

Crude Oil Properties & Their effect on LP

- Basic overview of LP
- LP Assay Data Base
- Crude Properties impact on LP
- Top 5 Ranking

Crude Oil Properties & Their Effect on LP

Basic Overview

- Mathematical model for a process.
- Model is used in a number of industries; refining, chemical plant, distribution network or any other situation with variables and constraints.
- Our focus is the refining LP
- Consists of many spreadsheets with various information such as:
 - refining kit structure, refining process constraints, logistics, crude quality(assay), marketing information, etc..
- Linear mathematics applied to optimize operation of refinery(s).

Crude Oil Properties & Their Effect on LP Assay Data Base

- “Raw” Crude properties are extracted from actual crude assays, formatted or redefined and stored in the LP assay data base.
- LP assay data base is used to provide crude assay data to the model in the form of cut yields and cut properties.
- Typical LP crude assay data base includes the following properties:
 - Distillation (TBD), Gravity, Sulfur, $N + 2A$, $N - 3/A$ (N= naphthenes, A= aromatics), Pour Pt., Viscosity, Con Carbon, Nitrogen, K-factor (Mean Avg Boiling Pt & gravity), Cetane, Smoke pt, Benzene, Aromatics, Flash Pt, Cloud Pt, Freeze Pt, Nickel, Vanadium, Nickel
- Each property has a significant impact on refinery operations and product yields.

Crude Oil Properties & Their Effect on LP

<u>Crude Property</u>	<u>Impact</u>
Distillation	Intermediate and product yields Cat cracker yields via K-factor (MABP)
Gravity	Cat cracker yields Coker yields Product qualities (blending impact)
Sulfur	Product quality Cat cracker yields
$N + 2A$ (Naphthenes + 2*Aromatics)	Reformer severity & rate
$N - 3/A$ (Naphthenes - 3/Aromatics)	Reformer H ₂ production

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<u>Crude Property</u>	<u>Impact</u>
Pour Pt	Diesel pour pt
Cetane	Diesel Cetane
Cloud Pt.	Diesel Cloud pt.
Freeze Pt.	Jet Freeze pt.
Smoke Pt.	Jet Smoke pt.
Viscosity	Jet & Diesel viscosity
Flash Pt.	Jet & Diesel Flash pt.

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<u>Crude Property</u>	<u>Impact</u>
K-factor	Cat Cracker yields
• function of MABP & gravity	Coker yields
Total Nitrogen	Cat Cracker yields, significant
Con Carbon	Cat Cracker yields Cat Cracker heat balance/operations Coke production
Nickel	Cat Cracker yields Coke quality
Vanadium	Cat Cracker yields Coke quality
Aromatics & Benzene	RFG Gasoline

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Top Five Ranking

Distillation

Nitrogen

K-Factor

Con Carbon

Gravity