Catalytic Additive for Reduced Fouling in Hydrocarbon Processing

COQG Meeting Philadelphia, PA

June 18, 2009

Stolat Enterprises LLC

What was the Problem?

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Goal

- Mitigation of surface fouling in hydrocarbon processing

Result

- Demonstrated 25% extension of process life through pre-soak of heat transfer tubing only

Current Activity

- Optimization with feedstock

What is the Technology?

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- Liquid Catalyst
  - Inorganic polymer composition
- Surface Conversion
  - Ions co-deposited on metals
- Applicability to crude refining….
  - Evidence of reduced carbonization in various refined products
  - Capabilities delivered via petroleum environments

Two Mechanism Technology

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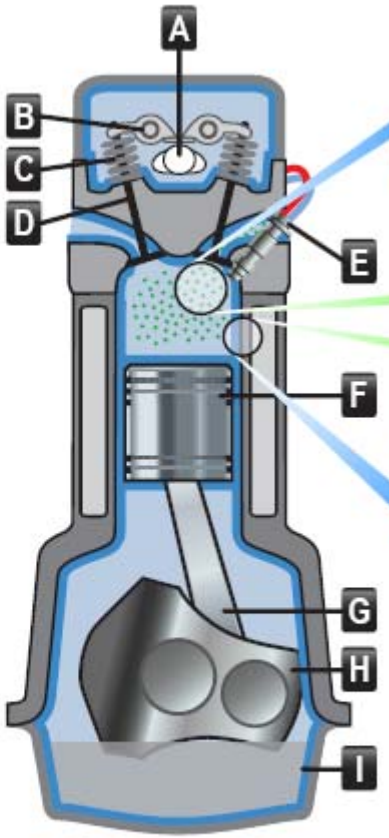
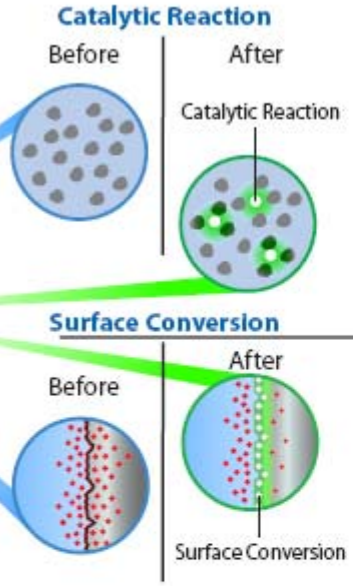
A Camshaft
B Rocker
C Valve Assembly
D Valve
E Injector
F Piston
G Connecting Rod
H Crankshaft
I Lubricating Oil





DFC creates a **Catalytic Reaction**. The catalytic reaction optimizes the heat release rate, which leads to increased power, reduced emissions, and increased fuel efficiency.

DFC and LTP create a non-accumulative **Surface Conversion**. The surface conversion mechanism forms an inorganic polymer complex on the surface of ferrous and non-ferrous metal surfaces which smooth and passivate the surface improving reflectivity (emissivity) and reducing oxygen reactivity resulting in a more complete combustion. This surface conversion can also reduce friction between metal surfaces which can increase component life and reduce fuel consumption.

Surface Reaction - Visible Surface Conversion

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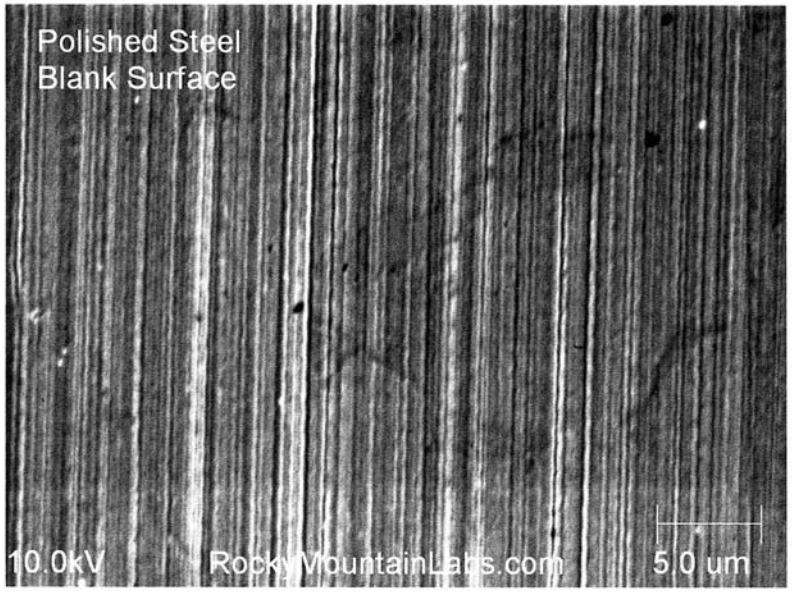

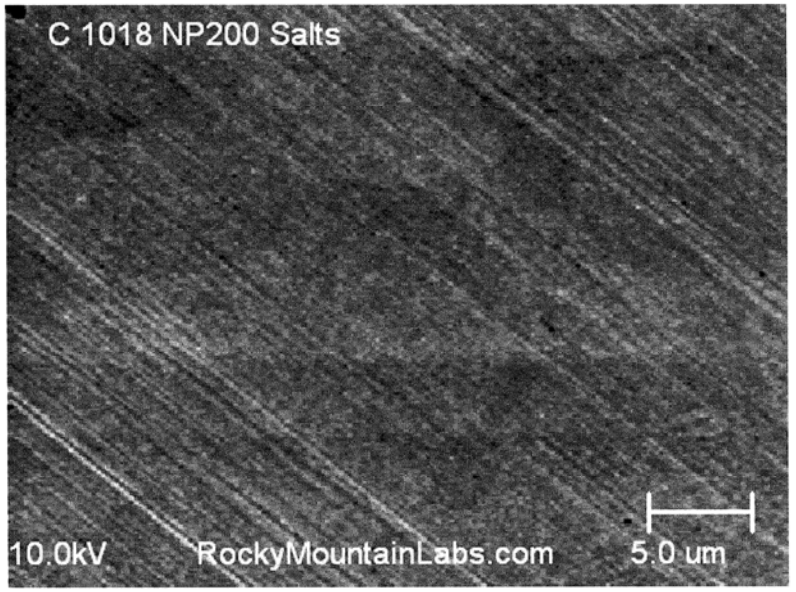

Technology creates a new surface which has a lower coefficient of friction

Heat Release Rate of Residual Fuel Oil

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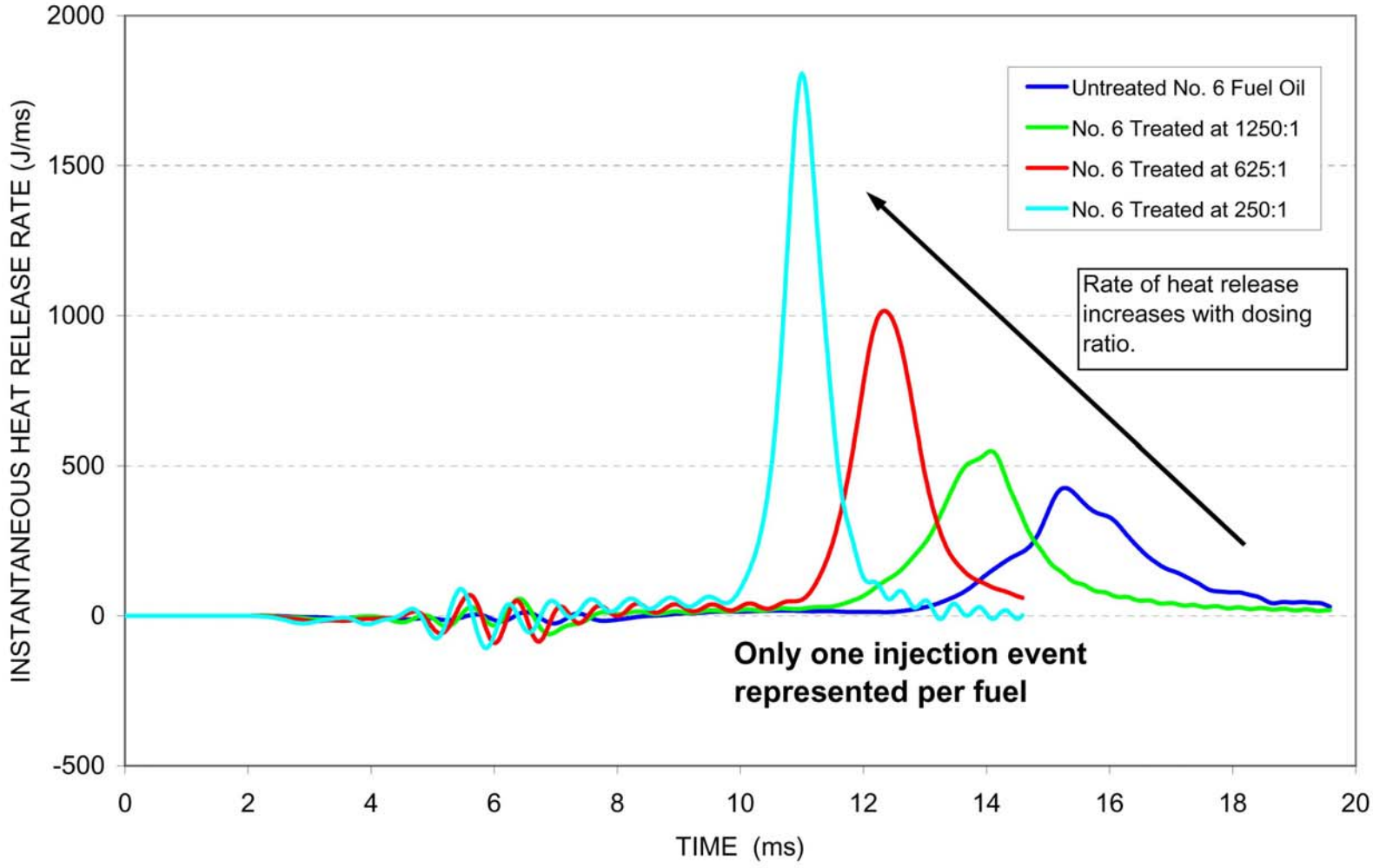

Source: Ignition Quality Test (IQT) performed at Southwest Research Institute

Heat Release Rate of Distillates

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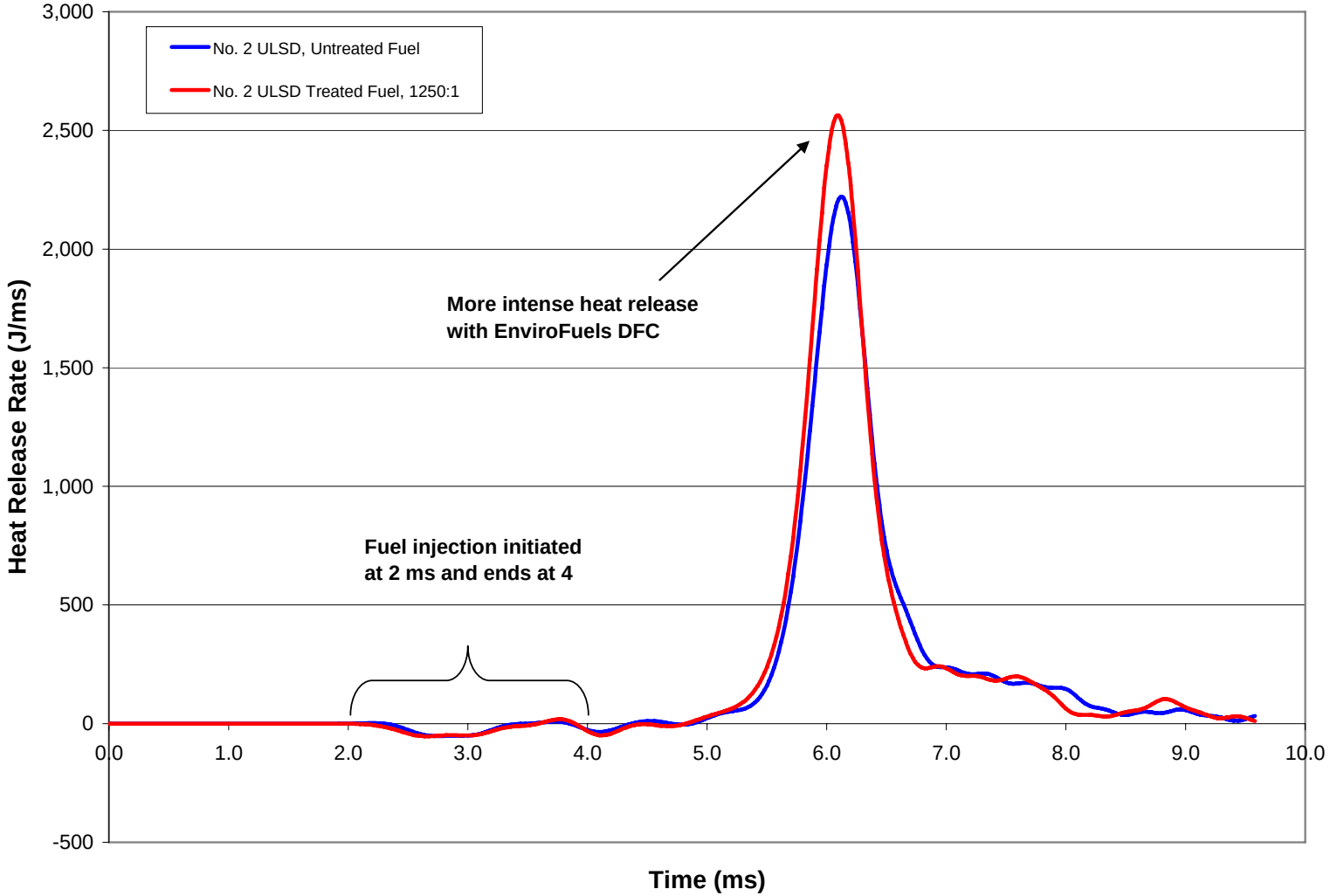

Source: Ignition Quality Test (IQT) performed at Southwest Research Institute

Anti-fouling Example #1

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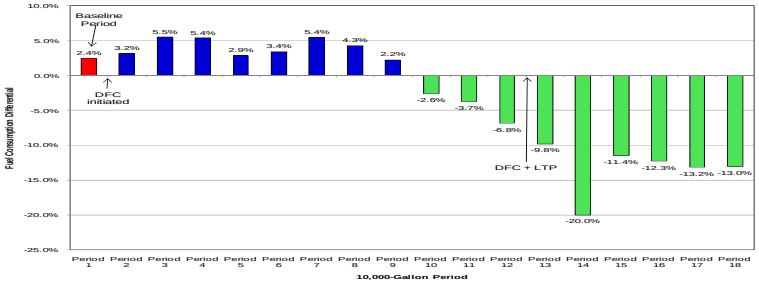
- 9.2% initial improvement
- Additional 4% with upper and lower chamber exposure
- 13.2% efficiency improvement
- Residue analysis showed less deposition

Percent Fuel Consumption Differential Between Starboard and Port Engines



Untreated Exhaust Port

Treated Exhaust Port

Anti-Fouling Example #2

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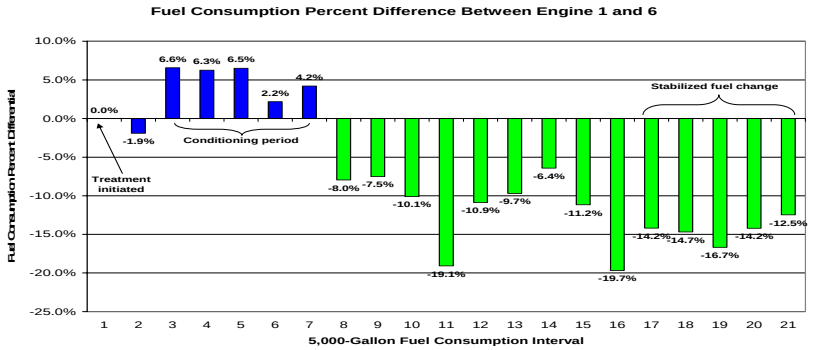
- Average 10% efficiency gain
- Chemical analysis showed less carbon on components



Untreated Engine Firing Face and Valves

Treated Engine Firing Face and Valves

Differentiation from other Additives

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- EPA program established to independently verify impact of environmental technologies
- Operates five centers and one pilot program, covering many categories
- Has verified more than 300 environmental technologies and developed more than 80 test protocols for technology testing
- http://www.epa.gov/etv/

Additional Characterizations

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- Distillate Stability (ASTM D6468)
  - Reflectance is improved 49%.
- Lubricity Improvement (ASTM D 6079)
  - Exceeds EMA Standard by 15%.
- Electrical Conductivity (ASTM D2624-06)
  - Up to 2x improvement in electrical conductivity. Minimum 15% improvement at nominal treatment.
- Oxidation Stability (ASTM D2274)
  - Up to 81% reduction in total insolubles.

Conclusion

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- Fundamentally proven and economic catalytic and surface conversion benefits in both operating and laboratory environments
- At least 25% anti-fouling improvement in hydrocarbon processing

Contact Information

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