

# Alternative Chemical Refrigerants -CRP150



Proposed SAE Cooperative  
Research Program to address  
new alternative refrigerants

# Background

- ❖ Letter sent to potential sponsors and potential suppliers of chemicals for evaluation 28APR06
- ❖ Deadline was 15JUN06
- ❖ Two responses received from chemical suppliers [see list on next page]
- ❖ 17 Companies responded with favorable interest in joining CRP
  - additional informal responses indicate high interest in cooperation

# Chemical Suppliers Solicited

<b>Company</b>	<b>Response</b>
Arkema (Autofina)	No Response
DuPont	Decline to participate
Honeywell	Supports concept but has confidential data concerns
Ineous Fluor	No Response
Jinzhu Modern Chemical Industry Co., LTD	No Response
Oberon Co., Ltd.	No Response
Solvay	No Response
Technochem Co., Ltd.	No Response

# Pros/Cons of CRP

<b>Pros</b>	<b>Cons</b>
Minimize duplication of engineering effort	Some confidential areas are more difficult to protect
Minimize development costs to the industry	
Easier to include all inputs of all parties in the evaluation	
Consensus risk assessment is enabled	
Others??	

# Timing

New Alternative Refrigerant Cooperative Development Program - DRAFT																												
Item	2006				2007				2008				2009				2010				2011							
	Qtr1	Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	Qtr4				
<b>Refrigerant Toxicity and Risk</b>																												
<b>Gold Team</b>																												
Initial Sampling																												
Toxicity Testing																												
Refrigerant breakdown/by-products																												
Study the Photochemical Reactivity of refrigerant constituents																												
Flammability assessment [ASHRAE]																												
Risk Assessment																												
Mitigation Alternatives																												
<b>Green Team</b>																												
Select an outside lab																												
Assemble materials, oils, etc																												
Sealed Tube testing with/without air, moisture																												
Sealed Tube testing with/without air, moisture, with and without (depleted)																												
Test desiccant dry and saturated with refrigerant, lubricant, with and without (depleted) additive(s)																												
Sealed Tube testing with/without air, moisture in the presence of selected additives in common use																												
Falex testing with refrigerant purge with and without (depleted) additive(s)																												
Sealing Material Compatibility per SAE J1662																												
<b>Blue Team</b>																												
Select Components/source																												
Charge Determination procedure-is current process ok?																												
Refrigerant system distribution																												
Affect of mal-distribution of air inlet temperature on condenser/evaporator																												
Expansion Device Requirements																												
Affect of re-circulation at condenser																												
Oil Circulation																												
Refrigerant Migration																												
Freeze test/thermistor location																												
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<b>Service and Sealing Issues</b>																												
Establish service port specifications																												
Assure Leak Detection Capability																												
Assess Service Safety (Storage & Handling) Concerns																												
Select components for evaluation:																												
Measure permeation rates for a variety of current hoses and analyze effluent or remaining refrigerant for changes in																												
System Emissions Testing																												

# Next Steps

- ❖ Determine if confidential interests of chemical companies can be adequately protected in framework of SAE CRP
  - Proposal to operate similar to previous CRP's where confidential data is kept within the OEM group
- ❖ Come to meeting Wednesday afternoon at 2:00 to provide your input

# CRP150 Original Overview



# Objective

## Objective:

- ❖ **Cooperate to reduce duplication of effort, the time, and expense related to qualifying the performance of new alternative refrigerants to meet the EU regulations in 2011**
  - **Share in one forum the results of chemical developments**
  - **Share in one forum changes needed in component technologies**
  - **Share in one forum changes needed in systems and system controls**



# Project Rational and Benefits

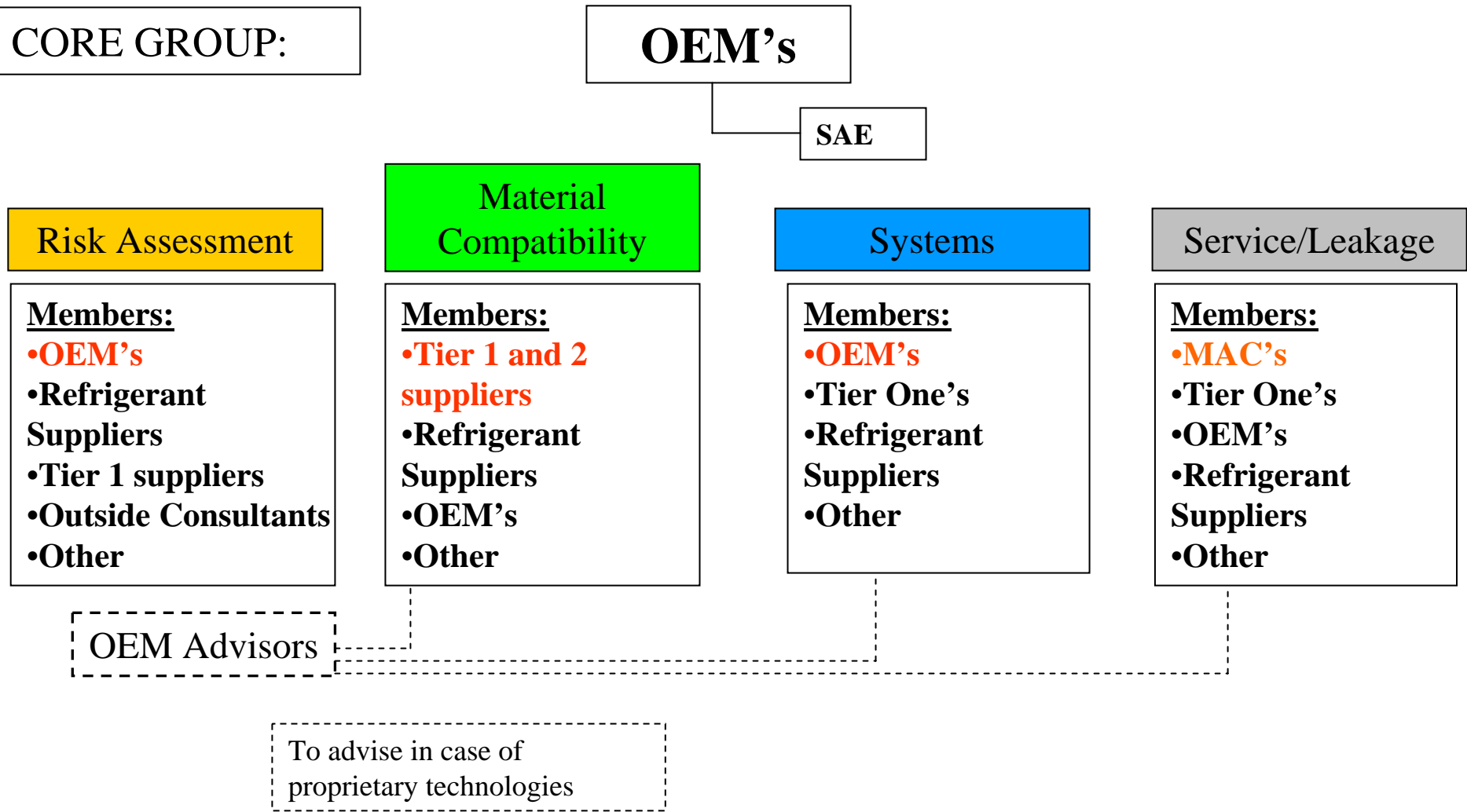
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- ❖ **Build on previous CRP's**
- ❖ **Share expenses related to basic evaluation of refrigerant and related risks**
- ❖ **Share expenses/experiences related to Basic Development of the Components and Systems**
- ❖ **Common assessment of risks**

# Funding Strategy

- ❖ All sponsors will be expected to contribute a fee to support independent lab testing and other miscellaneous expenses.
- ❖ Chemical Suppliers will be expected to be major contributors based on submitted chemicals
- ❖ Additional Industry Funding will include “in-kind” contributions such as parts/labor/Engineering time/travel expenses.

# Project Organization



# Risk Assessment Team

## 2006

- Identify issues to risks with the new chemical
- Assist in performing tests or funding testing at independent labs to quantify open issues/risks
- Identify toxicology/environmental impact assessment
- Develop initial fault tress

## 2007

- Conduct Risk Assessment
- Resolve any issues and propose solutions
- Report out to Sponsors

# Chemical Compatibility Team

## 2006

- Identify compatibility issues and related tests required
  - Moisture
  - Desiccant
  - Oil
  - Others
- Assist in performing tests or funding testing at independent labs
- Develop SAE standard for refrigerant purity
- Develop SAE standards for any special compatibility testing standards that may not already exist

## 2007

- Resolve any issues and propose solutions
- Report out to Sponsors

# System Impact Team

## 2006

- Identify issues and related tests required
  - COP/Capacity
  - Service Fittings
  - Leak Detection
  - Others
- Assist in performing tests or funding testing at independent labs
- Develop SAE standards for any special testing standards that may not already exist
- Development Risk Assessment framework – Initialize work

## 2007

- Resolve any issues and propose solutions
- Define Recovery Requirements
- Complete Risk Assessment
- Report out to Sponsors

# Service/Leakage Team

## 2006

- Identify issues to risks with the new chemical in service sector
- Assist in performing tests or funding testing at independent labs to quantify open issues/risks
- Identify toxicology/environmental impact assessment?
- Develop initial fault tress
- Establish Service procedures and equipment

## 2007

- Conduct Risk Assessment
- Resolve any issues and propose solutions
- Report out to Sponsors

# Deliverables

- ❖ **SAE J-standards on Refrigerant Purity and chemical compatibility**
- ❖ **SAE J-standards on any new testing methods that are developed**
- ❖ **SAE J-standards for service procedures and equipment**
- ❖ **Risk Assessment**
- ❖ **Demonstrated results of technology changes with laboratory results**
- ❖ **Quantify the Service impact of new alternative chemicals**




# CRP Formation

## ❖ Next Steps

- Estimate required budget-Draft 15APR2006
  - ✓ Component compatibility
  - ✓ System optimization
  - ✓ Leakage
  - ✓ Risk Assessment
  - ✓ Toxicology and Environmental Impact
- Draft letter to Chemical Suppliers-Draft 15APR2006
  - ✓ Minimum list of data-SNAP application
  - ✓ Answer requested by June 15, 2006
  - ✓ Expert Chemist/Toxicologists from OEM's and Tier 1's to screen and recommend best alternatives
    - Need names at Phoenix Forum 2006
- Solicit sponsors-team members-Phoenix Forum 2006



Back-up

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- A thick, horizontal yellow brushstroke is positioned near the top of the slide, below the SAE logo.
- ❖ 150 GWP CRP responses to date....
  - ❖ Positive:
    - ❖ Valeo
    - ❖ Behr
    - ❖ Renault
    - ❖ GM
    - ❖ BMW
    - ❖ Ineos Fluor
    - ❖ PSA
    - ❖ Denso
  - ❖ Positive but can't commit to funding:
    - ❖ Air Int'l
    - ❖ Ford
    - ❖ Modine
    - ❖ Honeywell
  - ❖ Negative:
    - ❖ DuPont
    - ❖ Responded to our request but said they need more details before they can make a decision:
    - ❖ Calsonic Kansei Europe
    - ❖ VW

# General Team Expectations

- Monthly conference calls/meetings
  - Take assignments and complete on schedule
- Assist in laboratory/vehicle testing
- Provide component level testing
- Decisions by consensus [if consensus cannot be reached, it is acceptable to report the alternatives]

# Example System Test Matrix

