

Introducing the Baker Hughes Field ASIT Services Technology

by Corina Sandu

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Outline

- Why this technology?
- Where are the problems?
- What are asphaltenes?
- Field ASIT Services™ Technology
- Field trial results
 - Crude oil
 - Blends of crudes
 - Desalter optimization
 - Fuel oil
- What are the targeted applications?

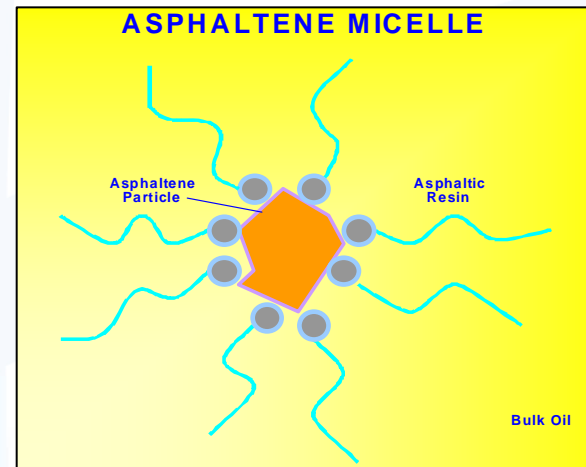
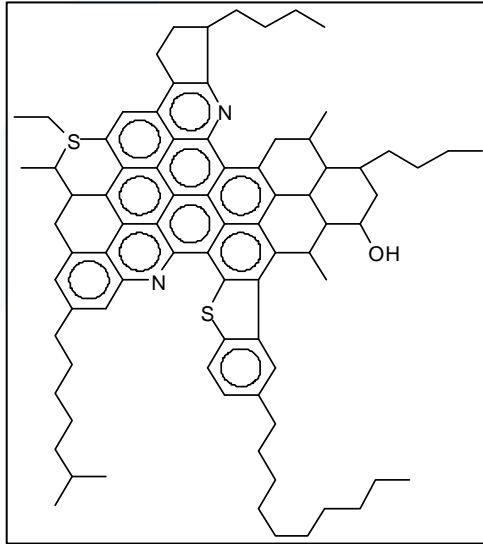
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Motivation

- Opportunity crudes (e.g., heavy and “high acidic”) are appealing feedstocks on the market
- Processing these particular crudes is challenging due to
 - High solids
 - Increased amount of water
 - S content
 - Asphaltenes
 - Viscosity
- Blending opportunity crudes can offer challenges with respect to stability and compatibility

Colloidal Structure of Asphaltenes



- Colloidal systems that contain condensed polyaromatic compounds ($H/C \approx 1.15$)
- Measured by solubility (Aromatic soluble, N-alkane insoluble)
- Not all black solids are asphaltenes (e.g., heavy wax and iron sulfide)
- High affinity towards aggregation (starting from nanoaggregation)
- *T, P, and chemical changes can significantly alter and result in asphaltene aggregation, and thus precipitation*

Current Methods on the Market

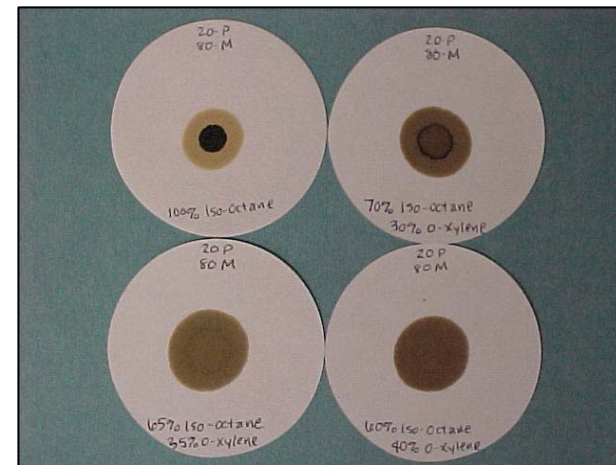
Settling Optical Technique	ASTM D7061	Not powerful for crude stability detection
Spot Test	ASTM D4740	Too qualitatively and inaccurate
Hot Filtration Test	ASTM D4870	Too limited, not reliable (can miss detecting very unstable fuels)

Baker Hughes Stability Methods of Evaluation

- Heptane Dispersant Test (HDT)
- Spot Test (ASTM D4740)
- Field ASIT services Technology
- Hot Filtration Test (ASTM D4870M)



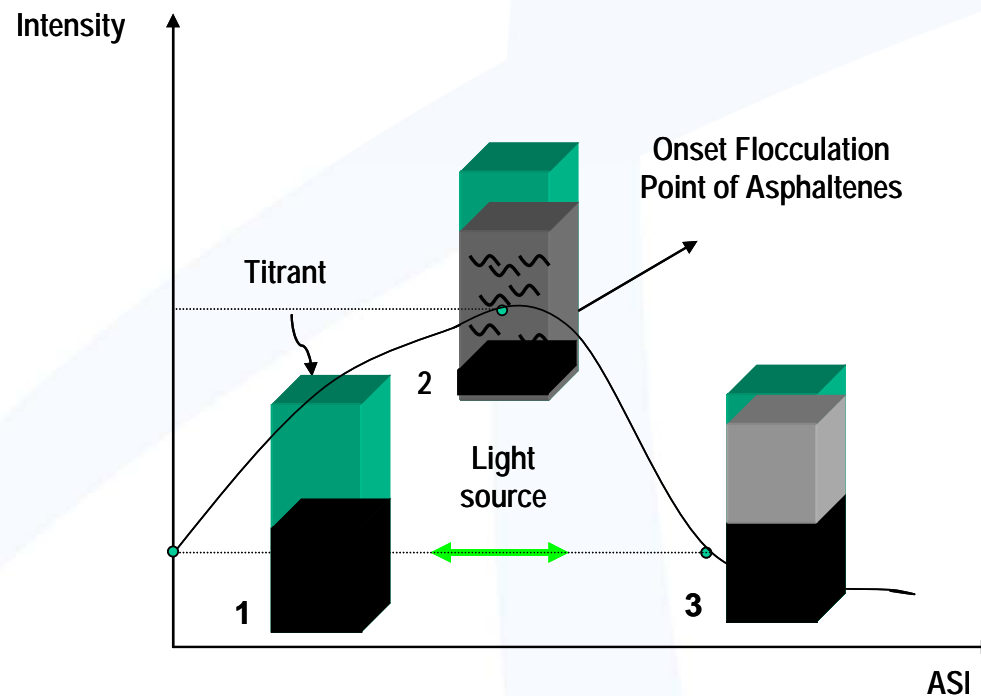
Heptane Dispersant Test (HDT)



Spot Test

Field ASIT Services—Instrument

- Measures the onset of the flocculation of the asphaltenes with high accuracy by inducing the asphaltene precipitation via titration with a paraffinic solvent



Field ASIT Services—Features

- Requires small volume of sample (1 to 2 mL)
- Fast acquisition (20 minutes per sample)
- Data-processing capabilities
- Ease of use
- Resolves different types of samples: crude, heavy crudes, reduced crudes
- Portable



Field ASIT Services—Automatic Report

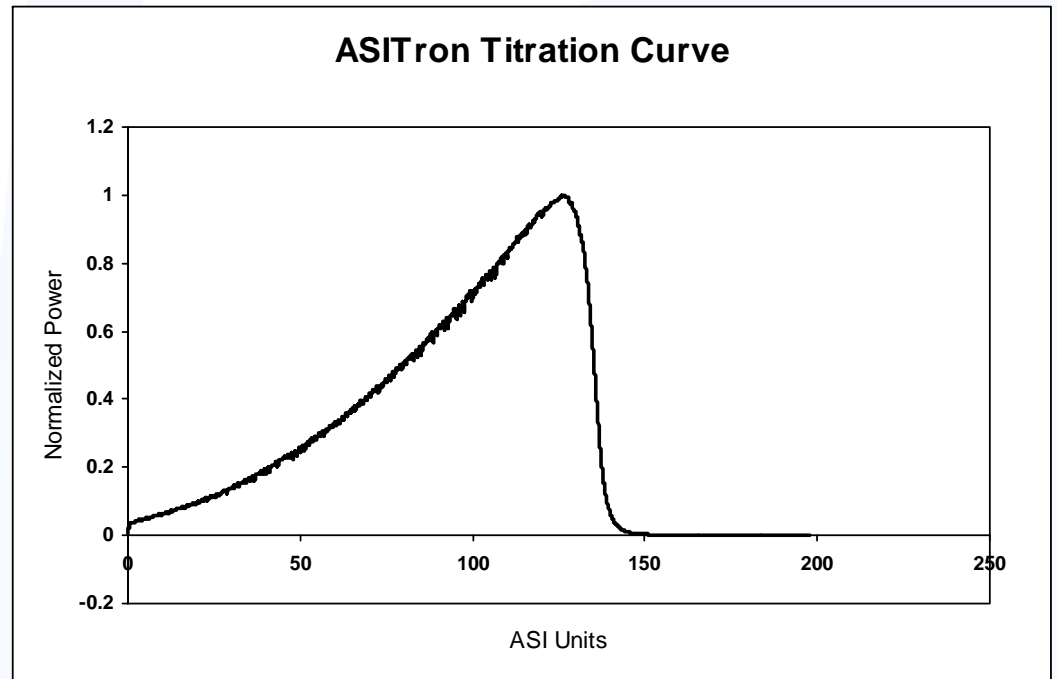
Test Operator: Ajmal Ansari
Date: 7/15/2009
Time: 1:52 PM
Fuel Type: Crude
Location: Blend #4 40/60, Untreated
Fuel Viscosity:

Additive Options

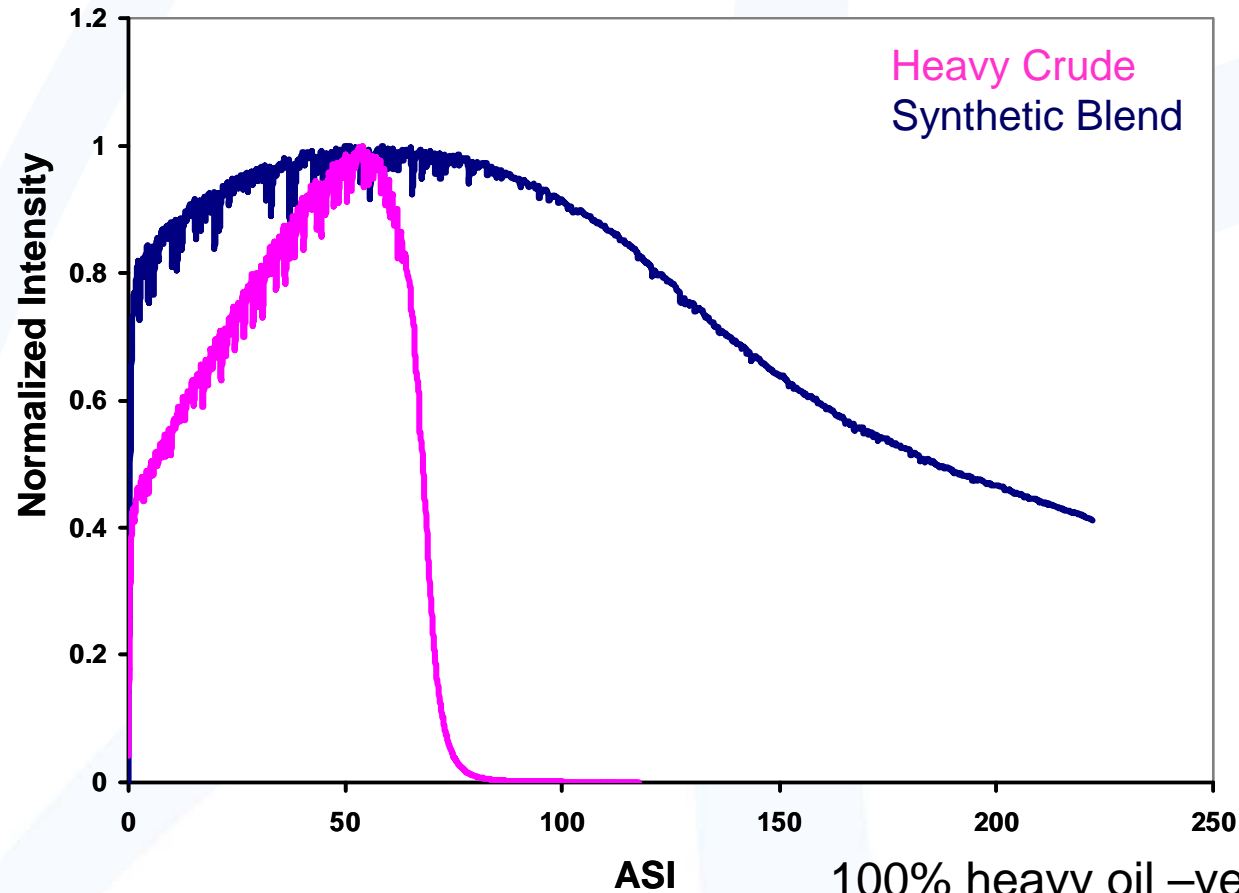
Additized: None
Additive Package: N/A
Additive Dosage: N/A

Data Analysis

ASI Value: 126.49 ppm
Fuel Grade: Borderline
Crashing Rate: N/A
Recommendation: N/A



Examples of Improved Stability by Blending



100% heavy oil –very unstable
Synthetic blend – no chemical treatment



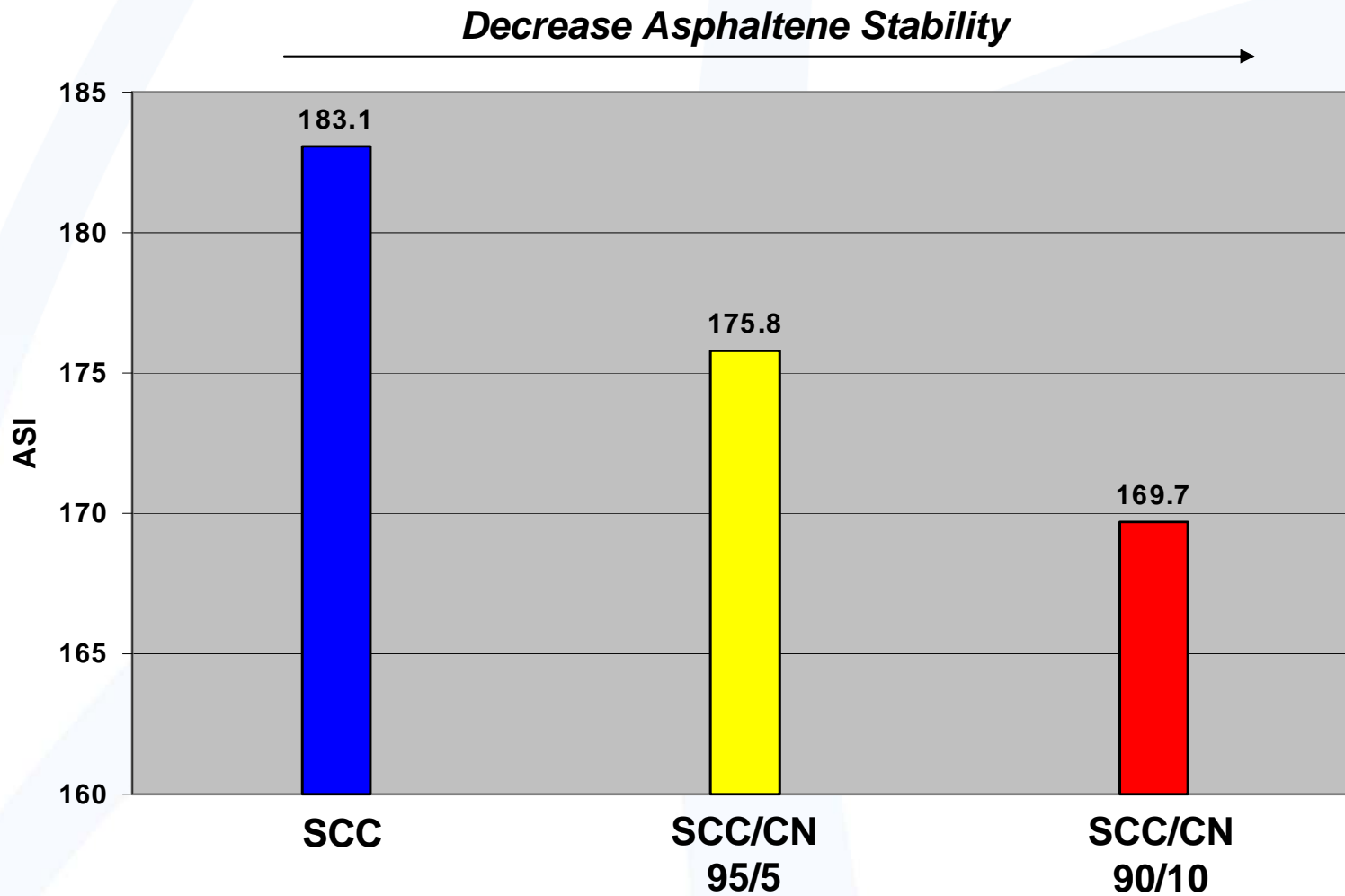
Desalter Upset Case Study

- Central US refinery reported
 - Destabilization of asphaltenes due to out-of-spec naphtha
 - Issues in desalter operation
 - Large stable rag layer
 - Poor effluent brine quality
- Baker Hughes tasks
 - To optimize desalter performance
 - To explore the possibility to increase the use of naphtha

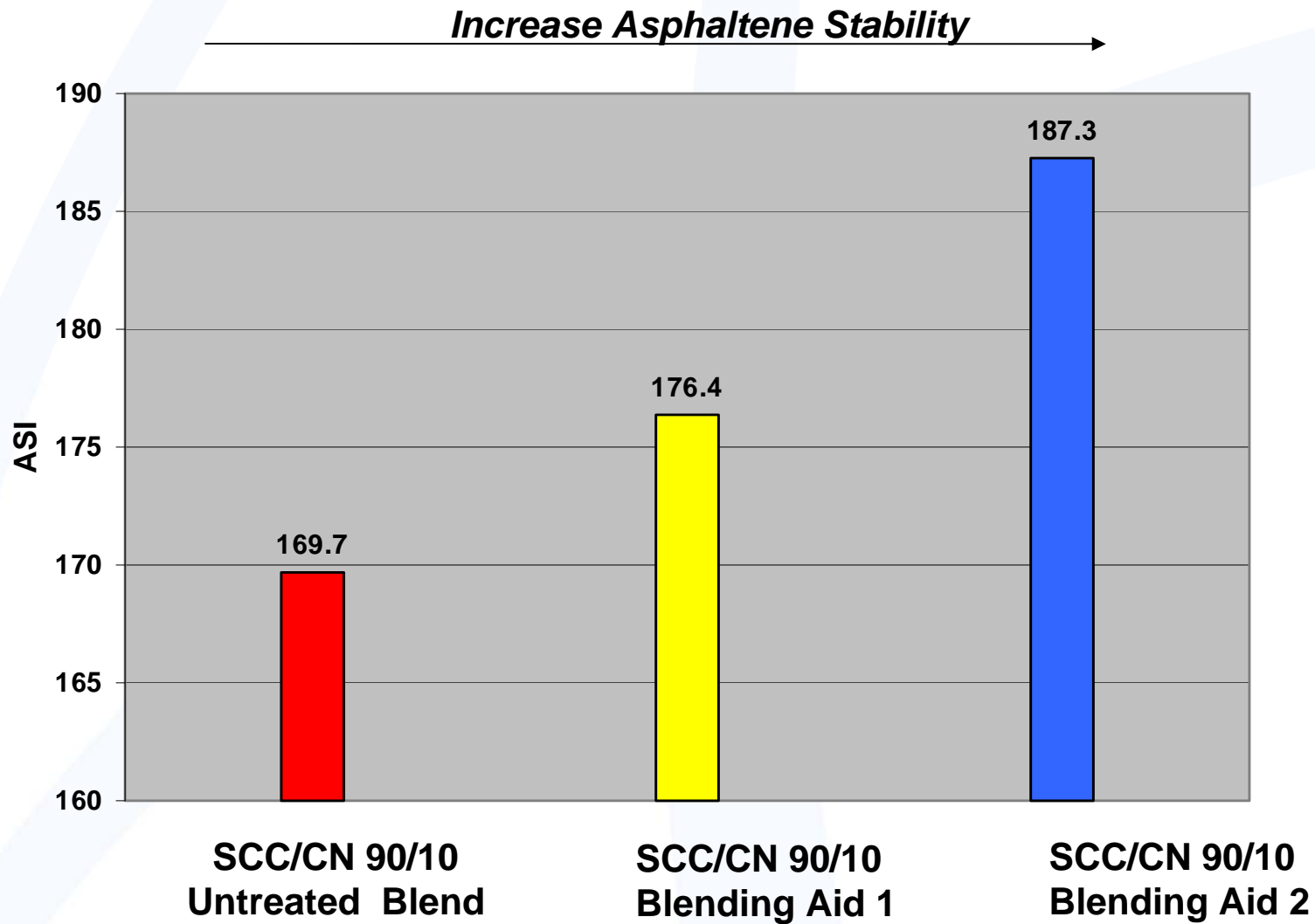
Samples Investigated for Central US Refinery

Tested Crude Samples	Ratio (%)
Synthetic Canadian Crude (SCC)	100
SCC/CN	95/5
SCC/CN	90/10
SCC/CN + Blending Aid # 1	90/10
SCC/CN + Blending Aid # 2	90/10

ASIT Results for Central US Refinery: SCC & SCC/CN



ASIT Data on SCC/CN Upon Chemical Treatment



Baker Hughes Solution: Desalter Upset Case Study

- Blending Aid # 2 was selected and applied in the SCC tank continuously at 24 ppm
- Resolution of rag layer achieved after one week; decreased from 5 ft to 10 in
- Demulsifier dose reduction from 12 to 9 ppm was applied
- Improvement in water quality

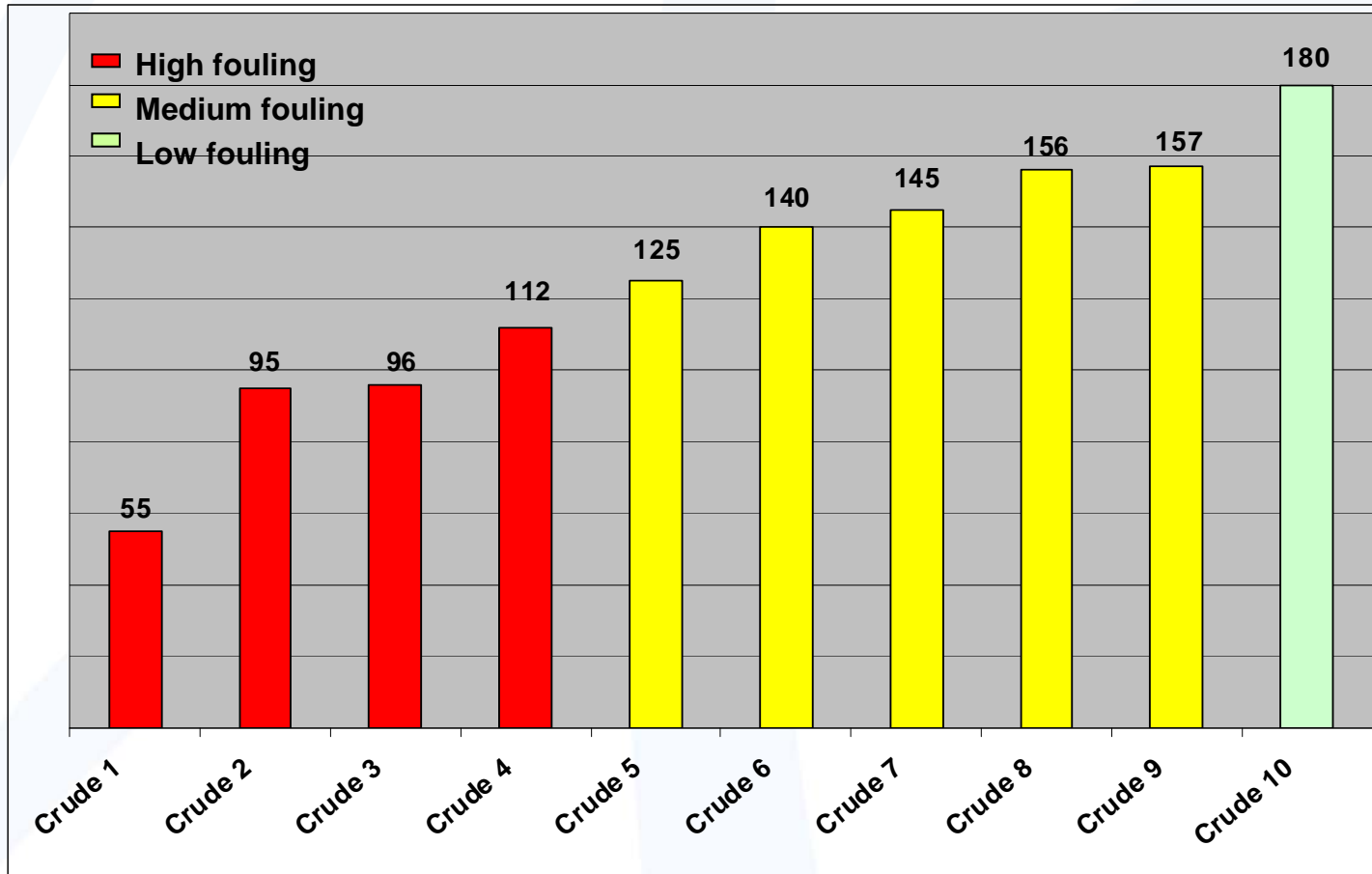
Crude Oil Blend Study

- Texas Gulf Coast refinery
 - Diversify the selection & blending of crude feedstocks
 - Avoid desalter upsets due to changes in the crude slates
- Baker Hughes approach
 - Perform a study on the asphaltene stability of the new crude selections
 - Test a series of crude blends to determine the most optimum blending ratio

ASIT Trend on Crude Oil Stability

Crude Stability Trend: Higher Stability, Higher ASI →

ASI

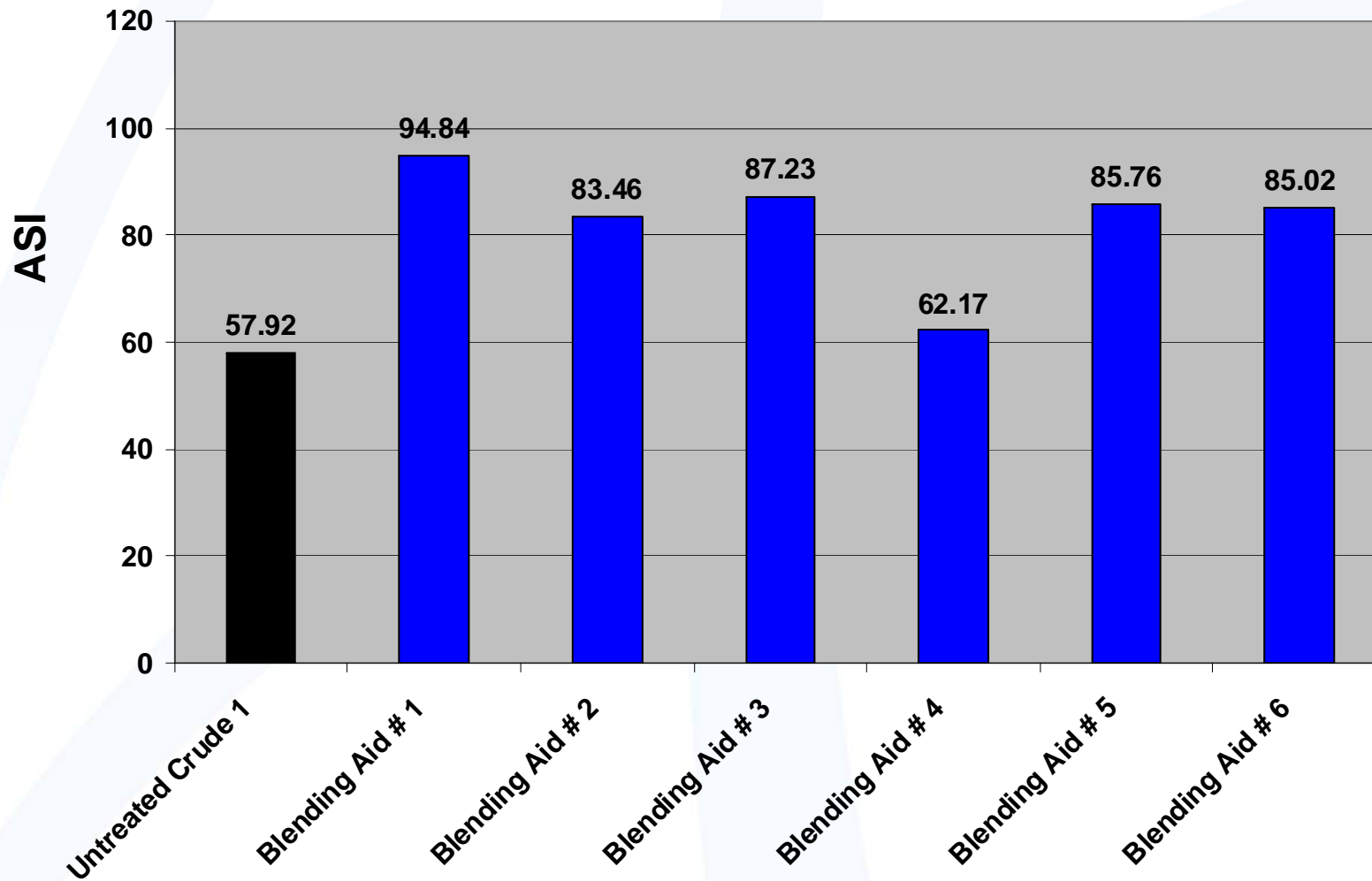


Field Results: One Day



ASIT Response Upon Chemical Treatment

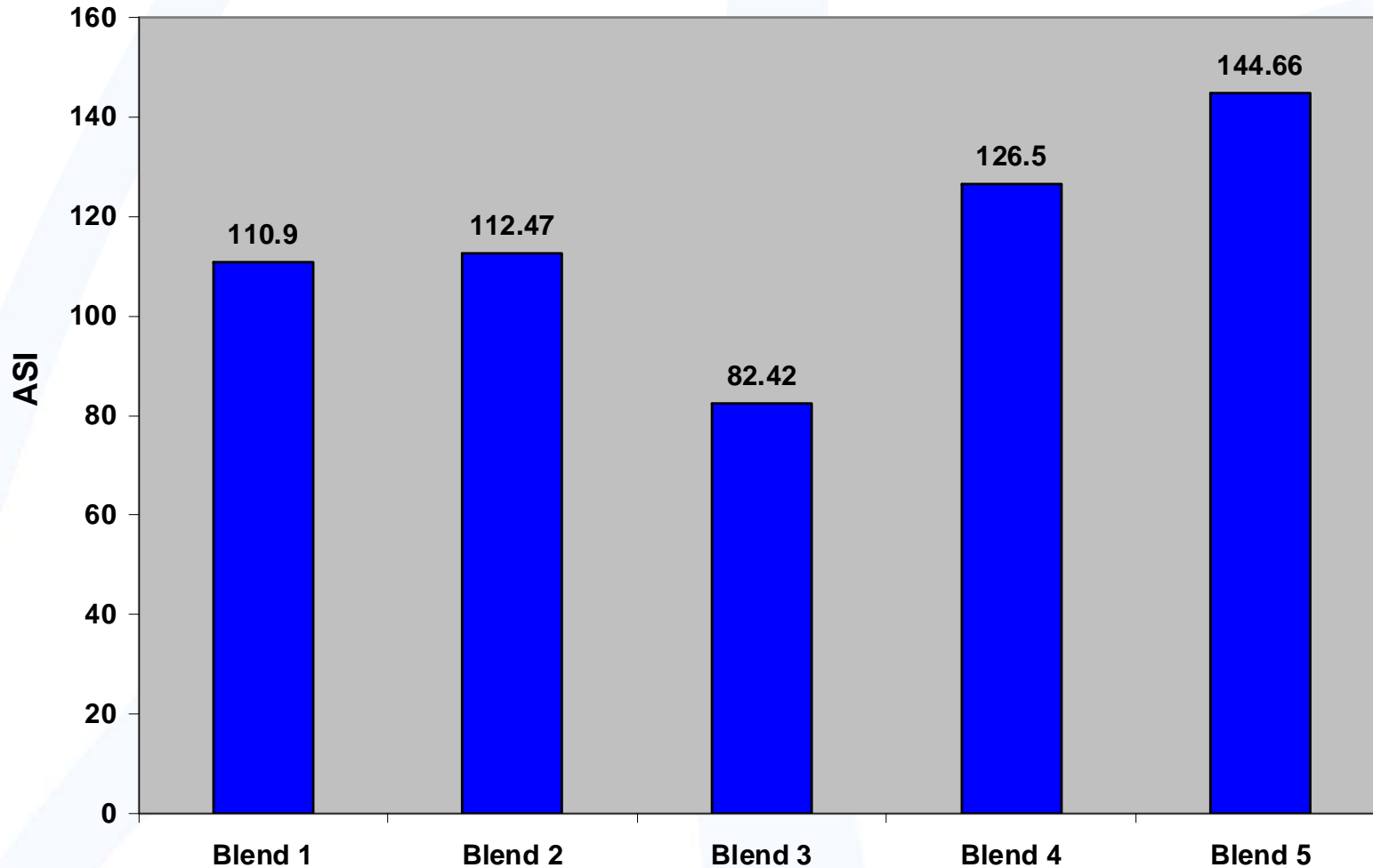
64% Improvement



Field Results



ASIT Results on Crude Oil Blending Study



Field Results: Customer Crude Blends



Baker Hughes Solution: Blending Crude Oil Case Study

- Identification of the most unstable crude was done
- Chemical treatment solution was identified and recommended
- Blending optimization study identifies the most unstable/stable blends

Field ASIT Services Technology Offers

- Flexibility in selecting feedstocks
- Ability to optimize the blend feedstock ratios
- Capability of selecting appropriate chemical solutions and optimum additive amount
- Fast response & implementation
- Customized solutions
- Energy savings
- Increased throughput (most important)

Targeted Applications

- Compatibility/stability of crude oil
 - Oil may be asphaltene unstable
 - Blending may cause destabilization of asphaltenes
- Desalter upsets due to asphaltene destabilization
- Heat exchangers fouling
- Continuous application monitoring

Thank You



corina.sandu@bakerhughes.com

