CNS SIMDIS: FAST QUANTITATIVE BOILING POINT DISTRIBUTION DATA FOR CARBON, SULPHUR AND NITROGEN FOR CRUDE OIL

Rob de Jong
PAC

Wed Nov 29th, 1.30 - 2.00 pm, Room 3.
OUTLINE

• Crude Value (Why CNS)?
• CNS SIMDIS Solution
• Scope & Performance
• Benefits
• Example data
• Q&A
THE VALUE IN CRUDE
NO CRUDE IS THE SAME...
**Differentiator** | Δ | **Price effect**
--- | --- | ---
API | +1° | 0.007 US$/$/ Brent
Sulphur | +1% | -0.056 US$/$/ Brent
TAN | +1 unit | -0.051 US$/$/ Brent

**Example**

1 barrel Crude | +1% Sulphur | Exp price delta -2.8 US$
Brent price level = | (All other parameters identical) | → 47.2 US$ (-5.6%)
50 US$/barrel

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*Crude intake value makes a significant impact on Refining Margins!*
*To know that value fast, allows for making that difference in Profit!*

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*Crude Oil Price Differentials and Differences in Oil Qualities: A Statistical Analysis.*
ESMAP Technical paper October 2005
THE VALUE IN CRUDE
DISTILLATION OPTIMIZATION

- Cut points driven by Boiling Point
- Specs driven by Sulfur/Nitrogen Content
THE VALUE IN CRUDE
LOOK-ALIKES AND BLENDS

REFINERS MUST KNOW IMPORTANT CRITERIA

Major Criteria to Consider for Crude Selection & Blending

- Total acid number (FAN)
- API gravity
- Compatibility
- Asphaltenes content
- Contaminants
- Carbon footprint
- Desirable cuts
- Paraffin content

Look-Alike of:
ANS
LLS
WTS

OPPORTUNITY CRUDES MANAGEMENT SEMINAR SERIES VIDEO #5: “WE ARE NOT COMPATIBLE” COPYRIGHT @HYDROCARBON PUBLISHING COMPANY
THE VALUE IN CRUDE
REFINERY RISK & INCOMPATIBILITY

• Regulations (Sulfur)
• Catalyst Poisoning (Sulfur)
• FCC units catalyst deactivation (Nitrogen)
• Salt Formation (Nitrogen) - heat exchanger fouling or filter blockage

• Compatibility?
• Product Value?
• Up-time?
• Process Control?
• Cost of Processing?
CNS SIMDIS

SOLUTION DESCRIPTION

CNS SIMDIS

- Delivers Quantitative data on S/N vs boiling point in 30 mins
- Can be compared to traditional Crude Assay (for BP, S & N)
- Provides Better understanding on Crude Oil input quality, modeling & Blending

- Lowers down-times
- Decreases Cost of Labor
- Optimizes product value within specification

→ Improve Refinery Profit
CNS SIMDIS

- Proven SIMDIS & SeNse Chemiluminescence Detector Technology
- Post-column Vent, Microfluidics splitter
- DHA FE optional for <C9 information
- Low Temp (middle Distillates) or High Temp Solution (Crude)
- Complies to D7807, Analog to other key SIMDIS methods
BENEFITS

• Fast decision making: <30 minutes analysis time
• Less sample required: <10 ml
• Accuracy / Precision <10% RSD
• High Resolution Sulfur and Nitrogen data by boiling point or carbon number easily accessible
• Typical SIMDIS Reporting w. export functions.
• Minimal technician/chemist training required
• Automation.
• Safety! No CS2 is used.
<table>
<thead>
<tr>
<th>CNS SIMDIS Application Range</th>
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<tr>
<td><strong>Method</strong></td>
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<tr>
<td>Carbon Number Range</td>
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<tr>
<td>Sample Range</td>
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<td>Sample Boiling Range</td>
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<td>Sample Injection</td>
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EXAMPLE DATA

TYPICAL RESULTS
CALIBRATION / LINEARITY

CALIBRATION Graph for Sulphur

CALIBRATION Graph for Nitrogen
### Repeatability

<table>
<thead>
<tr>
<th>Crude Oil 1</th>
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<th>N</th>
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<tbody>
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<td>797</td>
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<td>1373</td>
<td>855</td>
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### Reproducibility

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<td>2.5%</td>
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CNS VS COMBUSTION UVF

**Correlation CNS vs Combustion UVF**

- **% Sulphur - 15 crudes (Subset of 400)**
  - $R^2 = 0.9987$
- **% Nitrogen - 15 crudes (Subset of 400)**
  - $R^2 = 0.9815$

CNS SIMDIS Compares very well with Combustion UVF.
CRUDE COMPOSITION

Distribution Of Sulphur by BP Fraction by CNS SIMDIS/XRF
10 different Crudes

- Blue: Naphta (<165°C)
- Orange: Kero 165-270°C
- Gray: Diesel (270-370°C)
- Yellow: VGO (370-565°C)
- Light Blue: Vac Residue

www.paclp.com
CNS SIMDIS VALUE

Efficient
Reliable
Actionable Information
Proven Technology

Turnkey
Easy to use
Fast / Automated

- Optimize Crude Input Understanding/Blending
- Fast, Low cost, Easy Crude Assay Alternative
- Improve Refinery Profit
- Final Product Quality Control