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## Safer Alternatives in Auto Repair Cleaning

*Featured Presenter:* Dr. Katy Wolf, Director of the  
Institute for Research and Technical Assistance (IRTA)

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# **SAFER ALTERNATIVES FOR AUTO REPAIR CLEANING**

**September 30, 2008**

**Katy Wolf, Ph.D.  
Institute for Research and  
Technical Assistance**



# **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 STRIPPING**
  - **DRY CLEANING**
  - **LUBRICANTS**
  - **THINNERS**
  - **ADHESIVES**
  - **COATINGS**



# **BACKGROUND**

- **AUTO REPAIR CLEANING ACTIVITIES**
  - PARTS CLEANING
  - AEROSOL CLEANING
- **IRTA COMPLETED SEVERAL TECHNICAL PROJECTS OVER LAST 10 YEARS**
  - FOCUSED ON IDENTIFYING, TESTING, DEMONSTRATING LOW-VOC, LOW-TOXICITY ALTERNATIVES
  - SPONSORED BY VARIOUS SOURCES INCLUDING EPA, DTSC, CARB, HESIS, CITY OF SANTA MONICA
  - REGULATIONS BASED ON IRTA'S WORK WERE DEVELOPED / IMPLEMENTED IN CALIFORNIA



# **REPAIR AND MAINTENANCE CLEANING**

- **HISTORICALLY USED MINERAL SPIRITS PARTS CLEANERS**
- **WORKED WITH MANY AUTO REPAIR AND INDUSTRIAL FACILITIES**
- **TESTED VARIETY OF WATER-BASED CLEANERS FOR MONTHS**
  - **PARTS CLEANERS**
  - **SPRAY CABINETS**
  - **ULTRASONIC SYSTEMS**
- **ALTERNATIVE WATER-BASED SYSTEMS NEED TO BE HEATED**
- **VARIED CONCENTRATION TO DETERMINE OPTIMAL LEVEL**
- **ASSISTED MANY SHOPS IN CONVERTING TO ALTERNATIVES**



# **REPAIR AND MAINTENANCE CLEANING CONT'D**

- **ANALYZED SPENT BATHS TO DETERMINE HAZARDOUS WASTE STATUS**
- **WORKED WITH CROSS-MEDIA REGULATORY AGENCIES TO DETERMINE BEST METHODS OF HANDLING**
- **DEVELOPED CASE STUDIES**
- **ANALYZED / COMPARED COSTS OF USING ALTERNATIVES**



# **REPAIR AND MAINTENANCE CLEANING FINDINGS**

- **GREATER VARIETY OF EQUIPMENT WITH WATER-BASED CLEANERS**
- **WATER EQUIPMENT SHOULD BE HEATED**
- **SPRAY CABINETS AND ULTRASONIC SYSTEMS CLEAN AGGRESSIVELY**
- **COST OF USING WATER CLEANING SYSTEMS IS COMPARABLE TO COST OF USING MINERAL SPIRITS**
- **MORE THAN HALF THE SPENT BATHS ANALYZED WERE HAZARDOUS WASTE**
  - **METALS**
  - **CHLORINATED SOLVENTS**
  - **AQUATIC TOXICITY**



# **RESULTS FOR REPAIR AND MAINTENANCE CLEANING**

- **BASED ON TEST AND DEMONSTRATION WORK, SCAQMD REGULATION WHICH BECAME EFFECTIVE IN 1999**
  - **25 GRAM PER LITER VOC LIMIT**
  - **EMISSION REDUCTION OF 18 TPD**
  - **AFFECTED 40,000 PARTS CLEANERS**
- **MOST AIR DISTRICTS IN CALIFORNIA HAVE ADOPTED SIMILAR REGULATIONS**
- **DEMONSTRATED EFFECTIVENESS**



# **AUTOMOTIVE AEROSOL CLEANING**

- **FOUR CATEGORIES OF CLEANING**
  - BRAKE CLEANING
  - GENERAL PURPOSE DEGREASING
  - CARBURETOR/FUEL INJECTION SYSTEM CLEANING
  - ENGINE DEGREASING
- **COMMONLY USED PRODUCTS**
  - CHLORINATED SOLVENTS
  - VOC, OTHER TOXIC SOLVENTS
  - VOC AND GLOBAL WARMING CHEMICAL PROPELLANTS



# **HISTORY OF AEROSOL CLEANERS**

- **TCA USED EXTENSIVELY IN AEROSOL BRAKE CLEANERS**
- **ODS BAN CAUSED CONVERSION TO PERC**
- **CHLORINATED SOLVENTS BANNED IN CALIFORNIA**
  - **STILL USED WIDELY IN OTHER STATES**
- **CAUSED CONVERSION TO HEXANE, OTHER VOC/TOXIC SOLVENTS**
- **HYDROCARBON PROPELLANTS USED IN VIRTUALLY ALL PRODUCTS**



# **ALTERNATIVES TO AEROSOL CLEANERS**

- **IRTA CONDUCTED TEST, DEMONSTRATION PROJECT FOR WATER-BASED BRAKE CLEANING SYSTEMS**
  - **CARB CANNOT REGULATE BASED ON NON-AEROSOL ALTERNATIVES**
- **IRTA CONDUCTED LARGE PROJECT TO DEVELOP, TEST AND DEMONSTRATE LOW-VOC, LOW TOXICITY AEROSOL ALTERNATIVES**
- **IRTA CONDUCTED PROJECT TO CONVERT SHOPS TO AEROSOL AND NON- AEROSOL TECHNOLOGIES FOR THREE MONTHS**



# **RESULTS OF WATER-BASED BRAKE CLEANING SYSTEM PROJECT**

- **VARIETY OF WATER-BASED BRAKE CLEANING SYSTEM**
  - **CAN USE IN PLACE OF AEROSOL BRAKE CLEANERS**
- **COMPANIES WILL SERVICE SYSTEMS**
  - **ALSO SERVICE PARTS CLEANERS**
- **BRAKE CLEANING SYSTEMS ARE VIABLE AND COST EFFECTIVE ALTERNATIVE TO AEROSOL CLEANERS**



# **APPROACH TO AND RESULTS OF ALTERNATIVE AEROSOL PROJECT**

- **TESTED WITH 13 AUTO REPAIR FACILITIES, A CAR WASH, THREE  
DETAILERS AND THREE CONSUMERS**
- **TESTED WATER-BASED CLEANERS FOR ENGINE DEGREASING**
  - **CAR WASH, DETAILERS, CONSUMERS**
  - **FACILITIES USE BULK WATER CLEANERS**
  - **FOAMING PRODUCTS DESIRABLE**
  - **EIGHT CLEANERS TESTED**
    - **HAD HYDROCARBON PROPELLANTS**
    - **THREE COMMERCIAL CLEANERS WITH SOLVENT ADDITIVES**
    - **FIVE CLEANERS NOT COMMERCIAL**
  - **RESULTS SHOWED THAT ALL PARTICIPANTS FOUND AT LEAST ONE  
CLEANER THAT WORKED AS WELL AS OR BETTER THAN CURRENT  
PRODUCT**



# RESULTS CONT'D

- **TESTED SOY / ACETONE BLENDS FOR THROTTLE BODY VALVE CLEANING**
  - TESTED AT 13 AUTO REPAIR FACILITIES
  - WATER-BASED CLEANERS NOT USED
  - USED CARBON-DIOXIDE PROPELLANTS
  - ALL THREE CLEANERS PERFORMED ADEQUATELY AND TWO PERFORMED AS WELL AS OR BETTER THAN CURRENT CLEANER
- **TESTED FOUR NON-FOAMING AND TWO SLIGHTLY FOAMING WATER-BASED CLEANERS, THREE SOY/ACETONE BLENDS AND ACETONE CLEANERS FOR BRAKE CLEANING AND GENERAL PURPOSE DEGREASING**
  - TESTED AT 13 AUTO REPAIR FACILITIES
  - THREE NON-FOAMING WATER-BASED CLEANERS AND TWO SOY/ACETONE BLENDS PERFORMED ADEQUATELY



# RESULTS CONT'D

- **ALTERNATIVE PROPELLANTS INVESTIGATED**
  - PROPELLANTS INCLUDED VOCs AND GHGs
- **COMPARED RAW MATERIALS COST OF ALTERNATIVE CLEANERS**
  - RAW MATERIALS COST OF ALTERNATIVES HIGHER THAN RAW MATERIALS COST OF CURRENT CLEANERS
- **HESIS EVALUATED TOXICITY**
  - TOXICITY OF ALTERNATIVES LOWER THAN TOXICITY OF CURRENT CLEANERS



# **APPROACH TO AND RESULTS OF CONVERSION PROJECTS**

- **TESTED WITH 10 AUTO REPAIR FACILITIES**
  - **DID NOT TEST ENGINE DEGREASING**
- **FACILITIES USED ALTERNATIVES FOR AT LEAST THREE MONTHS**
- **IRTA TESTED NON-AEROSOL AND AEROSOL TECHNOLOGIES**
  - **WATER-BASED CLEANER IN SPRAY BOTTLE**
    - **ONE FACILITY**
  - **WATER-BASED BRAKE CLEANING SYSTEMS**
    - **FOUR FACILITIES**
  - **ACETONE CANNISTER SYSTEMS**
    - **THREE FACILITIES**



# APPROACH / RESULTS CONT'D

- **DEVELOPED OTHER AEROSOL PRODUCTS**
  - ACETONE / MINERAL SPIRITS
  - ACETONE / GLYCOL ETHER
  - TESTED AT SEVERAL FACILITIES
- **WORKED WITH KYZEN - VENDOR**
  - DEVELOPED WATER-BASED CLEANERS THAT DON'T FOAM
  - ALSO PACKAGED SOLVENT BASED PRODUCTS



# **CANNISTER SYSTEMS ISSUES**

- **VENDORS OFFERING CLEANERS WITH RANGE OF VOC CONTENT**
  - **SOME ARE 45 PERCENT VOC**
- **CANNISTERS NOT CONSIDERED AEROSOLS**
  - **IRTA REQUESTED RULING FROM SCAQMD**
  - **REGULATED LIKE REPAIR AND MAINTENANCE CLEANING**
  - **25 GRAMS PER LITER VOC**
- **IRTA TESTED ONLY VERY LOW VOC CANNISTER CLEANERS**



# **COST ANALYSIS / COMPARISON**

- **WATER-BASED BRAKE CLEANING EQUIPMENT**
  - **SMALL FACILITY**
    - **36 CASES OF BRAKE CLEANER PER YEAR**
    - **PURCHASED ONE BRAKE CLEANING SYSTEM**
  - **DEALERSHIP**
    - **50 TECHNICIANS**
    - **520 CASES OF BRAKE CLEANER PER YEAR**
    - **PURCHASED 10 BRAKE CLEANING SYSTEMS**
  - **COST ANALYSIS INCLUDES SERVICING**



# COST ANALYSIS / COMPARISON CONT'D

ANNUALIZED COST COMPARISON		
FACILITY TYPE	AEROSOL CLEANERS	BRAKE CLEANING SYSTEM
GENERAL AUTO REPAIR	\$648	\$554
DEALERSHIP	\$11,232	\$8,840



# COST ANALYSIS / COMPARISON CONT'D

- **CANNISTER SYSTEM**
  - **SMALL FACILITY**
  - **DEALERSHIP**

ANNUALIZED COST COMPARISON		
FACILITY TYPE	AEROSOL CLEANERS	CANNISTER SYSTEM
GENERAL AUTO REPAIR	\$1,654.00	\$1,264
DEALERSHIP	\$16,848	\$9,126



# **COST ANALYSIS / COMPARISON CONT'D**

- **LOW-VOC AEROSOL CLEANERS**
  - **COMPARED RAW MATERIALS COST TO HIGH VOC AEROSOLS**
- **RESULTS INDICATED ALTERNATIVES SUPPLIERS COULD PRICE PRODUCTS AT OR BELOW CURRENT AEROSOL MARKET PRICES**
  - **WOULD MAKE ACCEPTABLE PROFIT**



# REGULATIONS

- **CARB ADOPTED MORE STRINGENT REGULATION IN NOVEMBER 2006 BASED ON IRTA'S WORK**
  - **AFFECTS ALL FOUR CLEANING CATEGORIES**
  - **2008 INTERIM LIMIT OF 20 PERCENT VOC FOR ALL CATEGORIES EXCEPT ENGINE DEGREASING**
  - **2010 LIMIT OF 10 PERCENT VOC FOR ALL CATEGORIES**
- **SCAQMD REGULATION**
  - **160 FLUID OUNCES PER DAY OF VOC AEROSOL**
  - **25 GRAM PER LITER VOC LIMIT FOR PARTS CLEANERS, CANNISTERS AND BRAKE CLEANING SYSTEMS**



# OBSERVATIONS

- **YOUNGER TECHNICIANS/CONSUMERS LIKE WATER - BASED PRODUCTS BETTER THAN OLDER TECHNICIANS/CONSUMERS**
  - ENGINE DEGREASING
- **SHOPS CAN GET ALONG WITHOUT USING AEROSOLS AT ALL**
  - SANTA MONICA CITY YARD
  - COMPANY POLICIES
  - MORE PARTS REPLACEMENT
- **SOME SHOPS CAN USE FEW AEROSOL CANS**
  - RELY ON OTHER TECHNOLOGIES LIKE BRAKE CLEANING SYSTEMS AND SPRAY BOTTLES OR CANNISTERS



# **OBSERVATIONS CONT'D**

- **IN SCAQMD, DEALERSHIPS USING PURE ACETONE AEROSOLS**
  - ZERO VOC AEROSOLS
  - 160 FLUID OUNCES LIMIT
  - TECHNICIANS NOT HAPPY BUT DO GET ALONG WITHOUT VOC
- **DIFFERENCE IN PERCEPTION**
  - DEALERSHIPS USING CLOSE TO ZERO VOC LIKED OUR ACETONE CLEANERS
  - DEALERSHIPS USING 45% VOC DIDN'T LIKE OUR ACETONE CLEANERS



# OBSERVATIONS CONT'D

- **CARBON DIOXIDE PROPELLANT**
  - BETTER PROPELLANT THAN HYDROCARBON
  - INDUSTRY DID NOT USE UNTIL REGULATION BECAME MORE STRINGENT
- **INDUSTRY OPPOSED CARB REGULATION**
  - CAN'T BE ACHIEVED
  - FOAMING AN ISSUE WITH WATER-BASED CLEANERS
- **INDUSTRY ALWAYS FIGHTS REGULATION BUT LEARNS TO ADAPT**
  - WATER-BASED PARTS CLEANERS
  - OZONE DEPLETING SUBSTANCES



# CONCLUSIONS

- **WATER-BASED PARTS CLEANERS NOW PART OF COMMON PRACTICE IN CALIFORNIA**
- **SAFER ALTERNATIVES AVAILABLE FOR VOC/TOXIC SOLVENT BASED AEROSOLS**
  - **WATER-BASED BRAKE CLEANING SYSTEMS**
  - **SPRAY BOTTLES**
  - **CANNISTERS**
  - **WATER-BASED AND ACETONE AEROSOLS**
- **ALTERNATIVES CLEAN EFFECTIVELY AND ARE COST EFFECTIVE**

