Catalytic Additive for Reduced Fouling in Hydrocarbon Processing

COQG Meeting Philadelphia, PA
June 18, 2009

Stolat Enterprises LLC
What was the Problem?

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?

- 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

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

Technology creates a new surface which has a lower coefficient of friction
Heat Release Rate of Residual Fuel Oil

Source: Ignition Quality Test (IQT) performed at Southwest Research Institute
Heat Release Rate of Distillates

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

- More intense heat release with EnviroFuels DFC
- Fuel injection initiated at 2 ms and ends at 4 ms
Anti-fouling Example #1

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

Untreated Exhaust Port

Treated Exhaust Port

Percent Fuel Consumption Differential Between Starboard and Port Engines
Anti-Fouling Example #2

- 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

- 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

- **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

- 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

Frank Karbarz
Worldwide Distributor, EnviroFuels DFC
Stolat Enterprises LLC
4153 Lanark LN
Houston, Texas 77025
Phone | (713) 821-9606
Direct | (713) 594-0805
Fax | (713) 668-0604
frank.karbarz@stolatllc.com
frank.karbarz@envirofuelsllc.com