent through use of an outside recycling facility
Typical solvent recycling is accomplished by a distillation process that includes the following steps:

- Waste solution is poured into a charged still (distillation) vessel.
- A thermal oil jacket heats the waste solution until the solvent boils into vapor.
- The vapor passes through the condenser where it is collected and cooled back into a liquid solvent.
- The still bottoms, waste remaining at the bottom of the still, is disposed of as hazardous waste.
Simple Distillation Unit: Sidewinder

1. Load
2. Latch on lid
3. Push to start
4. Recycled Solvent

Turns This... Into This!
Distillation unit

Still bottoms
On-Site Vs. Off-Site Recycling

Consider the following when evaluating recycling options:

- Cost
- Recycled product quality
- Hazardous waste storage, handling, and disposal concerns
- Fire and electrical safety concerns
- Regulatory concerns
- End use concerns
Off-Site Vs. On-Site Recycling: Cost

- **On-Site Solvent Distillation**
  - $2,500 to $6,000 capital cost, equipment
  - $3,400 per year, O&M and HW disposal

- **Cost comparison calculator**
  

  http://p2library.nfesc.navy.mil/econs/8i4.xls
On-Site Vs. Off-Site Recycling: Recycled Product Quality

- **On-Site Solvent Distillation**
  - Mixture of cleaning solvent and paint reducers
  - depends on input

- **Off-Site Solvent Recycling Service**
  - Recycled or virgin product, known composition
Hazardous Waste Storage, Handling, and Disposal Concerns

- **On-Site Solvent Distillation**
  - Owner responsibility
    - Proper management of waste solvent, reclaimed solvent, and still bottoms

- **Off-Site Solvent Recycling Service**
  - Owner responsibility
    - Proper waste handling and storage
    - Use a licensed hazardous waste transporter
    - Ship to a facility permitted to treat the waste
On-Site Vs. Off-Site Recycling: Fire and Electrical Safety Concerns

➢ On-Site Solvent Distillation
  • Distillation unit heats flammable solvent creating potential hazard

➢ Off-Site Solvent Recycling Service
  • Safe storage on-site until picked up
On-Site Vs. Off-Site Recycling: Regulatory Concerns

- **On-Site Solvent Distillation**
  - Reclaimed solvents may exceed air district limits on VOC content in gun cleaning solvents.
  - Some local CUPAs and Fire Departments may not allow the use of on-site recyclers.

- **Off-Site Solvent Recycling Service**
  - Off-site recyclers are responsible for all necessary permits and maintaining regulatory compliance at their facility
  - Generator responsibility: check transporter registration & facility permit
On-Site Vs. Off-Site Recycling End Use Concerns

- **On-Site Solvent Distillation**
  - Use recycled product for spray gun cleaning.
  - Recycled solvent that is not used on-site is subject to hazardous waste regulations.

- **Off-Site Solvent Recycling Service**
  - Some off-site facilities create fuel instead of cleaning solvent as an end product.
  - Look for a service that produces recycled cleaning solvent.
On-Site vs. Off-Site Recycling
Summary

- **On-Site Solvent Distillation**
  - Advantages:
    - cost effective, compared to off-site recycling cost
    - inventory and storage reduction
    - reduces long term liability from off-site treatment and disposal

- **Off-Site Solvent Recycling Service**
  - May be most cost effective option if:
    - small waste stream, or
    - solvent waste is not routinely generated
  - Advantage: using reclaimed rather than virgin solvents
  - Disadvantages:
    - service and transportation costs
    - off-site transportation, treatment and disposal liability