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Technical Bulletin #5

ASTM Test Series of Gasoline Treated by the Fitch Fuel Catalyst

OBJECTIVE

The objective of the experiment is to measure the impact of Fitch Fuel Catalyst on commercial grade gasoline. The ASTM test series selected included all tests employed for gasoline sold for transportation use in the US, plus the additional tests listed in the DoD Policy Guidelines for Use of Aftermarket Fuel and Lubricant products. The Fitch Catalyst is a permanent fuel treatment device.

EXPERIMENTAL METHODS

A 5 gallon sample of commercial gasoline containing 10% ethanol was procured. 7.5 liters of this fuel was exposed to the In Line Fitch Fuel Catalyst in a lab scale circulating system designed to treat the fuel in a manner representative of the exposure the fuel would experience in an engine application. ASTM tests were performed on samples of the blank untreated fuel and the treated fuel exposed to the fuel catalyst.

FUEL PREPARTION

A re-circulating system was constructed including a variable flow pump and flow meter. (Figure 1). The system was placed under a chemical hood. The system included a ball valve to allow removal of fuel samples of the treated fuel at the desired exposure time. The purpose of the system is to circulate fuel at a controlled and known rate through the fuel catalyst and return it to a reservoir in a manner similar to that in a fuel handling system on a vehicle.

Date of Treatment July 26, 2006

Fitch Fuel Catalyst - Model Number F 200-A
7.5 liters of fuel in Pyrex / glass reservoir
Pump flow rate 0.50 liters per minute. (1 complete turnover of fuel every 15 minutes.)

Start of circulation: 12:00 noon.
At 2-1/2 hours fuel was withdrawn from the system and the tests were performed on treated fuel and the untreated blank.

Temp: at start of circulation: 80.0 °F Temp: At end of 1 Hour : 80.5 °F Temp: at end of 2 hour : 81.0 °F Temp: at end of 2.5 hour: 81.0 °F

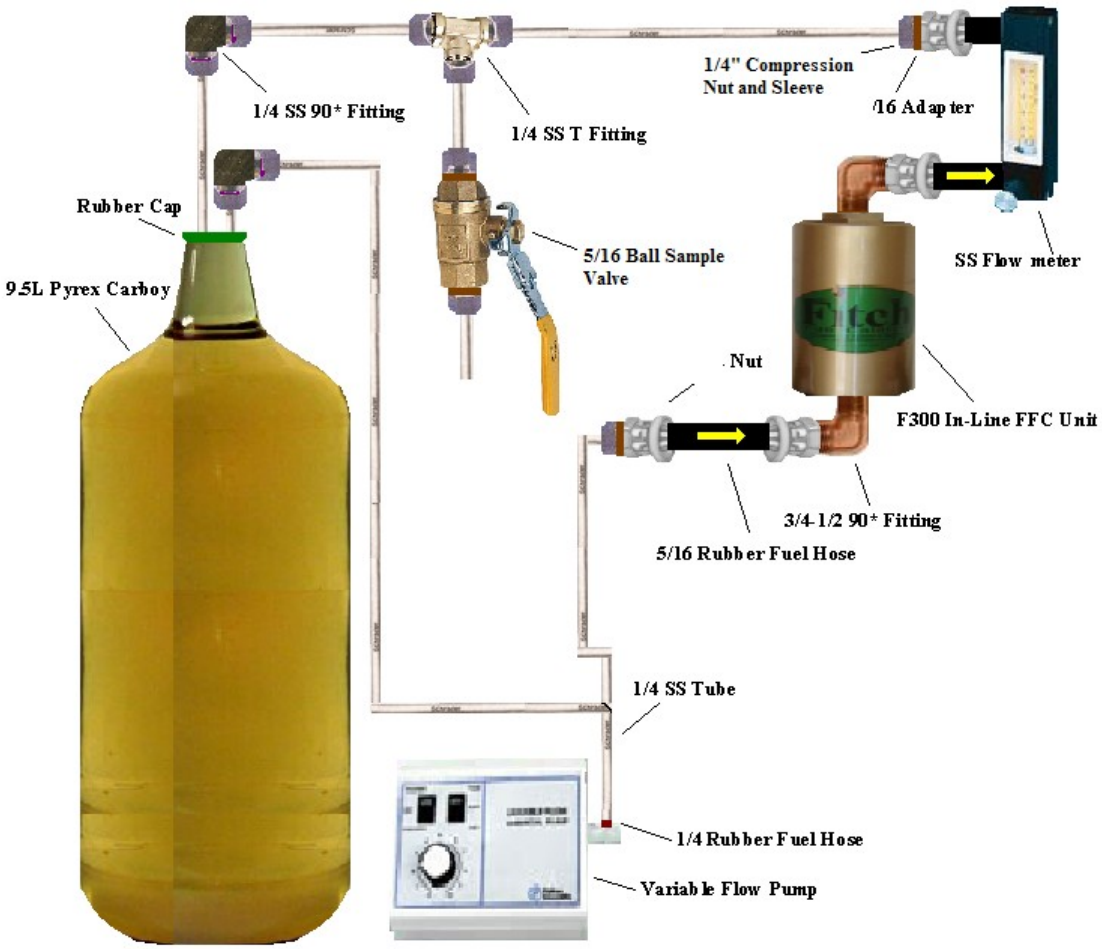

Figure 1
Fuel - Fuel Catalyst Treatment Circulating System

RESULTS

Intertek Caleb Brett

Date 07/26/06

Advanced Power Systems International, Inc

558 Lime Rock Rd
Lakeville, CT 06039

Re: Fitch Fuel Catalyst experiment - Gasoline

We have performed the series of ASTM tests required for gasoline plus additional ASTM tests requested by APSI, on a sample of commercial grade gasoline with 10% ethanol content. A portion of the fuel sample was exposed to a Fitch Fuel Catalyst at our laboratory in New Haven CT under our supervision. After exposure to the fuel catalyst, the ASTM tests were performed on the blank untreated fuel, and the treated fuel. Results are on the following page.

Discussion of Results
Both the untreated and treated fuel are within specification and suitable for commercial use.
The fuel treated by the fuel catalyst had superior characteristics compared to the untreated fuel in the following categories that relate to performance:
ASTM D5291 Ultimate Analysis Ratio of Hydrogen to Carbon
ASTM D2700 Motor Octane Number

The fuel treated by the fuel catalyst had superior characteristics compared to the untreated fuel in the following categories that relate to emissions:
ASTM D4814 Vapor / Liquid Ratio
EPA VOC Reduction Percentage
EPA TOX Reduction Percentage

The fuel exposed to the Fitch Fuel Catalyst is preferable from the perspective of the consumer and would be our recommendation compared to the untreated fuel.

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Intertek Caleb Brett

Test	Method	Untreated Blank	Treated	Units
API Gravity @ 60 °F	ASTM D4052	55.90	55.34	Deg. API
Sulfur	ASTM D5453 Correlated to D2622	44	42	PPM
Mercaptan Sulfur	ASTM D3227	0.0005	0.0006	Wt%
RVP	ASTM D5191 (EPA)	6.9	6.77	PSI
Oxygen Content (Wt. %)	ASTM D4815 Correlated to D5599	3.57	3.57	Wt. %
Methanol		0	0	Vol%
Ethanol		9.82	9.80	Vol %
t-butanol		0	0	Vol%
MTBE		0.08	0.14	Vol %
ETBE		0	0	Vol %
TAME		0.09	0.18	Vol %
Distillation: 10%	ASTM D86	140.0	140.0	Deg F
Distillation: 50%		215.6	215.6	Deg F
Distillation: 90%		313.7	310.0	Deg F
Distillation: FBP		374.9	374.9	Deg F
Distillation E200		44.4	44.4	Vol %
Distillation E300		86.4	87.0	Vol %
Aromatics Content	ASTM D1319 Correlated to D 5769			
Olefins Content	ASTM D1319	9.2	8.9	Vol %
Benzene Content	ASTM D3606	0.78	0.79	Vol %
Appearance	ASTM D4176	Clear & Bright	Clear &Bright	
Copper Corrosion (3hrs @ 122°F)	ASTM D130	1a	1a	
Ultimate Analysis Carbon	ASTM D5291	83.90	83.59	Wt%
Hydrogen		12.26	12.51	Wt%
Nitrogen		0.02	0.02	Wt%

Existent Gum	ASTM D381	1	1	mg/100ml
Lead	ICP	<0.01	<0.01	gm/gal
Octane, Research	ASTM D2699	93.4	93.4	
Octane, Motor	ASTM D2700	83.6	84.6	
Octane, (R+M)/2		88.5	89	
Oxidation Stability	ASTM D525	>240	>240	mins
Phosphorous	ICP	<0.004	<0.004	gms/gal
Vapor / Liquid Ratio (Calculated)	ASTM D4814	151.0	151.5	
Driveability Index	ASTM D4814	1170.5	1166.8	
Emissions				
VOC Reduction Percentage	EPA	-28.24	-29.02	
TOX Reduction Percentage	EPA	-8.51	-7.15	
NOX Reduction Percentage	EPA	-13.30	-13.35	

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Dept of Chemistry - University of Connecticut
Syed N. Naqvi Laboratory Manager Intertek Caleb Brett New Haven CT
Chris Finnegan - Lab Tech - Intertek Caleb Brett New Haven CT
Rob Andrighetti – Technician - Advanced Power Systems

References:

ASTM D4814-99 Specification for Gasoline
DoD Policy Guideline for Fuel and Lubricant Additives