

# Focus on PC-10

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**Chairman**

**Heavy-Duty Engine Oil Classification Panel**

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*Chicago, Illinois*



# PC-10 Program Concerns

- **API CI-4+ Taking All Resources From PC-10, Lack of Task-Force Meetings**
- **Potential Two Caterpillar Test Procedures at Two Different Sulfur Levels: Cost and Time**
- **Caterpillar Can Not Support SC Tests Due to Hardware Supply – Need to Develop One New Single Cylinder With Aluminum Piston**
- **Mack T-12 Not Available Until June 2004**

# PC-10 Test Activity

- **Cummins ISM and ISB at Outside Labs  
With Test Procedures and Reference Oils**

# Engine Oil Category “PC-7” Project Planning: Original Time Table



Calendar Year Quarters	1994			1995				1996				1997				1998
	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>
Category																
ASTM	█															
Estab. Funding	█	█														
Reference Oils																
Selection		◆														
Review & Eval.		█	█	█												
Modifications				◆												
Availability						◆										
Performance Tests																
Development		█	█	█	█											
Hardware Avail.						█										
Tests Go/No Go								◆								
Stat. Testing								█	█	█						
CMA Review										█		◆				
Write Res. Rpts.										█		◆				
Estab. Pass/Fail											◆					
Tests Available												◆				
Society Ballot											█					
Candidate Testing												█	█	█	█	
API Licens. Begins																◆



# Proposed PC-10 Timeline

ASTM Task Name	2002				2003				2004				2005				2006				2007		
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	
EMA Request				█																			
Funding Group									██████████														
Chemical Limits									██████████														
Test Selection									█														
Test Development									██████████														
Precision Matrix													██████										
HDEOCP Acceptance & Limits Approval															█*								
Product Qualification/ API Licensing															██████████								
Oils in Market																					█		

\*Acceptance of PC-10 Limits – June 2005

# Lubricants Chemical Limits for ACEA E6 and JASO DH-2



1.0% Ash (ACEA E6) - 2005  
1.0% (JASO DH-2) - 2005

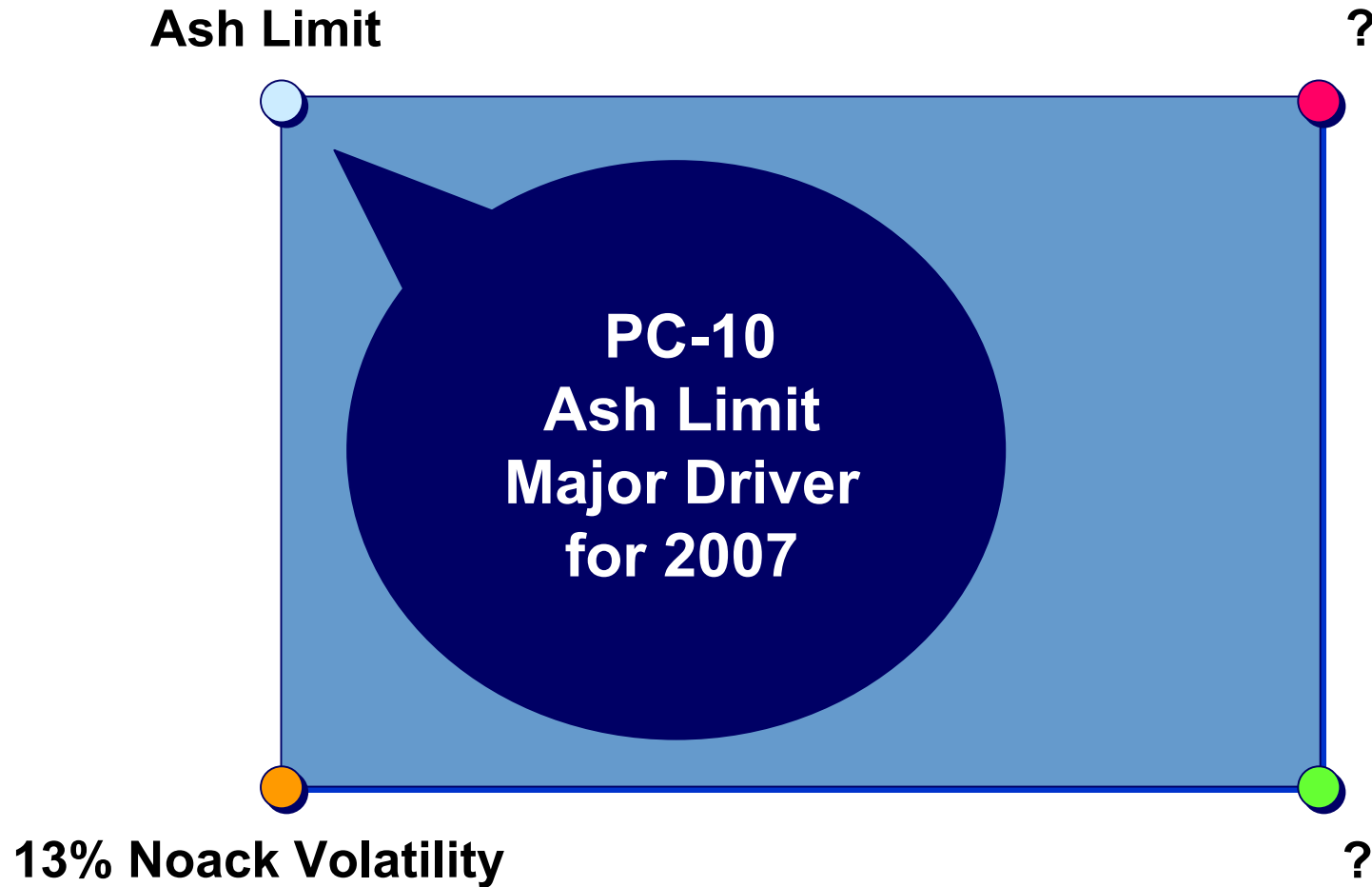
0.3% Sulfur (ACEA E6)  
0.5% Sulfur (JASO DH-2)



13% Volatility (ACEA)

0.08% Phosphorus (ACEA E6)

# High EGR and DPFs





# PC-10 Multicylinder Engine Tests

	ISM	ISB	6.5L	C13	T-12	T-11	III G	7.3L
Valve Train Wear	✓	✓	✓					
Liner Wear					✓			
Ring Wear	✓				✓			
Bearing Corrosion					✓			
Oxidation Viscosity Inc.					✓		✓	
Oil Consumption				✓	✓			
Piston Deposit Control				✓				
Soot Viscosity Increase						✓		
Sludge	✓							
Filter Plugging	✓							
Aeration								✓



# Proposed PC-10 Diesel Fuel Sulfur Levels for Each Test



Oil Category	PC-10	PC-10
Fuel Sulfur	500 ppm	15 ppm
Engine Test		
Caterpillar 1K	-	-
Caterpillar 1N	-	-
Caterpillar 1R	-	-
Caterpillar C-13 (CCV)		X
Cummins M11-EGR	-	-
Cummins ISM	X	-
Cummins ISB	-	X
Mack T-8	-	-
Mack T-12	-	X
Mack T-11	X	-
Sequence IIIF	-	-
Sequence IIIG (Sulfur 1,000 ppm)	-	-
GM 6.5 Liter Roller-Follower Test	X	-
Navistar 7.3L Aeration	X	-

# After-Treatment Compatibility

- **DPF Will Be Used by 2005-2007 in Japan, Europe, and U.S.**
- **All Diesel Engines in U.S. Will Use DPF for 2007 to Meet Particulate Emissions**
- **PC-10 Should Be Driven by Sulfated Ash Limit to be Compatible With DPF**

# Motions to Date by HDEOCP

- **Issued Chemical Limit Letter (August 22, 2003) With Limits to Be Frozen June 22, 2004. Exit-Criteria Ballot April 15<sup>th</sup>**
- **13% Noack Volatility**
- **90 Cycle Shear Stability**
- **Vamac Added to API CI-4 Seals**
- **75% Membership Vote in HDEOCP to Move Forward With PC-10**
- **API CI-4 Supplement to Be Included in D 4485**
- **TMC Monitoring of API CI-4 Elastomer Tests**

# Customers Require One Oil

## Number of Tests to Qualify Products

