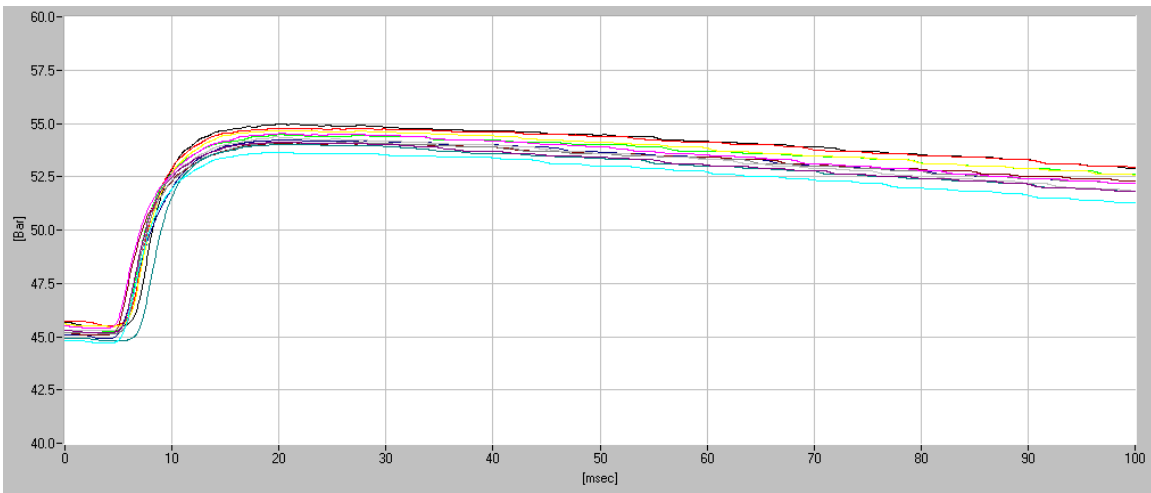
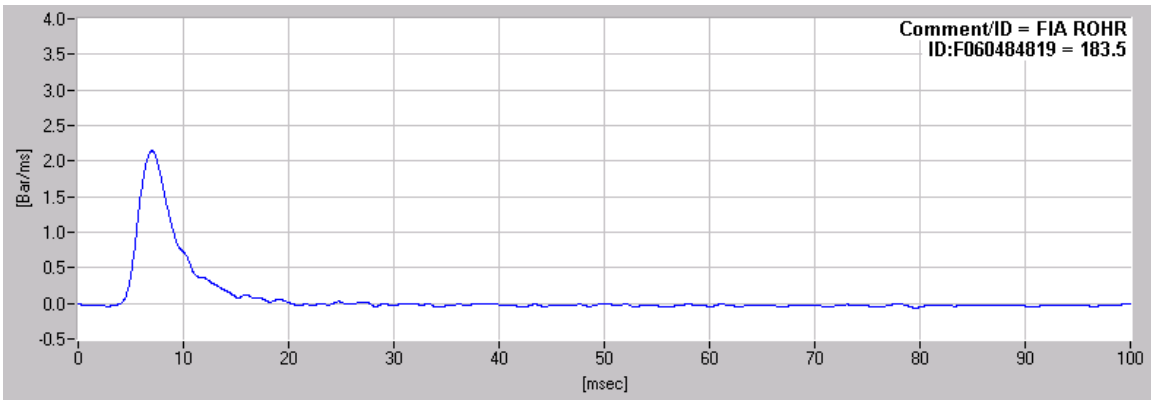
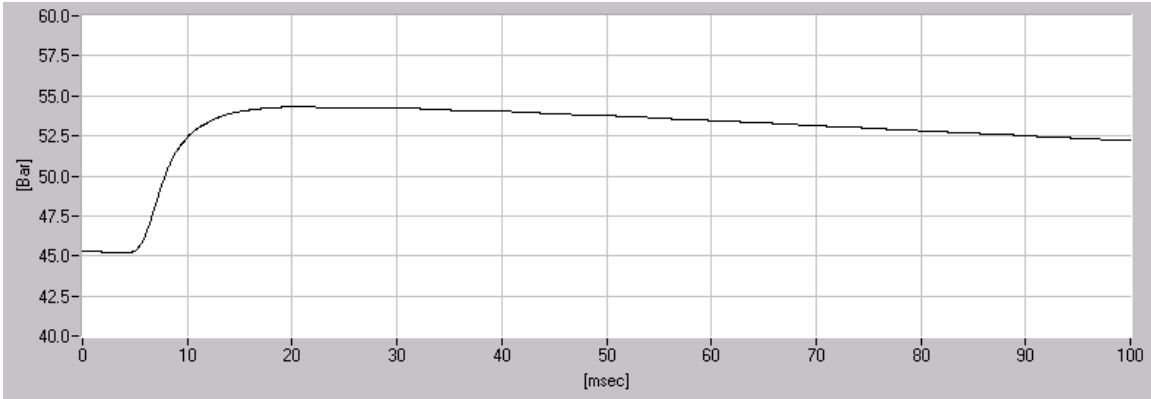


# Baseline unusually high quality fuel



Comment/Filename	Start Water Fuel temp	Start temp	Max temp	Max press	Ign. press	At	Delay
84819001.FIA 500.0	88.8	93.4	45.7	9.3	12.4	7.70	
84819002.FIA 500.0	87.0	91.7	45.7	9.1	13.5	7.25	
84819003.FIA 500.0	88.8	91.9	45.1	9.1	12.8	6.95	
84819004.FIA 500.0	82.6	93.4	45.3	9.2	13.3	6.80	
84819005.FIA 500.0	84.9	93.0	45.2	8.9	14.4	6.25	
84819006.FIA 500.0	86.9	92.3	45.6	9.1	13.1	7.30	
84819007.FIA 500.0	81.9	92.7	45.2	8.9	13.2	6.85	
84819008.FIA 500.0	88.4	93.1	45.5	9.0	14.0	6.25	
84819009.FIA 500.0	79.2	92.9	44.9	9.1	12.8	8.15	
84819010.FIA 500.0	85.8	92.7	45.3	9.1	13.0	6.75	
84819011.FIA 500.0	90.3	92.7	45.3	8.8	12.8	6.75	
84819012.FIA 500.0	84.3	92.9	44.8	8.9	12.7	6.80	

Min. delay 6.25 ms  
Max. delay 8.15 ms  
Mean delay 6.98 ms  
Standard deviation 0.55

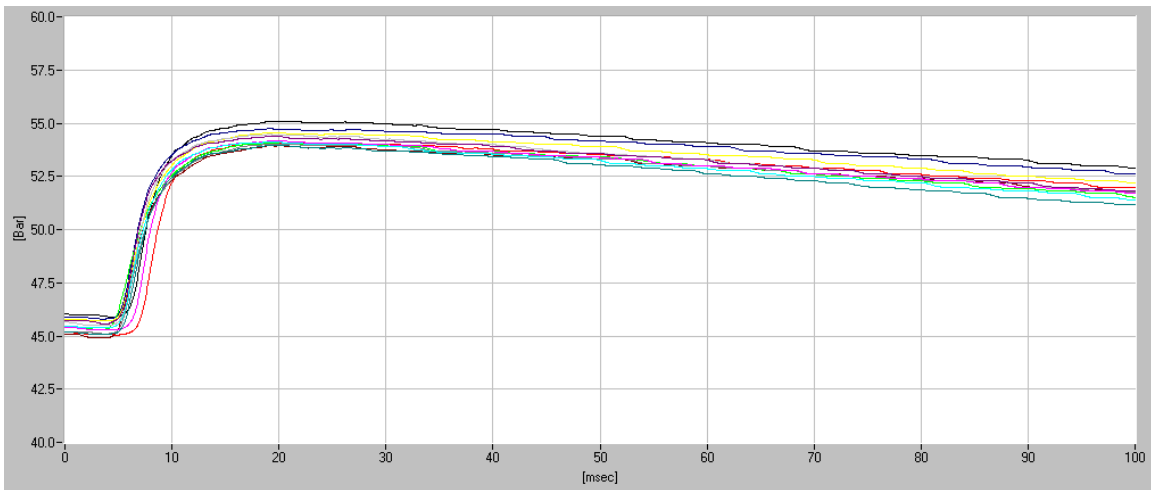
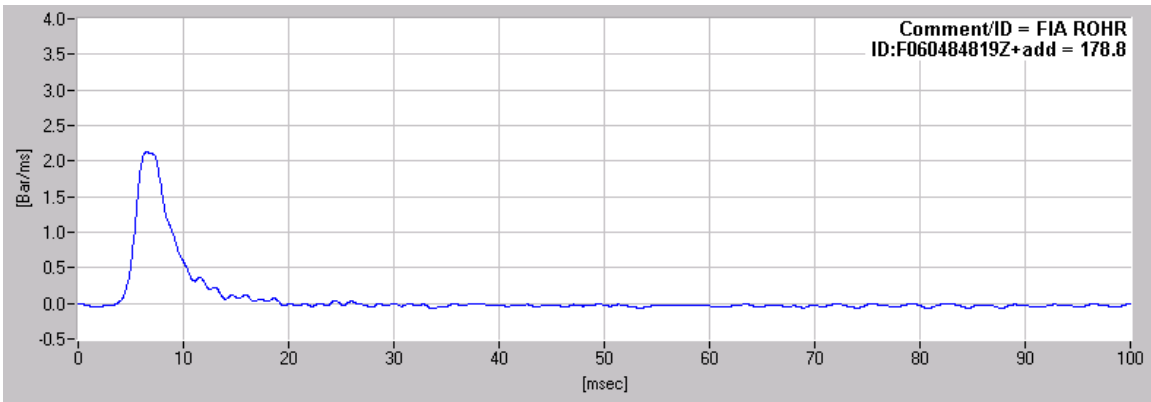
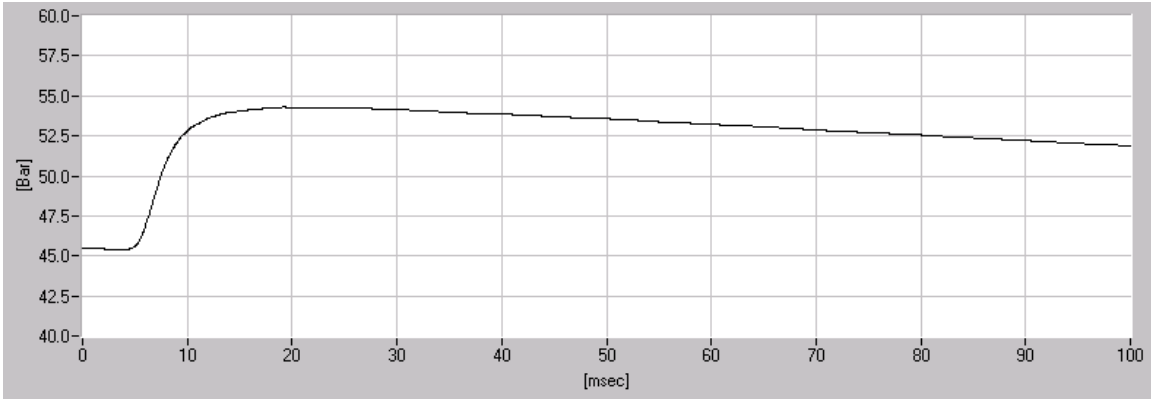
**Ignition and Combustion data - Summary:**

Ignition delay 5.30 ms (dP=0.2 bar above initial chamber pressure)  
Start of main combustion 7.05 ms (dP=3.0 bar above initial chamber pressure)  
FIA Cetane Number 39.9  
Combustion periode 15.7 ms (ROHR positive area)  
Max. ROHR position 7.0 ms (Position relative to start of injection)  
Max. ROHR level 2.1 bar/ms (Max. rate of combustion pressure increase)  
FIA ROHR index 183.5 (ROHR positive area)

**Fuel sample parameters:**

**Fuel Sample ID** F060484819  
**Bunkering Port** SHARJAH, UAE  
**Date of Bunkering** 4/16/06  
**EFN** 71 **Fuel Grade** RME 180  
**Calorific Value** 40.88 MJ/Kg. **Density** 929.1Kg/m<sup>3</sup> @ 15<sup>0</sup>C  
**CCAI** 820 **Viscosity** 70.63 cSt @ 50<sup>0</sup>C  
Instrument ID. 010.03.0198  
Date of testing 2006/04/22  
Chamber ref. Pressure 45.0 bar  
Chamber ref. temp. 500.0 °C  
Fuel ref. temp. 92.6 °C  
Cooling water ref.temp. 90.0 °C  
Reference file used Inst010.03.0198Heavy\_09.2003.FIR

# High quality fuel with catalyst note cetane value from 39.9



Comment/Filename	Start Water Fuel temp temp temp	Start temp	Max temp	Max press	Ign. press	At	Delay
Z+add001.FIA500.0	79.8	127.3	46.0	9.1	13.1	7.25	
Z+add002.FIA500.0	85.8	127.7	45.2	8.9	11.7	8.05	
Z+add003.FIA500.0	88.2	127.9	45.9	8.8	12.8	6.40	
Z+add004.FIA500.0	79.8	127.9	45.4	8.7	13.2	6.15	
Z+add005.FIA500.0	86.4	127.9	45.1	8.8	12.8	6.35	
Z+add006.FIA500.0	83.9	127.9	45.8	8.7	12.4	6.60	
Z+add007.FIA500.0	86.4	127.9	45.2	8.8	12.5	6.60	
Z+add008.FIA500.0	82.1	127.8	45.4	8.8	12.8	7.45	
Z+add009.FIA500.0	79.8	127.5	45.2	8.8	12.6	6.70	
Z+add010.FIA500.0	80.0	127.7	45.6	8.8	12.5	6.60	
Z+add011.FIA500.0	85.8	127.9	45.7	8.7	12.8	6.40	
Z+add012.FIA500.0	87.0	127.9	45.5	8.6	12.5	6.60	

Min. delay 6.15 ms  
Max. delay 8.05 ms  
Mean delay 6.76 ms  
Standard deviation 0.55

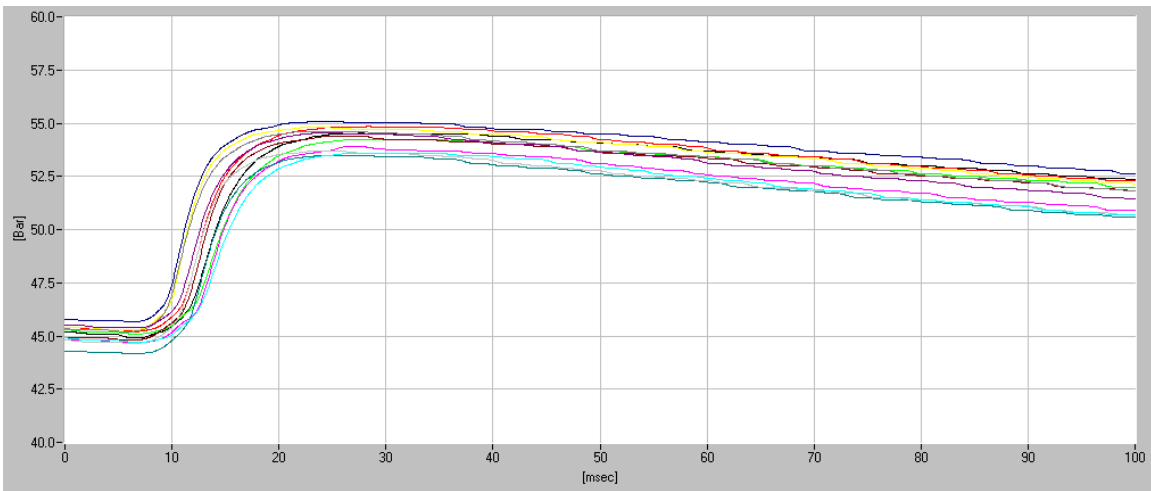
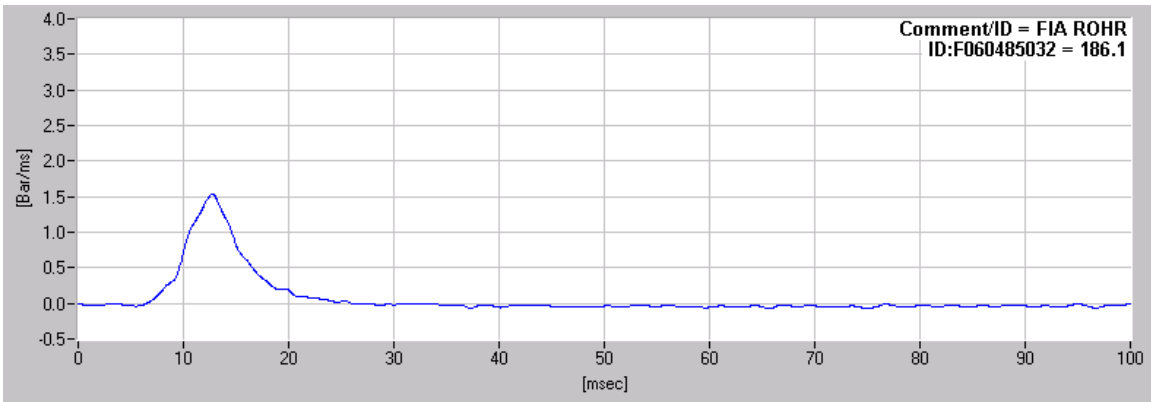
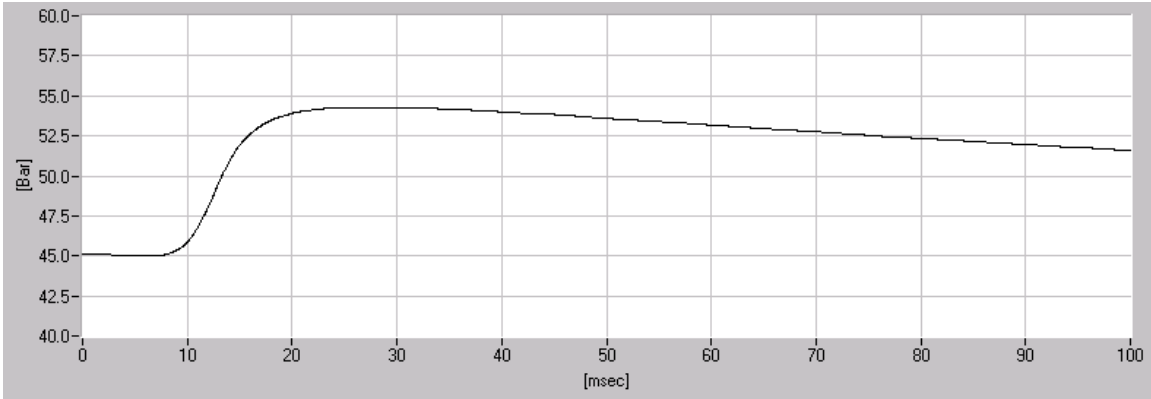
**Ignition and Combustion data - Summary:**

Ignition delay 5.15 ms (dP=0.2 bar above initial chamber pressure)  
Start of main combustion 6.80 ms (dP=3.0 bar above initial chamber pressure)  
FIA Cetane Number 46.0  
Combustion periode 14.9 ms (ROHR positive area)  
Max. ROHR position 6.4 ms (Position relative to start of injection)  
Max. ROHR level 2.1 bar/ms (Max. rate of combustion pressure increase)  
FIA ROHR index 178.8 (ROHR positive area)

**Fuel sample parameters:**

**Fuel Sample ID** F060484819Z+add  
**Bunkering Port** SHARJAH, UAE  
**Date of Bunkering** 4/16/06  
**EFN** 71 **Fuel Grade** RME 180  
**Calorific Value** 40.88 MJ/Kg. **Density** 939.1 Kg/m<sup>3</sup> @ 15<sup>0</sup>C  
**CCAI** 820 **Viscosity** 70.63 cSt @ 50<sup>0</sup>C  
Instrument ID. 010.03.0198  
Date of testing 2006/04/23  
Chamber ref. pressure 45.0 bar  
Chamber ref. temp. 500.0 °C  
Fuel ref. temp. 127.6 °C  
Cooling water ref.temp. 90.0 °C  
Reference file used Inst010.03.0198Heavy\_09.2003.FIR

# Baseline heavy fuel not usable without blending



Start Comment/Filename	Water Fuel	Start temp	Max temp	Max temp	Ign. press	press	At	Delay
85032001.FIA 500.0		88.9	128.7	45.2	9.3	14.7	13.00	
85032002.FIA 500.0		84.3	126.9	45.4	9.4	16.2	12.20	
85032003.FIA 500.0		88.8	126.5	45.8	9.3	13.4	10.65	
85032004.FIA 500.0		79.4	127.5	45.3	8.9	13.2	13.60	
85032005.FIA 500.0		90.0	128.6	44.9	9.5	13.2	12.25	
85032006.FIA 500.0		82.9	128.4	45.4	9.4	12.9	10.80	
85032007.FIA 500.0		86.7	127.7	45.3	9.3	13.3	10.75	
85032008.FIA 500.0		86.6	127.3	44.8	9.1	13.5	13.50	
85032009.FIA 500.0		87.6	127.3	44.3	9.2	13.0	12.60	
85032010.FIA 500.0		90.9	127.9	44.8	8.9	12.2	11.90	
85032011.FIA 500.0		87.4	127.9	45.5	9.0	11.9	11.85	
85032012.FIA 500.0		87.2	127.5	44.9	8.7	20.2	13.85	

Min. delay 10.65 ms  
Max. delay 13.85 ms  
Mean delay 12.25 ms  
Standard deviation 1.12

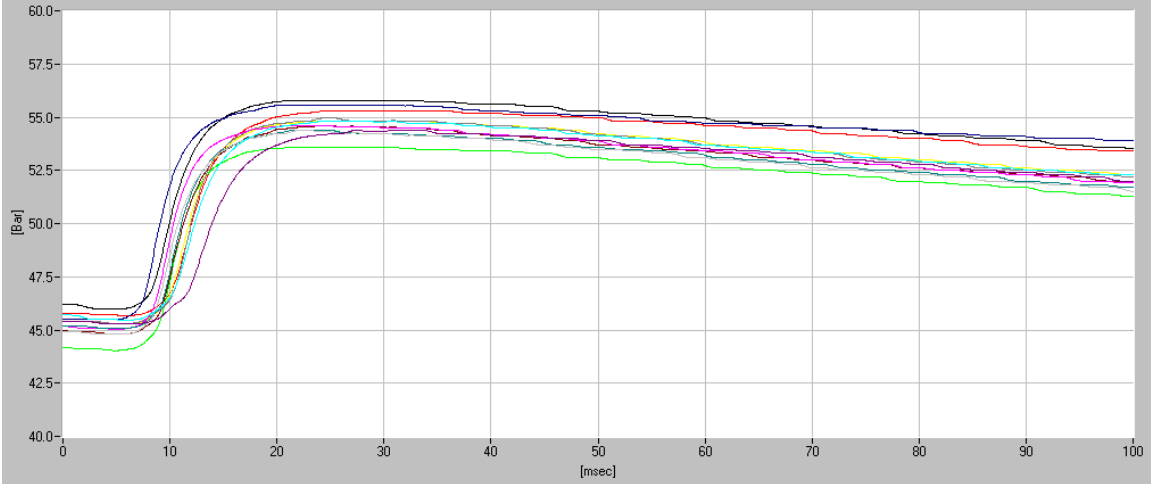
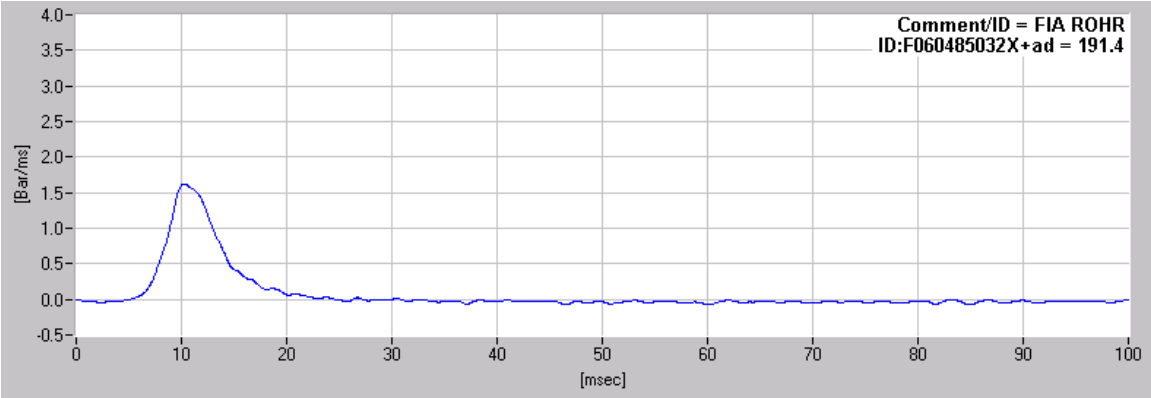
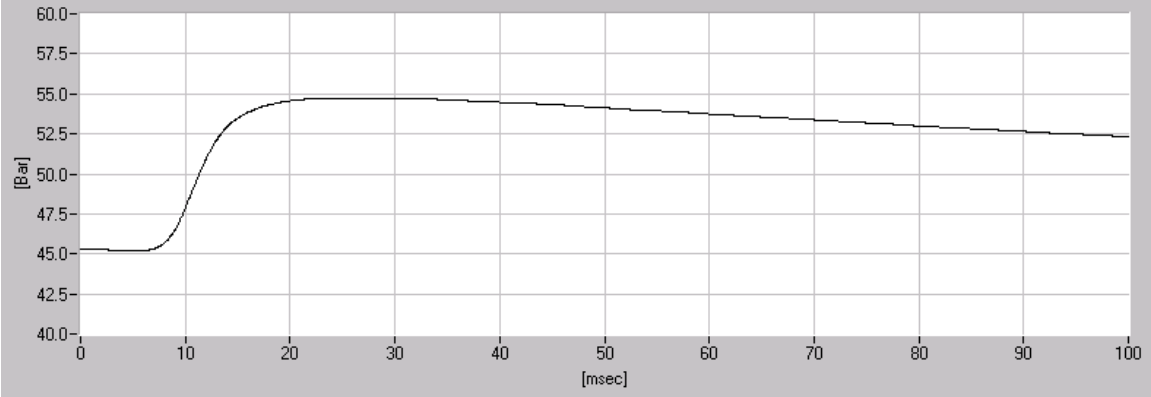
#### Ignition and Combustion data - Summary:

Ignition delay 8.90 ms (dP=0.2 bar above initial chamber pressure)  
Start of main combustion 12.05 ms (dP=3.0 bar above initial chamber pressure)  
FIA Cetane Number <19.4  
Combustion periode 18.5 ms (ROHR positive area)  
Max. ROHR position 12.8 ms (Position relative to start of injection)  
Max. ROHR level 1.5 bar/ms (Max. rate of combustion pressure increase)  
FIA ROHR index 186.1 (ROHR positive area)

#### Fuel sample parameters:

Fuel Sample ID	F060485032		
Bunkering Port	ANTWERP		
Date of Bunkering	4/18/06		
EFN	48	Fuel Grade	RMG 380
Calorific Value	40.37 MJ/Kg.	Density	989.5 Kg/m <sup>3</sup> @ 15 <sup>0</sup> C
CCAI	851	Viscosity	362.8 cSt @ 50 <sup>0</sup> C
Instrument ID.	010.03.0198		
Date of testing	2006/04/22		
Chamber ref. pressure	45.0 bar		
Chamber ref. temp.	500.0 °C		
Fuel ref. temp.	127.6 °C		
Cooling water ref.temp.	90.0 °C		
Reference file used	Inst010.03.0198Heavy_09.2003.FIR		

Heavy fuel with catalyst now usable without blending  
note change in cetane value increase from < 19.4



Comment/Filename	Start Water Fuel	Start temp	Max temp	Max press	Ign. press	At	Delay
2X+ad001.FIA	500.0	79.0	125.1	46.2	9.6	21.1	9.60
2X+ad002.FIA	500.0	88.8	126.3	45.8	9.5	22.0	11.45
2X+ad003.FIA	500.0	82.5	130.2	45.5	10.1	21.1	8.50
2X+ad004.FIA	500.0	87.0	128.8	44.2	9.4	18.5	10.00
2X+ad005.FIA	500.0	79.0	126.7	45.0	9.6	13.9	10.25
2X+ad006.FIA	500.0	88.1	126.7	45.4	9.4	22.0	11.05
2X+ad007.FIA	500.0	78.8	128.1	45.4	9.6	13.8	11.30
2X+ad008.FIA	500.0	89.1	128.5	45.2	9.4	12.9	9.55
2X+ad009.FIA	500.0	84.4	127.9	45.2	9.2	12.3	10.25
2X+ad010.FIA	500.0	84.3	127.5	44.9	9.5	12.8	9.75
2X+ad011.FIA	500.0	81.7	127.5	45.4	9.0	18.9	12.90
2X+ad012.FIA	500.0	80.1	127.9	45.7	9.1	14.6	11.65

Min. delay 8.50 ms  
Max. delay 12.90 ms  
Mean delay 10.52 ms  
Standard deviation 1.19

**Ignition and Combustion data - Summary:**

Ignition delay 7.65 ms (dP=0.2 bar above initial chamber pressure)  
Start of main combustion 10.30 ms (dP=3.0 bar above initial chamber pressure)  
FIA Cetane Number 22.6  
Combustion periode 18.1 ms (ROHR positive area)  
Max. ROHR position 10.2 ms (Position relative to start of injection)  
Max. ROHR level 1.6 bar/ms (Max. rate of combustion pressure increase)  
FIA ROHR index 191.4 (ROHR positive area)

**Fuel sample parameters:**

**Fuel Sample ID** F060485032X+ad  
**Bunkering Port** ANTWERP  
**Date of Bunkering** 4/18/06  
**EFN** 48 **Fuel Grade** RMG 380  
**Calorific Value** 40.37 MJ/Kg **Density** 989.5 Kg/m<sup>3</sup> @ 15<sup>0</sup>C  
**CCAI** 851 **Viscosity** 362.8 cSt @ 50<sup>0</sup>C  
Instrument ID. 010.03.0198  
Date of testing 2006/04/22  
Chamber ref. Pressure 45.0 bar  
Chamber ref. temp. 500.0 °C  
Fuel ref. temp. 127.6 °C  
Cooling water ref.temp. 90.0 °C  
Reference file used Inst010.03.0198Heavy\_09.2003.FIR