

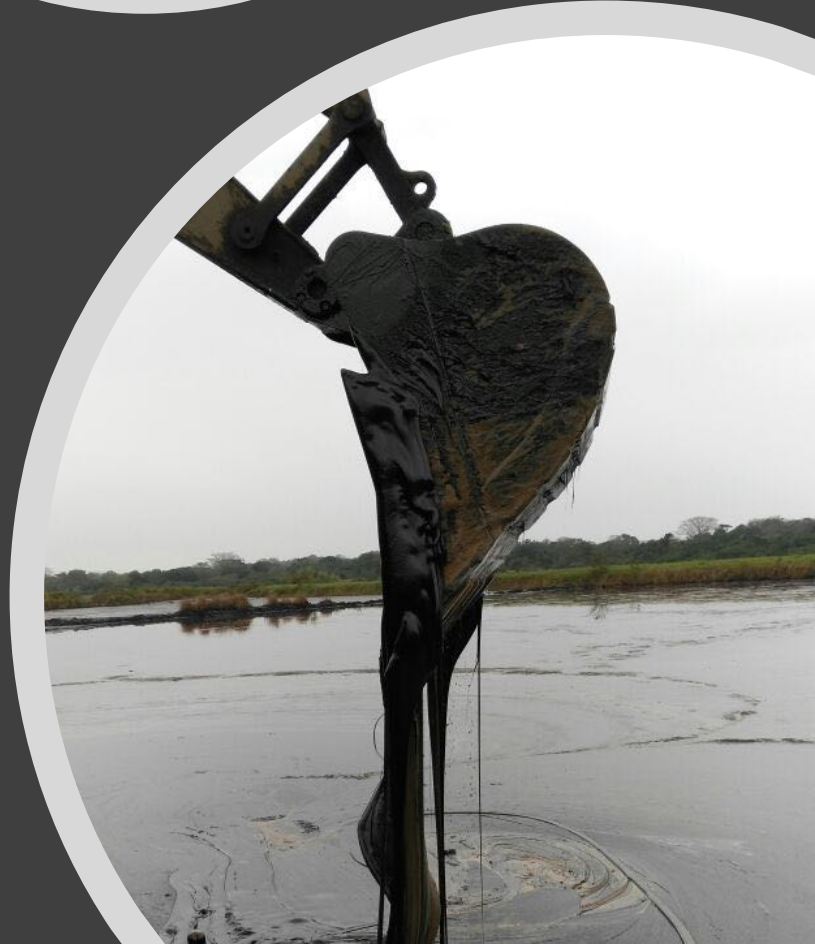


# Heavy Crude Upgrading

Multi Phase Reactor

Mechanical Cracking of Long Chain Hydrocarbons

# AESA

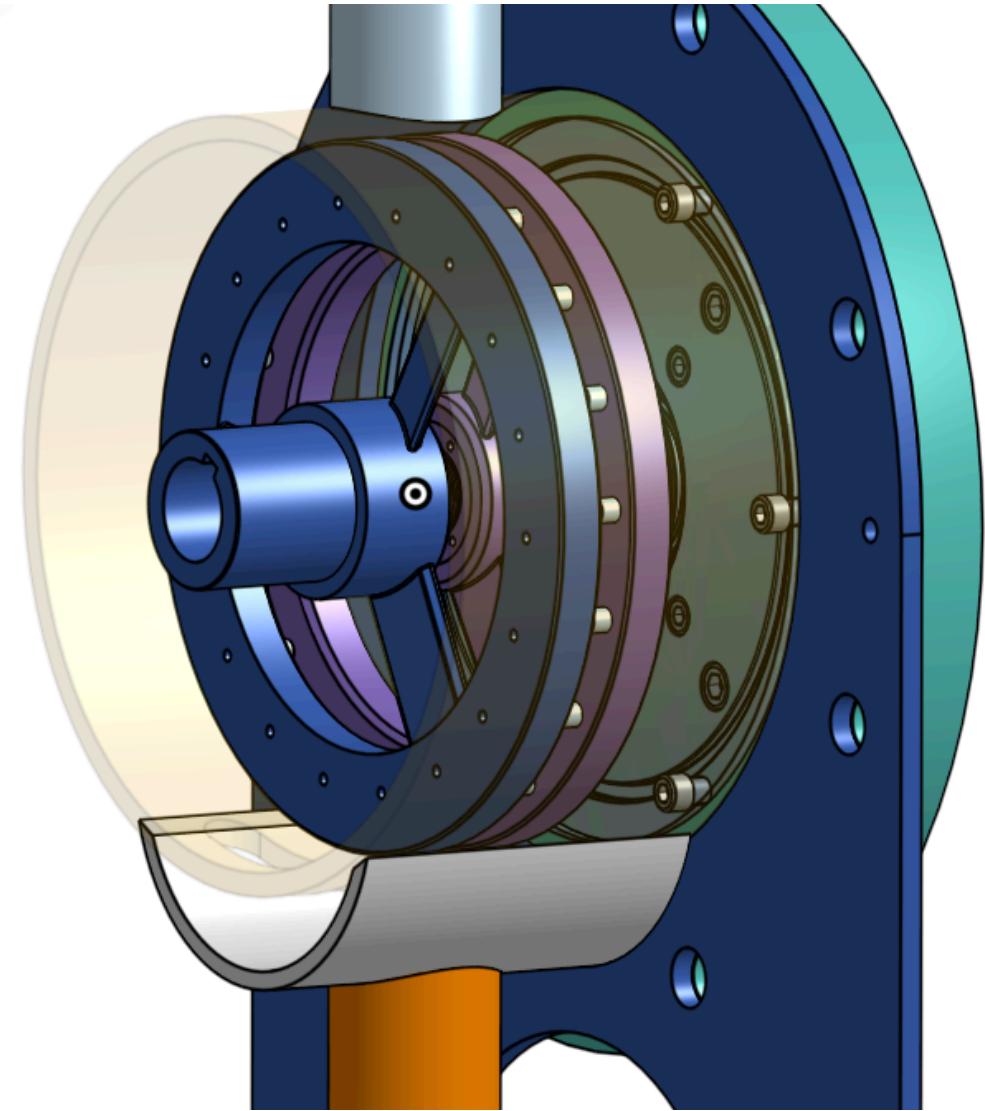


## Malargue Heavy Crude Project



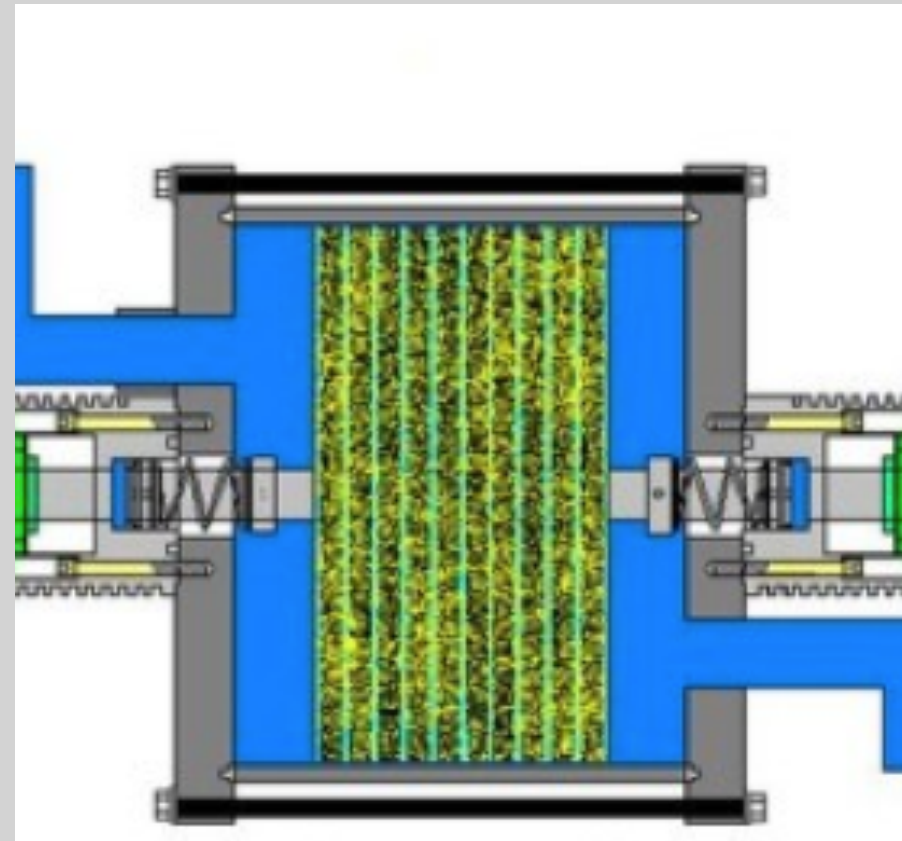
# Mechanics

- The technology is driven by use of mechanical force generated from counter rotating, high rpm rotors. As the fluid flows through the system millions of microscopic bubbles are created and collapsed producing waves of high energy, heat, and mixing.



# Microscopic Bubble Heating Technology

- Hydro-Cracking and Heating produced by collapse of bubbles
- Heat produced within fluid, no heat transfer from external source.
- Aggressive mixing through increase in surface contact area
- Combination of heating and mixing technologies



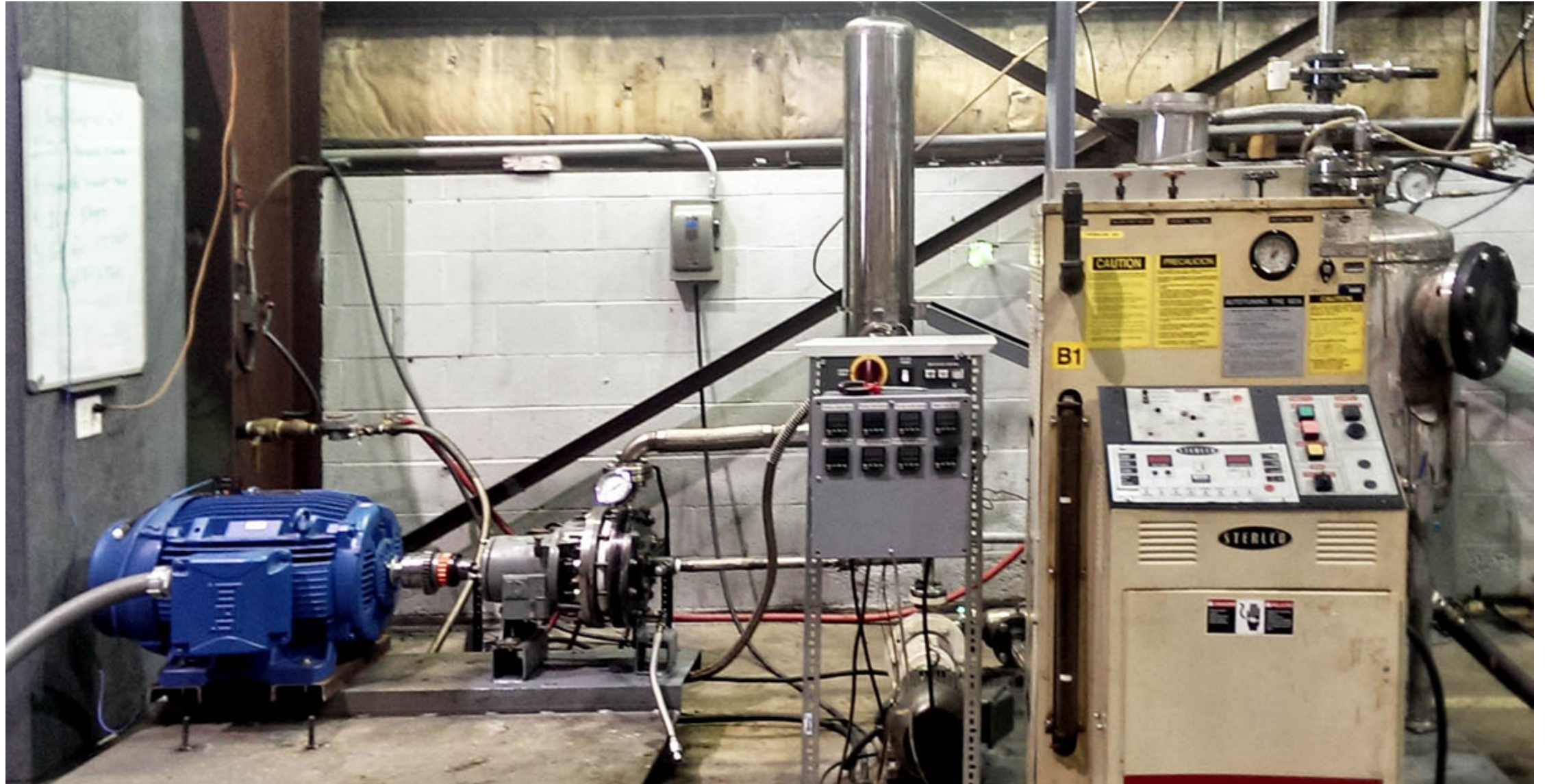
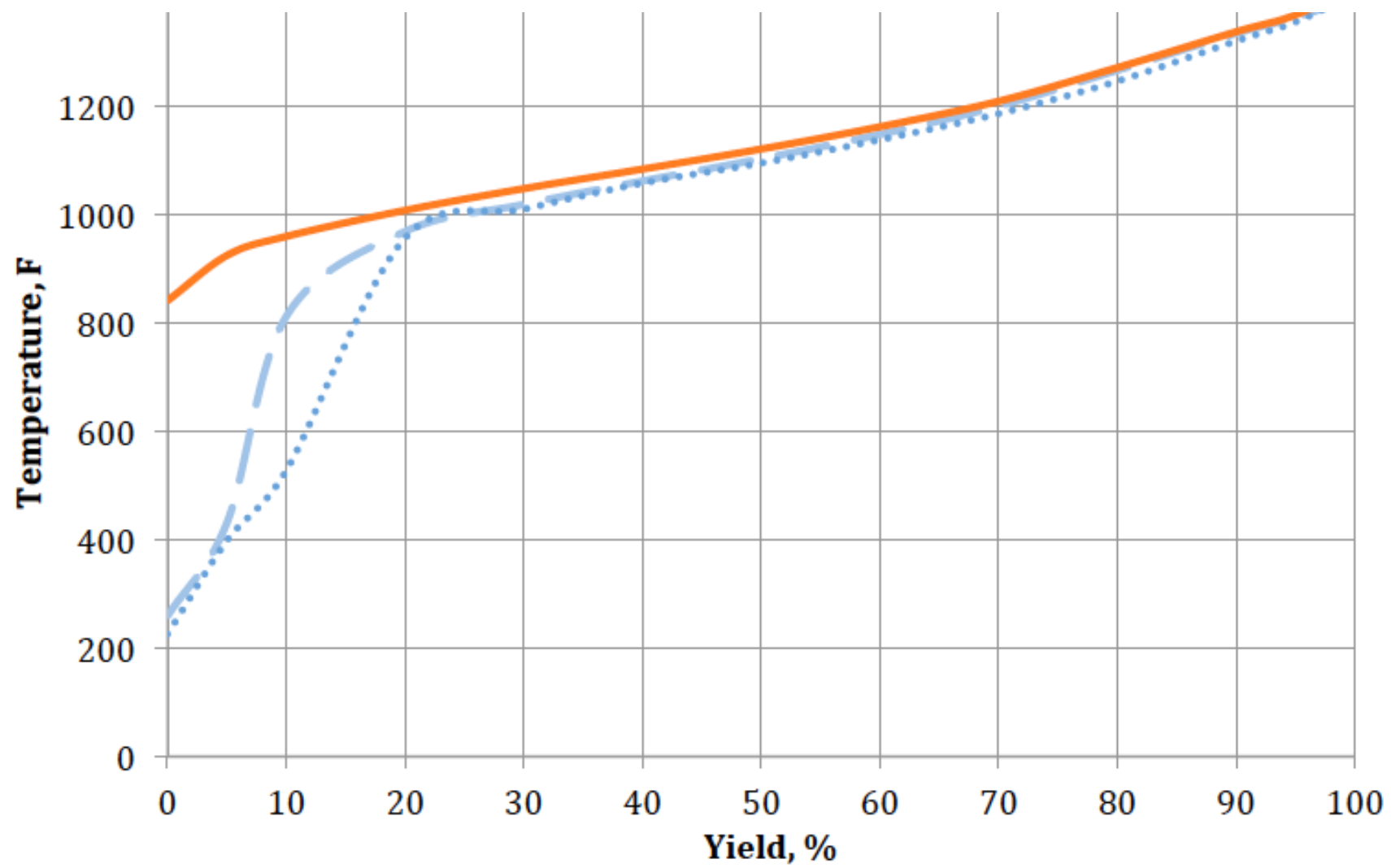




Table 1. The summary of the atmospheric bottoms (Kendex® 0842) upgrading results.

	Untreated Residue	Treated Residue	Change	Untreated after 4 weeks	Treated after 4 weeks	Change
Specific Gravity, °API	24	25.1	1.1° ↑	24	25.2	1.2° ↑
Viscosity, cSt @ 40°C	2426	534	78% ↓	2863	495	80% ↓
Bromine Number				< 0.3	0.4	0.1 ↑
Total SimDist Yield, %	18	26	7% ↑	18	28	10% ↑
LSR, %	0	0	–	0	0	–
RFD, %	0	3	3% ↑	0	4	4% ↑
Kero, %	0	3	3% ↑	0	3	3% ↑
Diesel, %	0	4	4% ↑	0	3	3% ↑
AGO, %	0	0	–	0	0	–
VGO, %	18	17	1% ↓	18	17	1% ↓
Residue, %	82	74	8% ↓	82	72	10% ↓



# Hydrocarbon Species Before and After Treating

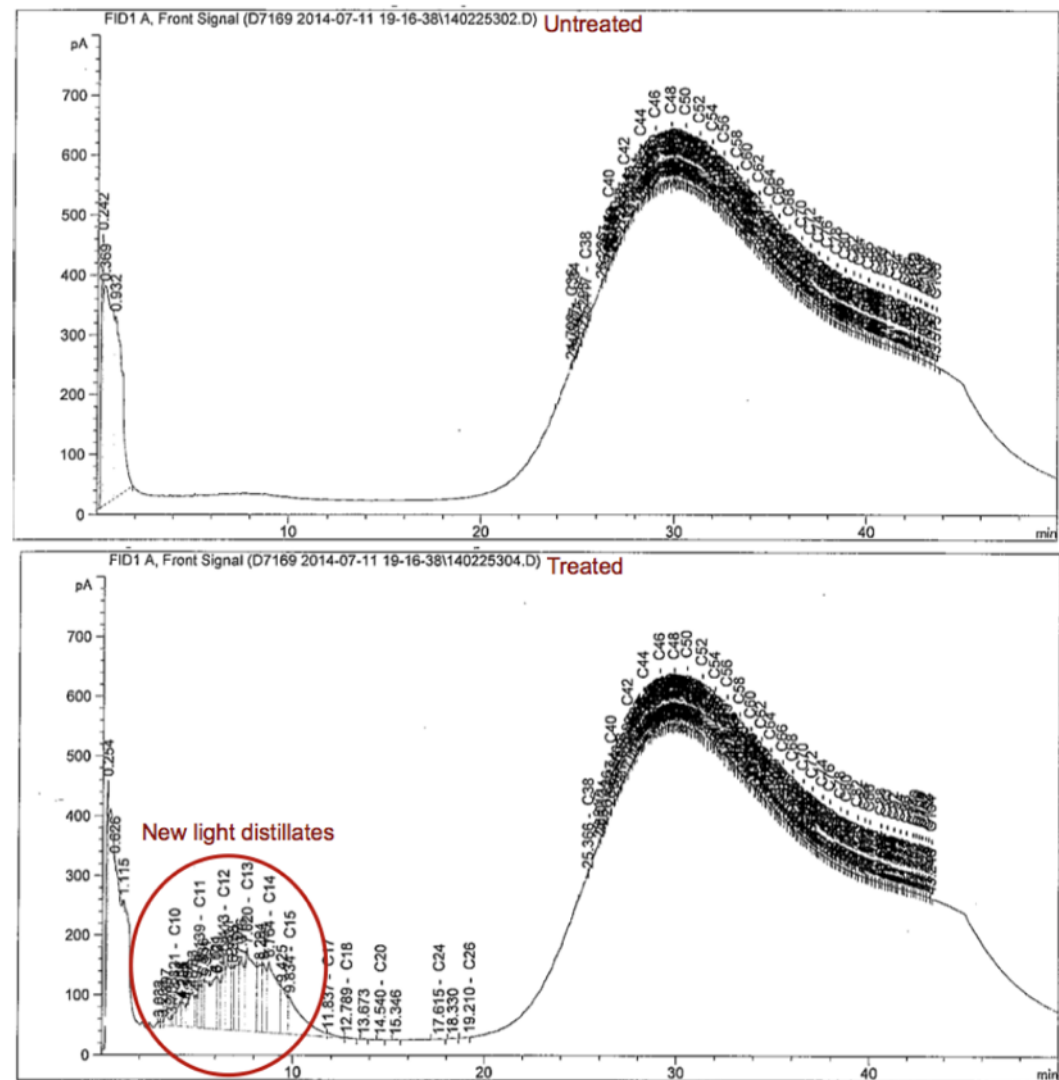


Fig. 4. ASTM D7169 SimDist chromatogram of the untreated (top) and treated (bottom) residue highlighting the new prominent C10-C15 peaks appearing in the treated residue chromatogram indicative to the formation of light hydrocarbons in the gasoline-kerosene range.



# Results



Increase API by 1 degree



Reduce Viscosity 80% -  
permanent



Generation of C10-C15, proof of  
cracking

# Status

Subsequent Process, Technology and Technique developments have significantly improved process from reported results.

Reported results from tests performed in 2007 and 2014.

Significant developments to the MPR Reactor™ have ensued in the intervening time period.