LOW-VOC, LOW TOXICITY
ALTERNATIVES FOR CONSUMER
PRODUCT CLEANUP AND
THINNING SOLVENTS

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INSTITUTE FOR RESEARCH AND TECHNICAL ASSISTANCE

• NON-PROFIT ORGANIZATION ESTABLISHED IN 1989
• IDENTIFIES, DEVELOPS, TESTS AND DEMONSTRATES SAFER ALTERNATIVES
• HEAVY FOCUS ON SOLVENT ALTERNATIVES
  – CLEANING
  – PAINT STRIPING
  – DRY CLEANING
  – LUBRICANTS
  – THINNERS
  – ADHESIVES
  – COATINGS
BACKGROUND

• PRODUCTS INCLUDE SOLVENTS SOLD IN HARDWARE, HOME IMPROVEMENT AND PAINT STORES
  – PURCHASED BY CONSUMERS AND BUSINESSES
• PRODUCTS USED FOR CLEANUP OF COATING APPLICATION EQUIPMENT
  – SPRAY GUNS, ROLLERS, BRUSHES
• PRODUCTS ALSO USED FOR THINNING COATINGS WHEN APPLIED WITH SPRAY GUNS
BACKGROUND CONT’D

• CARB RESPONSIBLE FOR REGULATING CATEGORIES
  – CALL THEM PAINT THINNERS AND MULTI-PURPOSE SOLVENTS
  – LAST CARB SURVEY INDICATED VOC EMISSIONS OF
    PRODUCTS AMOUNT TO 13.6 TONS PER DAY
  – CARB CONDUCTING NEW SURVEY TO UPDATE NUMBERS

• MANY CONSUMER PRODUCT COATINGS ARE
  WATERBORNE
  – THINNED AND CLEANED WITH WATER

• CONSUMER PRODUCTS USED WITH SOLVENTBORNE
  PAINTS ARE FOCUS
IRTA ALTERNATIVES PROJECTS

• EPA PROJECT, SCAQMD PROJECT
  – FOCUSED ON IDENTIFYING, DEVELOPING, TESTING, DEMONSTRATING LOW VOC, SAFER CLEANUP MATERIALS
  – INDUSTRY USE FOR CLEANUP OF COATING/ADHESIVE APPLICATION EQUIPMENT

• SCAQMD RULE 1171 MODIFIED TO SET VOC LIMIT OF 25 GRAMS PER LITER FOR CLEANUP SOLVENTS
  – BASED ON IRTA PROJECTS
  – APPLIED TO INDUSTRIAL OPERATIONS

• DTSC PROJECT
  – FOCUSED ON IDENTIFYING, DEVELOPING, TESTING, DEMONSTRATING LOW-VOC, LOW TOXICITY ALTERNATIVES FOR CONSUMER PRODUCT CLEANUP AND THINNING SOLVENTS
  – CONSUMER AND INDUSTRY USE OF PRODUCTS
DTSC PROJECT

• CONSUMER PRODUCT THINNERS AND CLEANUP SOLVENTS
  – PAINT THINNER, LACQUER THINNER, MEK, XYLENE
• TESTED ALTERNATIVES FOR TYPES OF SUBSTRATES
  CONSUMERS AND SMALL COMPANIES PAINT
  – WOOD, METAL, PLASTIC
• IRTA WORKED WITH FIVE TYPES OF OPERATIONS AS
  SURROGATES
  – TWO WOOD REFINISHERS
  – FOUR CONTRACTORS
  – FOUR AUTOBODY SHOPS AND ONE CONSUMER AUTOBODY
    APPLICATION
  – ONE FACILITY THAT PAINTS METAL PARTS
  – ONE FACILITY THAT PAINTS PLASTIC PARTS
THINNING / CLEANUP SOLVENTS

• MOST COMMON ARE PAINT THINNER AND LACQUER THINNER

• LACQUER THINNER
  – BLEND OF VARIOUS SOLVENTS INCLUDING TOLUENE, MEK, IPA, GLYCOL ETHER ACETATES, METHANOL, PETROLEUM DISTILLATES

• PAINT THINNER
  – TERM FOR PETROLEUM BASED SOLVENTS
  – INCLUDES PETROLEUM DISTILLATES, STODDARD SOLVENT, 1,2,4-TRIMETHYLBENZENE
APPROACH TO ALTERNATIVES DEVELOPMENT

• CLEANUP MATERIALS
  – SOLVENTBORNE COATINGS MUST BE SOLUBLE IN ALTERNATIVE

• THINNERS/REDUCERS
  – MUST HAVE ACCEPTABLE EVAPORATION RATE
  – CAN HAVE FASTER EVAPORATION RATE BUT COATING MUST BE DEPOSITED PROPERLY
  – MORE CHALLENGING THAN CLEANUP MATERIALS
WOOD REFINISHING

• CONSUMERS STRIP AND / OR REFINISH WOOD ITEMS
  – DOORS, MOLDING, FURNITURE, CABINETS

• FURNITURE STRIPPERS, CONTRACTORS STRIP AND REFINISH WOOD ITEMS
  – ANTIQUE ITEMS, DOORS, FURNITURE, CABINETS

• IRTA WORKED WITH TWO FURNITURE STRIPPING COMPANIES
  – BOTH USE SOLVENTBORNE COATINGS
  – ONE DOES CONTRACT STRIPPING FOR HOMES AND OFFICES
CONTRACTOR REFINISHING

- ARCHITECTURAL CONTRACTORS
  - WOOD ITEMS
  - METAL TRIM
- OFTEN USE WATERBORNE (LATEX) COATINGS
- IRTA WORKED WITH FOUR CONTRACTORS
  - WOOD
  - METAL
METAL REFINISHING

• CONSUMERS PAINT METAL PATIO FURNITURE AND BUSINESSES PAINT CARS, OTHER METAL PRODUCTS
  – MANY METAL COATINGS ARE POWDER COATS
  – SOME METAL COATINGS ARE SOLVENTBORNE

• IRTA WORKED WITH SIX OPERATIONS
  – FOUR AUTOBODY SHOPS
  – METAL SAFE MANUFACTURER
  – CONSUMER PRODUCT AUTO COATING
PLASTIC REFINISHING

• MANY COMPANIES REFINISH PLASTIC PARTS
  – SOME USE SOLVENTBORNE COATINGS

• IRTA WORKED WITH ONE COMPANY THAT PAINTS PLASTIC AUTOMOTIVE PARTS
  – SPOILERS
ALTERNATIVES TESTING

• CLEANUP
  – ACETONE, ACETONE BLENDS, WATER-BASED CLEANER
  – ACETONE NOT A VOC AND IS LOWER IN TOXICITY THAN MOST OTHER ORGANIC SOLVENTS

• THINNING
  – ACETONE AND ACETONE BLENDS
  – TECHNICALLY CHALLENGING
    • MUST HAVE APPROPRIATE EVAPORATION RATE
    • BLENDED ACETONE WITH GLYCOL ETHER OR SOY
FURNITURE STRIPPER

• STRIPS AND REFINISHES WOOD ITEMS AT SHOP
• ALSO STRIPS AND REFINISHES CABINETS IN HOMES AND OFFICES
• CONVERTED TO ACETONE FROM LACQUER THINNER FOR CLEANUP SEVERAL YEARS AGO
• CONVERTED FROM LACQUER THINNER TO ACETONE FOR THINNING AFTER IRTA TESTING
  – TESTED ACETONE AND ACETONE/SOY BLEND
## COST ANALYSIS FOR FURNITURE STRIPPER

### Annualized Cost Comparison for Cleanup Materials

<table>
<thead>
<tr>
<th></th>
<th>Lacquer Thinner</th>
<th>Acetone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleanup Solvent Cost</td>
<td>$562</td>
<td>$562</td>
</tr>
<tr>
<td>Total Cost</td>
<td>$562</td>
<td>$562</td>
</tr>
</tbody>
</table>

### Annualized Cost Comparison for Thinners

<table>
<thead>
<tr>
<th></th>
<th>Lacquer Thinner</th>
<th>Acetone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinner Cost</td>
<td>$1,404</td>
<td>$1,404</td>
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<tr>
<td>Total Cost</td>
<td>$1,404</td>
<td>$1,404</td>
</tr>
</tbody>
</table>
CONTRACTOR #1

• WORK INVOLVES PAINTING HOUSES AND BUILDINGS
• PURCHASES PAINT THINNER FROM HOME IMPROVEMENT STORE
  – USED FOR BOTH CLEANUP AND THINNING
• USED SOLVENTBORNE PRIMER ON WOOD AND METAL TRIM
• TESTED ACETONE FOR CLEANUP AND THINNING
  – CONTRACTOR INDICATED IT PERFORMED WELL
**COST ANALYSIS FOR CONTRACTOR #1**

<table>
<thead>
<tr>
<th>Annualized Cost Comparison for Cleanup Materials</th>
<th>Paint Thinner</th>
<th>Acetone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleanup Material Cost</td>
<td>$13</td>
<td>$28</td>
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<tr>
<td>Total Cost</td>
<td>$13</td>
<td>$28</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Annualized Cost Comparison for Thinners</th>
<th>Paint Thinner</th>
<th>Acetone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinner Cost</td>
<td>$6</td>
<td>$14</td>
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<tr>
<td>Total Cost</td>
<td>$6</td>
<td>$14</td>
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</tbody>
</table>
CONTRACTOR #2

- WORKS ON COMMERCIAL BUILDINGS
- PAINTS STEEL BEAMS AND RAILS USED IN CONSTRUCTION OF THE BUILDINGS
- USES SOLVENTBORNE RED OXIDE PRIMER
- USES SPRAY GUN FOR APPLYING COATING TO RAILS
- USES PAINT THINNER FOR CLEANUP AND THINNING
- IRTA TESTED ACETONE FOR CLEANUP AND ACETONE AND ACETONE/SOY FOR THINNING
## COST ANALYSIS FOR CONTRACTOR #2

### Annualized Cost Comparison for Cleanup Materials

<table>
<thead>
<tr>
<th></th>
<th>Paint Thinner</th>
<th>Acetone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleanup Solvent Cost</td>
<td>$574</td>
<td>$1,257</td>
</tr>
<tr>
<td>Total Cost</td>
<td>$574</td>
<td>$1,257</td>
</tr>
</tbody>
</table>

### Annualized Cost Comparison for Thinners

<table>
<thead>
<tr>
<th></th>
<th>Paint Thinner</th>
<th>Acetone</th>
<th>Acetone/Soy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinner Cost</td>
<td>$574</td>
<td>$1,257</td>
<td>$1,268</td>
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<tr>
<td>Total Cost</td>
<td>$574</td>
<td>$1,257</td>
<td>$1,268</td>
</tr>
</tbody>
</table>
SAFE MANUFACTURER

- MANUFACTURES BURGLARY, FIRE PROTECTION AND GUN SAFES
- USES PRIMER AND TOPCOAT
- USES HIGH VOC CONTENT “REDUCER”
  - SLOW, MEDIUM OR FAST
- IRTA WORKED WITH COMPANY EARLIER AND HELPED THEM TO CONVERT FROM LACQUER THINNER TO ACETONE FOR CLEANUP
- TESTED ALTERNATIVE THINNERS
  -_plain acetonE
  - SOY/ACETONE BLENDS
- ALL PANELS HAD GOOD APPEARANCE BUT HIGHER CONTENT SOY BLENDS DID NOT DRY QUICKLY ENOUGH
COST ANALYSIS FOR SAFE MANUFACTURER

<table>
<thead>
<tr>
<th>Annualized Cost Comparison for Cleanup Materials</th>
<th>Lacquer Thinner</th>
<th>Acetone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleanup Solvent Cost</td>
<td>$28,080</td>
<td>$28,080</td>
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<tr>
<td>Total Cost</td>
<td>$28,080</td>
<td>$28,080</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Annualized Cost Comparison for Thinners</th>
<th>Current Thinner</th>
<th>Acetone</th>
<th>Acetone/Soy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinner Cost</td>
<td>$1,598</td>
<td>$1,176</td>
<td>$1,260</td>
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<tr>
<td>Total Cost</td>
<td>$1,598</td>
<td>$1,176</td>
<td>$1,260</td>
</tr>
</tbody>
</table>
AUTOBODY SHOP

- SMALL SHOP THAT REPAIRS AND PAINTS VEHICLES
- APPLIES PRIMER, BASE COAT, TOPCOAT
  - SOLVENTBORNE COATINGS
- USES HIGH VOC THINNER FROM A PAINT SUPPLY COMPANY FOR CLEANUP AND THINNING
- TESTED ACETONE AND ACETONE/METHYL ACETATE FOR CLEANUP
- TESTED ACETONE, ACETONE/SOY AND ACETONE/DPM FOR THINNING BASE COAT
## COST COMPARISON FOR AUTOBODY SHOP

### Annualized Cost Comparison for Cleanup

<table>
<thead>
<tr>
<th></th>
<th>Current Solvent</th>
<th>Acetone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleanup Solvent Cost</td>
<td>$1,324</td>
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</tr>
<tr>
<td>Total Cost</td>
<td>$1,324</td>
<td>$1,361</td>
</tr>
</tbody>
</table>

### Annualized Cost Comparison for Thinners

<table>
<thead>
<tr>
<th></th>
<th>Current Solvent</th>
<th>Acetone/Soy</th>
<th>Acetone/DPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinner Cost</td>
<td>$441</td>
<td>$486</td>
<td>$486</td>
</tr>
<tr>
<td>Total Cost</td>
<td>$441</td>
<td>$486</td>
<td>$486</td>
</tr>
</tbody>
</table>
PLASTIC PARTS MANUFACTURER

• MANUFACTURES PLASTIC AUTOMOTIVE PARTS
  – SPOILERS
• HAS USED ACETONE AS CLEANUP SOLVENT FOR MANY YEARS
• APPLIES AUTOMOTIVE SOLVENTBORNE COATINGS
  – PRIMER, BASECOAT, TOPCOAT
• TESTED ALTERNATIVE THINNERS FOR BASE COAT APPLIED TO SPOILERS
  – ACETONE, ACETONE/SOY, ACETONE/DPM
• CONDUCTED ADHESION TESTS
• ACETONE AND ACETONE/DPM PERFORMED WELL
Test # 53  Color Test Blue
P/N 1Km-071-646
Date Painted  9/7/06
Date Tested: 9/18/06
(#1)
Test #52  Color: Test Blue
P/N # 1KM-071-646
Date Painted: 9/7/06
Date Tested: 9/18/06
(#2)
Test #51  Color: Test Blue
P/N # 1 KM-071-647
Date Painted: 9/7/06
Date Tested: 9/18/06
(#3)
# COST ANALYSIS FOR PLASTIC PARTS MANUFACTURER

## Annualized Cost Comparison for Thinners

<table>
<thead>
<tr>
<th></th>
<th>Current Thinner</th>
<th>Acetone</th>
<th>Acetone/DPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinner Cost</td>
<td>$21,450</td>
<td>$18,161</td>
<td>$18,357</td>
</tr>
<tr>
<td>Total Cost</td>
<td>$21,450</td>
<td>$18,161</td>
<td>$18,357</td>
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</table>
REGULATIONS

• SCAQMD
  – ALREADY HAS CLEANUP MATERIAL REGULATION FOR INDUSTRIAL FACILITIES

• SCAQMD INITIATED REGULATION ON CONSUMER PRODUCT PAINT THINNERS AND MULTI-PURPOSE SOLVENTS
  – PROPOSING VOC LIMIT AND PROHIBITION OF SALE
  – 25 GRAMS PER LITER VOC
  – MANUFACTURERS MUST REGISTER PRODUCTS
  – JURISDICTION ISSUES WITH CARB
REGULATIONS CONT’D

• CARB BEGINNING REGULATORY DEVELOPMENT
  – ESTABLISHED WORKGROUP
  – PROPOSED 3 PERCENT LIMIT EARLIER
    • BACKED OFF REGULATION
  – CONDUCTING NEW SURVEY
  – BOARD ADOPTION FOR REGULATION PLANNED FOR JUNE 2009
CONCLUSIONS

- SAFER ALTERNATIVE CLEANUP MATERIALS ALREADY USED IN SOUTH COAST BASIN
- SAFER ALTERNATIVE THINNERS DEMONSTRATED IN IRTA PROJECT
- SCAQMD AND CARB BOTH INITIATED REGULATORY DEVELOPMENT
- COULD REDUCE VOC EMISSIONS IN CALIFORNIA BY 13.6 TONS PER DAY
CONTACT INFORMATION

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