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Variable Margin Methodology: Base Oils North America

ICIS
Independent Commodity Intelligence Services

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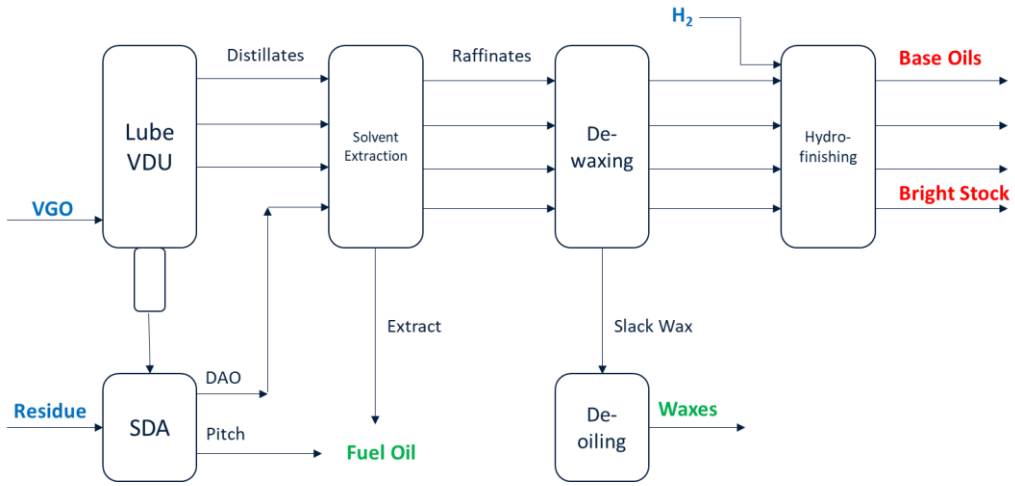
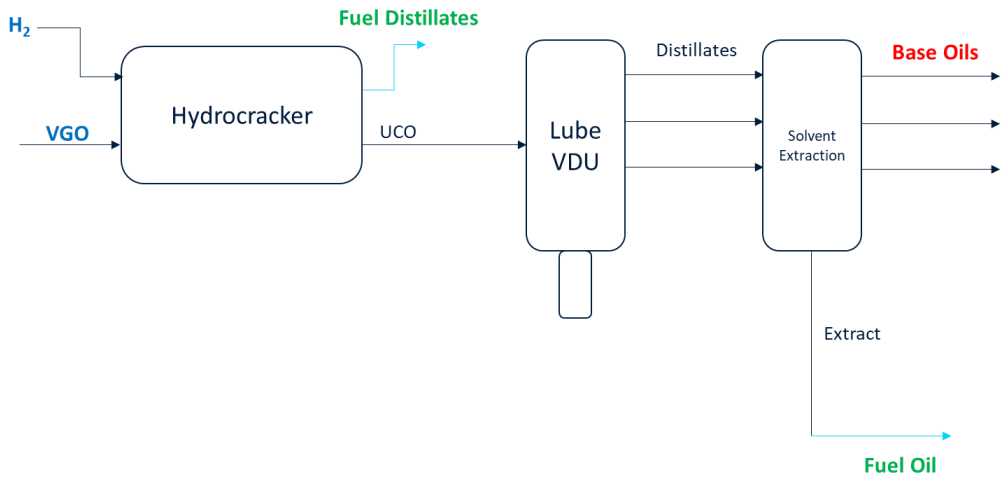
THE BUSINESS MODEL

The diagrams below show the typical production processes for Group I, II and III base oils. Group I uses Vacuum Gas Oil (VGO) and atmospheric residue (AR) as feeds. Group II uses VGO as feed. VGO and AR are derived from the fractionation of crude oil. Group III feed is defined as unconverted oil (UCO) the heavy ends from the bottoms of a VGO hydrocracking unit (note UCO is an intermediate stream in Group II operation, but the subtleties of feed quality and processing in the hydrocracking unit are different for each configuration). In Group I we assume key products as a mix of various viscosity Group I products (including Brightstock). Group I has co-products of Pitch and Extracts (both represented in this model by Fuel oil pricing, but extracts can have significantly higher value if certain quality requirements are met) and Wax. Group II and III produce a range of viscosity material in the relevant group as the key products, with fuel distillates (naphtha and diesel) as the coproducts. Hydrogen is required at varying levels in all processes.

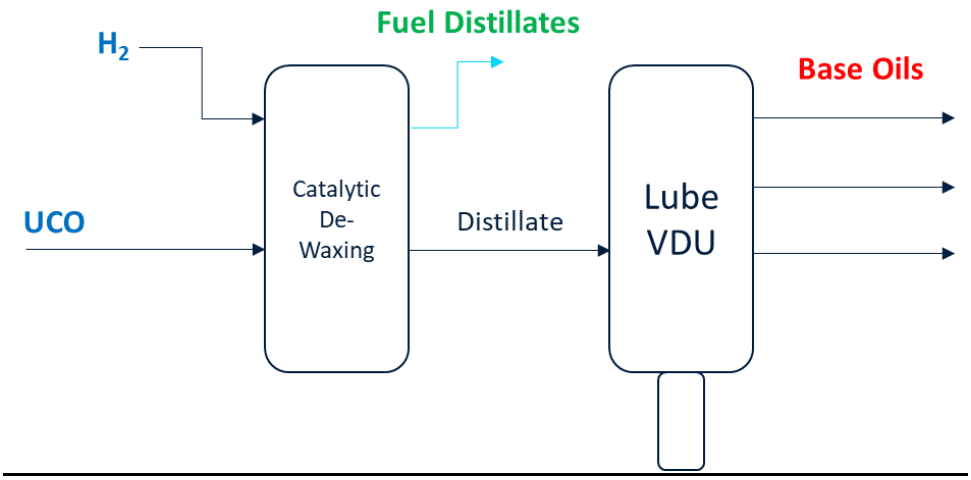
Group I:



Group II:



GROUP III:



THE MARGIN CALCULATION

- The margin measure provides an assessment of the ex-works cash margin obtained for the product over raw material costs, credit for selling co-products and key variable manufacturing costs, including power and steam, chemicals and catalysts. This measure can also be termed as a variable margin, contribution or benefit.

- This margin measure provides simple signals on the direction of business margins as dictated by the environment, thus informing market positioning by sellers, buyers and traders.

- ICIS does not model beyond raw material costs, credit for selling co-products and key variable manufacturing costs. Further analysis would cease to be generic to the industry and would be highly specific to individual business operations, their site structure, location, ownership and financial structures. Such detail would not fairly reflect or be applicable in a wider industry context. It may also be more subjective, open to fair challenges and not feasible to reference in commercial discussions.

- ICIS models plant operations for a series of 'representative' plants around the world. These representative plants have no flexibility with respect to feedstock or process configuration and ICIS assumes the plants to be purchasing inputs and selling outputs at constant prices.

- As the process model is generic and not based on any individual operation, the contribution measure is indicative. Instead of absolute value terms, it is most valuable as an index and in step-change terms.

- ICIS plant manufacturing and feedstock yield assumptions incorporate data from Intratec (www.intratec.us), an independent provider of chemical production cost reports.

- Ex-works product price assessments link to ICIS pricing quotations for large-volume commodity products, with netbacks assessed using the ICIS petrochemicals logistics model. To estimate representative transport costs, the ICIS logistics model considers a network with nodes at individual production sites connected by streets and ports linking each continent. The logistics model incorporates shipping data from Xeneta (www.xeneta.com), and duties data from SimplyDuty (www.simplyduty.com).

The calculation below shows how ICIS derives the base oils group I margin for a unit on the US Gulf. The example is based on spot sales prices, is denominated in US dollars per tonne, and uses average prices for the year 2017.

Group I margin ($/tonne)

Group I spot price	822
Logistics costs/netbacks	(3)
Group I product value	**819**
Co-products value	**326**
Total income	**1145**
Purchased feedstocks	618
Utilities	178
Variable costs	**796**
Group I variable margin	**1,145 – 796 = 349**

MODEL YIELD PATTERN AND CALCULATION

Plant manufacturing data relates to the variable cost components of base oil plant operations. Yield pattern data relates to the overall material balance of the base oils unit. For example, for one tonne of base oils produced (mixed viscosities), a Group I unit might use approximately one and a half tonnes of VGO/AR as feedstock. In addition to the base oils, the unit will produce around half a tonne of co-products (including wax and fuel oil).

ICIS analytics provides the plant manufacturing and feedstock yield data used in the model.

- The base oils margins are calculated for the following production processes:
    - Group I
    - Group II
    - Group III
- Due to the different base oil yield patterns for Group I, II and III, a comparative analysis is not a simple case of comparing base oil price differences but must consider the different co-product credits and amounts of feed required.
- This analysis demonstrates business volatility and the influence of price floors (as an uneconomic margin generally forces supply reductions). A further influence is the overall regional trade balance. All pricing is based on domestic sales, but, in particular, a large amount of Group I is exported, generally at a discount to domestic pricing and hence a healthy margin domestically may still lead to a poor export position and supply limits.

ASSESSMENT INPUTS

ICIS uses the following inputs to generate the full content of the ICIS Base Oils North America margins

US GULF

- Gasoil High-Sulphur Vacuum FOB USG Assessment Spot Full Market Range Weekly (Mid) : (converted from USD/US gal to USD/tonne)
- Gasoil Low-Sulphur Vacuum FOB USG Assessment Spot Full Market Range Weekly (Mid) : (converted from USD/US gal to USD/tonne)
- Base Oils Group I SN150 FOB USG Assessment Spot 2-6 Weeks Full Market Range Weekly (Mid) : (converted from USD/US gal to USD/tonne)
- Base Oils Group I SN500/550 FOB USG Assessment Spot 2-6 Weeks Full Market Range Weekly (Mid) : (converted from USD/US gal to USD/tonne)
- Base Oils Group I Brightstock FOB USG Assessment Spot 2-6 Weeks Full Market Range Weekly (Mid) : (converted from USD/US gal to USD/tonne)
- Base Oils Paraffinic Group II N200/220 FOB USG Assessment Market Spot 2-6 Weeks Full Market Range Weekly (Mid) : (converted from USD/US gal to USD/tonne)

- Base Oils Paraffinic Group II N600 FOB USG Assessment Market Spot 2-6 Weeks Full Market Range Weekly (Mid) : (converted from USD/US gal to USD/tonne)
- Base Oils Group III 4cSt FOB USG Assessment Spot 2-6 Weeks Full Market Range Weekly (Mid) : (converted from USD/US gal to USD/tonne)
- Base Oils Group III 6cSt FOB USG Assessment Spot 2-6 Weeks Full Market Range Weekly (Mid) : (converted from USD/US gal to USD/tonne)
- Base Oils Group III 8cSt FOB USG Assessment Spot 2-6 Weeks Full Market Range Weekly (Mid) : (converted from USD/US gal to USD/tonne)
- Naphtha Open Spec Physical FOB ARA Assessment Barges Spot 0-4 Weeks Closing Value Daily (Mid) : USD/tonne
- Diesel Low Sulphur, Europe FOB USG Assessment Spot Closing Value Daily (Mid) : USD/tonne
- Fuel Oil Paraffinic 3.0% FOB USG Assessment Spot 2-6 Weeks Full Market Range Weekly (Mid) : (converted from USD/US gal to USD/tonne)
- Paraffin Wax MP 125F (52°C)-140F (60°C) FOB USG Assessment Spot 4-6 Weeks Full Market Range Weekly (Mid) : USD/tonne

The methodology associated with each ICIS pricing individual quotation referenced above can be found on the ICIS Compliance and Methodology website.

In addition to the listed ICIS pricing inputs, the model also takes into account logistic costs (calculated through the ICIS logistics model), and utilities costs.

A key objective of the calculation process is to provide a weekly summary that strongly aligns to the reported market price positions on the date of release.

Where inputs are unavailable for individual weeks, e.g. due to public holidays, prior-week data is carried forward to the current week. This is for the specific purpose of populating the model and preventing model inconsistency. This form of data interpolation infers some limited data points that may not be market derived, and customers should be aware of this assumption.

As the majority of petrochemical trades are in US dollars, all data used in the ICIS Margin – Base Oils North America model are denominated in USD unless specifically stated otherwise.

NORTH AMERICA WEBPAGE

Filter data on the website using the following criteria.

- **Area:** Select US Gulf.

- **Product:** Select Group I, Group II or Group III
- **Process type:** There is currently only one process available for each base oil group.
- **Price terms:** Variable margins are generated for spot price terms only
- **Frequency:** Viewable with weekly, monthly, quarterly, or yearly granularity.
- **Currency:** Allows prices to be displayed in either EUR or USD.
- **Unit:** Allows conversion from displayed unit to unit of choice in data download only.

Variable margins data are available online from January 2014 onwards. One year of trailing data shows as default.

The website deploys the following data, all per tonne of base oil:

- **Main product value, ex-works:** the estimated base oil netback value for the producer, taking into account the ICIS assessed price, shipping costs, handling costs and applicable duties.
- **Co-product credits:** the revenues from the other products generated in a process, also ex-works. This data is also available broken down into co-product types.
- **Feedstock and utility costs:** or total variable input costs for a process. This data is also available broken down into the component feedstock costs and utility costs.

Calculated outputs are:

- Variable cost = [Feedstock and utility costs] – [Co-product credits]

- Variable margin = [Main product value] + [Co-product credits] – [Feedstock and utility costs]

A selected variable margin (i.e. a margin for a specific location, process and price term) is comparable with margins of different process technologies in the same region, and with margins using the same technology in different regions. Subscribers can review margin performance by week, month, quarter and per annum. Subscribers can view the flows of different products, in terms of their volume and value, into and out of the representative production unit used to calculate base oil variable margin.

PUBLICATION FREQUENCY

The ICIS Weekly Margin – Base Oils North America model is based on the latest data at the close of business in UK on Friday and released to customers

on the following Monday, along with written commentaries, subject to schedule planning. When the Monday is a public holiday in the UK, commentaries will be made available the following day. Updates are not published on some public holidays. Holiday dates and days of publication may be subject to revision.