



Crude Oil Management: Reduce Operating Problems While Processing Opportunity Crudes

*By Larry Kremer
Baker Petrolite Corporation*



Baker Petrolite



Outline of Presentation

- Introduction
- Baker Petrolite Crude Oil Management
- ASITSM test indicates asphaltene instability
- Opportunity crude impact on desalter operation
- Processing Doba crude oil

ASIT is a service mark of Baker Hughes Incorporated



Introduction

- Several quality parameters indicate potential processing problems
- Few key quality parameters specified
 - Sulfur
 - Gravity
 - BS&W
- Some parameters vary for each shipment
 - Crude oils are blends
 - Degradation and alteration during shipment

Selected Quality Parameters

Commonly Monitored Parameters	Other Significant Parameters
Gravity or Density	Organic Chlorides
Sulfur	Methanol
BS&W	Naturally Occurring Radioactive Material (NORM)
Salt (usually as water soluble chlorides)	Calcium Naphthenate
Total Acid Number (TAN)	Crude Incompatibility
Filterable Solids	Asphaltene and Resins (SARA)
Metals (Ni, V, Fe, Hg, Se, <i>etc.</i>)	Ease of Desalting
Crude Distillation Properties	Volatile Amines



Crude Quality Can Impact Operations

- Some quality issues are rare but can cause significant problems
 - NORM
 - Hg
 - Se
- Focus on quality impact on desalting



Baker Petrolite's Crude Oil Management

- Screen opportunity crude oils for quality
- Determine impact on
 - Oil movements
 - Desalting
 - Waste water treatment
- Develop mitigation strategy
- Implement strategy prior to receipt of crude oil
- Monitoring

The title is overlaid on a blue-tinted background image of an industrial refinery or chemical plant. The image shows various pipes, towers, and structures, with a grid pattern overlaid on the top portion. The text is in a large, white, sans-serif font.

ASIT Test Indicates Asphaltene Instability

- Some crude oil can be incompatible with current crude slate
- Paraffinic crudes can destabilize asphaltene
- Several potential problems
 - Fouling
 - Foaming
 - Desalter upsets
 - Precipitation in tankage



Mitigation Strategies for Ashphaltenes

- Discontinue purchase
- Limit blends to compatible mixtures
- Treat crude oil with asphaltene stabilizers

Case History 1

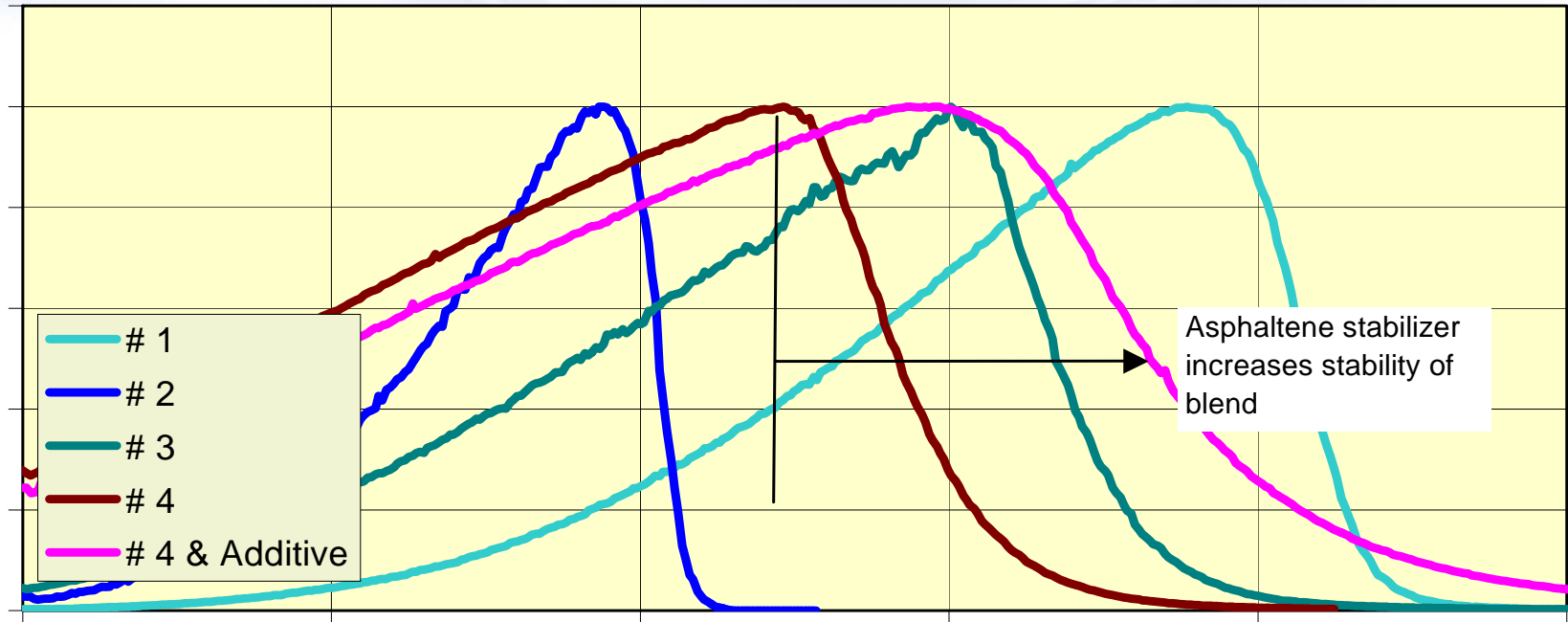
- Introduction of crude 2 caused formation of rag layer shorting out bottom grids
- Oils were found to be compatible
- Blend had ASI in unstable region

#	Oil / Blend	ASI	% Asphaltenes	% Resins	Asph/Res
1	Crude 1	1.75	3.4	7	0.49
2	Crude 2	0.96	5.4	10.8	0.50
3	Crude 3	1.5	6.53	27	0.24
4	55% (1) 20% (2) 25% (3)	1.24	-	-	-

Case 1

ASITSM Asphaltene Stability Index Test

120



EDDA Demulsification Test	% Water Drop			BS&W
	5 min	10 min	15 min	
# 4	0	0	0	0.6
# 4, Stabilizer & Demulsifier	3.3	3.8	4.5	0.14




Mitigating Strategy for Case 1

- Asphaltene stabilizer added to crude 2 as it was transferred to storage tanks
- Wash water rate increased from 4% to 5.3%
 - Increases droplet population
 - Increases oil-water interfacial area, effectively diluting asphaltene surface concentration
- Wetting agent added
 - Control solids that increase asphaltene destabilization



Opportunity Crude Impact on Desalter Operation

- Electrostatic Demulsification and Dehydration Apparatus (EDDA) simulates desalting operation.
- Screen opportunity crude oils compared with normal crude slate
- Develop mitigation strategies
 - Operational changes (i.e. mixing, wash water)
 - Additive adjustment

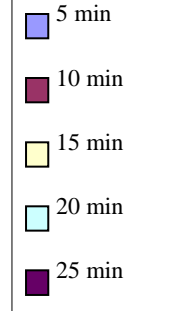
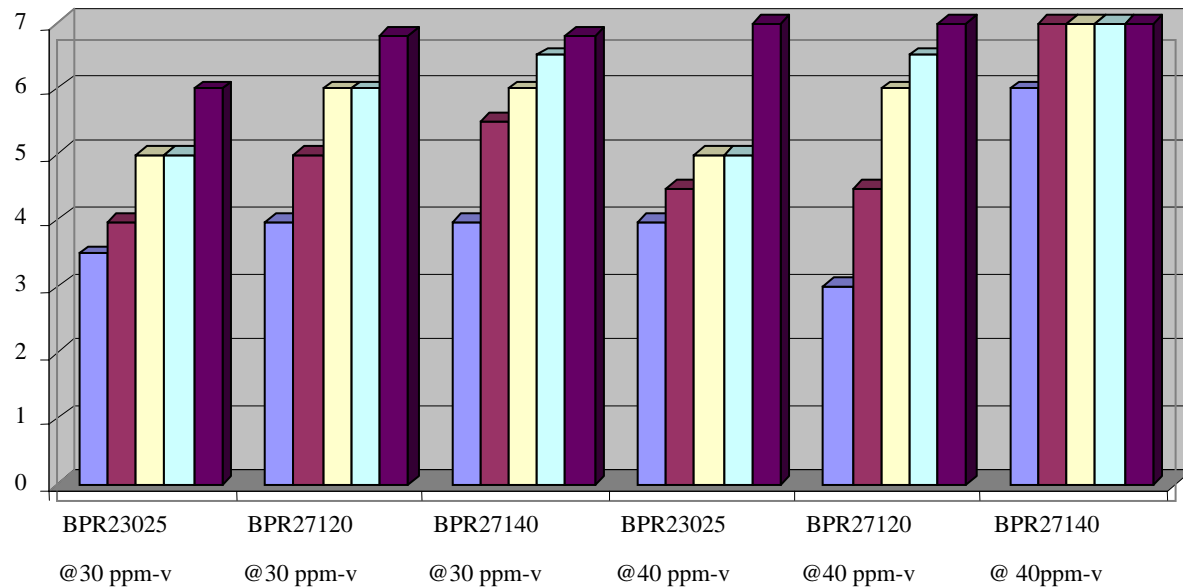


Case History: EDDA Testing of Opportunity Crude Oil

- Routinely compare potential crude oils against existing crude blend
- One crude indicated potential more difficult to desalt
- Product dosage testing
 - Existing product could handle new crude oil
 - May need to increase dosage of emulsion breaker

EDDA Testing for Opportunity Crude Oil

**COALESCED
WATER %**



TOTAL WASH WATER ADDED = 7 %

CHEMICAL EMULSION BREAKER DOSAGE AT 30 AND 40 PPM-V



Case History: Doba Crude Oil

- Central African crude oil with favorable pricing
- High in calcium naphthenate
 - Can stabilize emulsions
 - Can cause severe fouling
 - Calcium contamination down stream
 - FCC catalyst poison
 - Negative impact on coke quality
 - Impacts residual fuel quality




Initial Screening of Doba

- Recognized calcium could be a problem
- Conducted ASIT tests to determine if asphaltene would be problem
- Estimated impact on waste water plant
- Conducted EDDA tests for desalter impact
 - Verified that EXCALIBUR Metals Removal Technology could remove calcium in desalters
 - Found existing EB was acceptable



Increased Monitoring

- Measured calcium
 - Raw crude oil
 - Desalted crude oil
 - Desalter effluent water
- Provided WWTP with computer based algorithms to calculate scaling tendencies
- Installed corrosion and pH monitoring on desalter wash water lines
- Increased attention paid to desalter operation



Implemented EXCALIBUR Metals Removal Technology Program

- Emulsion breaker optimized for best dehydration in desalter
- Metals removal additives injected into desalter wash water
 - Scale inhibitor
 - Corrosion inhibitor



Results of EXCALIBUR Metals Removal Technology Program

- Calcium successfully removed in desalter
 - 95+% Calcium removal across desalter
 - Met down stream calcium targets
- No net increase of BOD or COD to WWTP
- No scaling problems observed
- No corrosion problems in desalter wash water



Conclusion

- Crude Oil Management approach can reduce operating problems for opportunity crude oils
 - Evaluate potential problems through laboratory testing
 - Develop mitigation strategy
 - Develop appropriate monitoring program