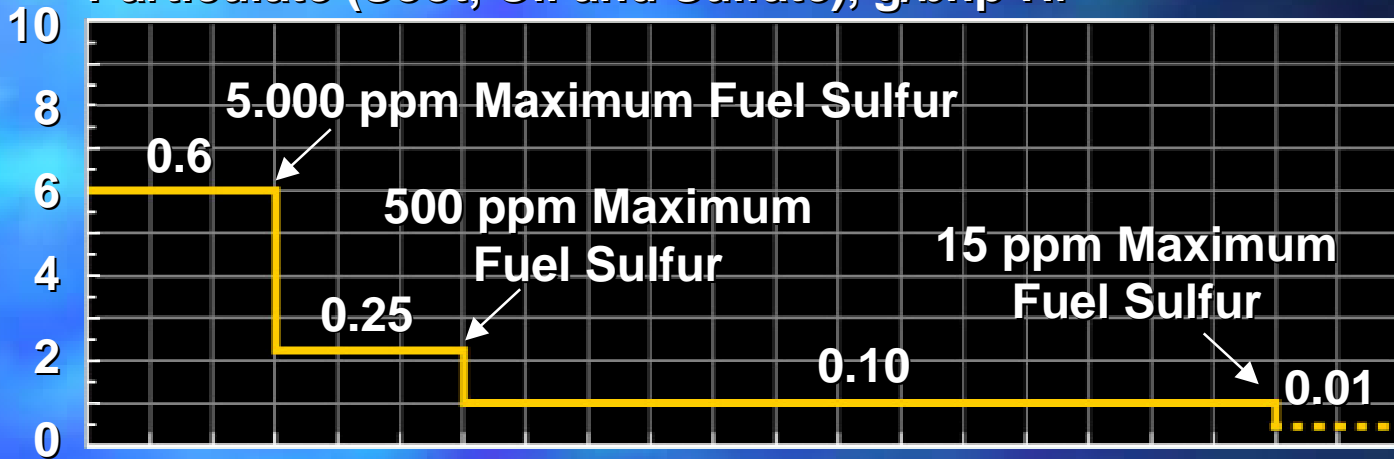
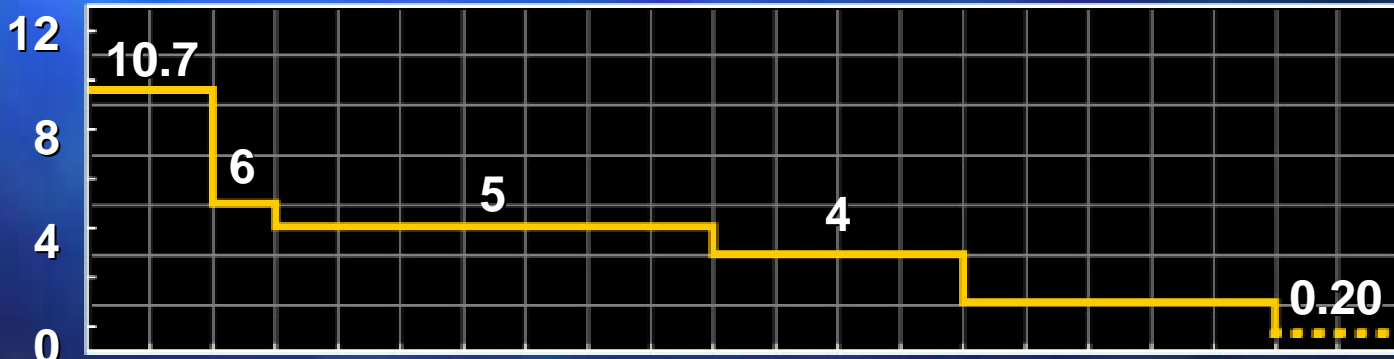


Timely Delivery of High Quality Engine Oils

Particulate (Soot, Oil and Sulfate), g/bhp-Hr



No_x (g/hp-Hr)



Year: '88 '90 '92 '94 '96 '98 '00 '02 '04 '06 '08

API: CE CF-4 CG-4 CH-4 PC-9 PC-10

PC-9 Testing Status of New Tests

Test	Matrix	Statistical Analysis	Limit Setting
Mack T-10	June Completion	August 15th Limit Discussion	September 5th
Cummins M11 (EGR)	June Completion	August 15th Limit Discussion	September 5th
Cat 1Q	Aborted*	None	–
Cat 1R	Started June – End August	–	September 5th

***Aborted on High Oil Consumption and Scuffing on All Feature Oils and Base Oil Types**

PC-9 Tests Status of New Tests

Performance	Engine and Bench Tests	Limit Setting Discussions	Limit Setting
Viscosity Control	Mack T-8E	August 15th	September 5th
Oxidation	FT-IR Mack T-10/Cat 1R	August 15th	September 5th
Volatility	Noack: All Grades	—	Completed
Elastomer Compatibility	Equal to Reference Oils	August 15th	September 5th
Used Oil Viscometrics (Low Temperature)	J300 Bench Test	August 15th	September 5th
HT/HS for SAE 10W-30 (3.5 Min.)	SAE J300	August 15th	September 5th

PC-9 Overview Timeline

Task	2000				2001				2002			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
EGR Test Development	Active											
Precision Matrix					Active							
Limits/Ballot							Active					
API Licensing (9 Months)								Active				
EPA 2 NO _x Limit (October 2002)											Active	

API CJ-4
June 2002

October
2002

Three Matrix Base Oils

API Group	% Saturates	Sulfur, ppm	VI
I	75	2000-5000	96-102
II	90	20-30	>95
II	99	1	>95

Three Additive Technologies

	Sulfate Ash %	TBN D 2896
X	1.5	11
Y	1.4	12
Z	1.3	8

Matrix Cost \$5.7 Million

EGR Engines	Number of Tests
Mack T-10	28
Cummins M11 EGR	26
Caterpillar 1Q	28
Total Number of Tests	82

T-10/EGR Test Design – Feature Oil A

Lab/Stand						
Lab 1	Lab 2		Lab 3		Lab 4	Lab 5
1	2	3	4	5	6	7
A	A	A	A	A	A	A
G	A	G	D	A	A	D
E	E	B	H	E	H	B
C	J	F	C	J	F	J

Cummins M11/EGR Test Design – Feature Oil E

Lab/Stand					
Lab 1		Lab 2	Lab 3		Lab 4
1	2	3	4	5	6
E	E	E	E	E	E
H	E	H	B	E	B
A	G	D	G	A	D
F	C	C	F	J	J
E			E		

Caterpillar 1Q/EGR Test Design – Feature Oil J

Lab/Stand						
Lab 1		Lab 2	Lab 3		Lab 4	Lab 5
1	2	3	4	5	6	7
J	J	J	J	J	J	J
C	J	C	F	J	J	F
E	E	H	B	E	B	H
G	A	D	G	A	D	A