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Ethylene Glycol Asia Variable Margin Analytics Methodology

ICIS
Independent Commodity Intelligence Services

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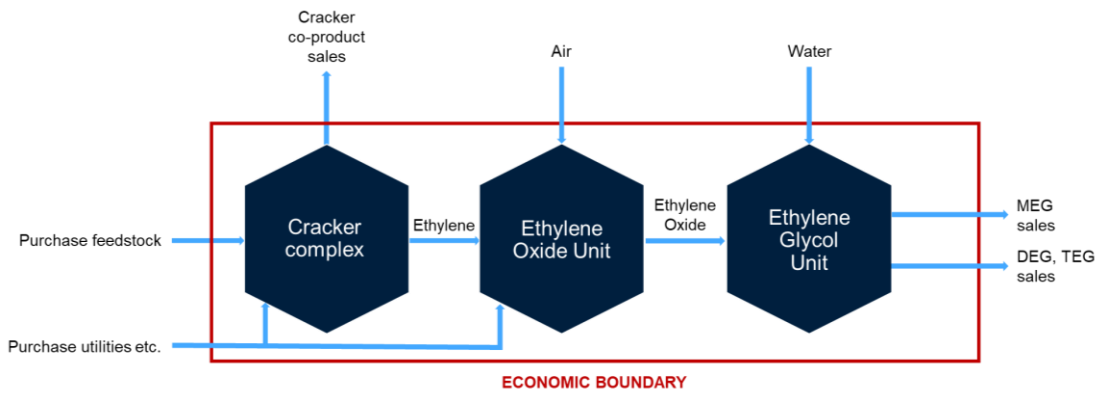
THE BUSINESS MODEL

The simplified diagram below shows the main method of making ethylene glycol (EG) starting from a steam-cracker.

Naphtha (or LPG, or ethane) with steam is fed into a cracker unit where ethylene and other co-products (such as propylene, butadiene, benzene, etc.) are made. The ethylene from the cracker unit is separated from the co-products and processed with oxygen to make ethylene oxide which is then hydrolysed to produce EG and higher molecular weight glycols including diethylene glycol (DEG) and triethylene glycol (TEG). The cracker co-products are also separated, and either sold for use in other chemical plants or used as fuel.

A simplified illustration of material flows is as follows:



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 ethylene glycol margin (feedstock naphtha) for Asia. The example is based on spot sales prices, is denominated in US dollars per tonne, and uses average prices for the year 2017.

Naphtha-based cracker margin ($/tonne)

EG spot price		851
EG product value		**851**
Co-product sales		**658**
Total income		**1,509**
Purchase feedstock (naphtha)		876
Utilities		66
Variable costs		**942**
Ethylene glycol margin	1,509 – 942	**= 567**

MODEL YIELD PATTERN AND CALCULATION

Plant manufacturing data relates to the variable cost components of the cracker operations. Yield pattern data relates to the overall material balance of the cracker unit. For example, for 1 tonne of ethylene glycol produced, a cracker will use approximately 1.5 tonnes of naphtha as feedstock. In addition to the 1 tonne of ethylene glycol, the cracker will produce around 3 tonnes of co-products (including diethylene glycol, triethylene glycol, propylene, butadiene, benzene, raffinate-1, pygas and a fuel export balance).

- Naphtha is the dominant cracker feedstock in Asia. ICIS also models LPG feedstocks (propane and butane) as some cracker units are flexible, and able to increase LPG usage when economically favourable. Additionally, methanol is used as a feedstock in some ethylene production facilities.
- Ethylene margins are calculated for four different production processes in North East Asia:
    - LPG Ethylene Glycol Generic
    - Naphtha Ethylene Glycol Generic
    - Standalone Ethylene Glycol Generic
    - Methanol Ethylene Glycol Generic
- Naphtha steam cracking with benzene and butadiene extracted Due to the different cracker yield patterns when using naphtha, LPG, or methanol feedstocks, a comparative analysis is not a simple case of comparing feedstock price differences, but must take into account the different co-product credits.
- This analysis demonstrates business volatility and the influence of price floors (as an uneconomic margin generally forces supply reductions).

ASSESSMENT INPUTS

The following pricing inputs are used to generate the full content of the ICIS Weekly Margin – Ethylene Glycol Asia report:

NORTHEAST ASIA

- Ethylene glycol in China Spot CFR (close-weighted weekly range) ($/tonne)
- Diethylene glycol in China Spot CFR (close-weighted weekly range) ($/tonne)

- Naphtha in Asia Pacific Spot CFR Japan (ICIS pricing, Friday assessment) ($/tonne)
- Propane spot CFR Japan/Korea (refrigerated cargo) ICIS Pricing, (weekly average) ($/tonne)
- Propane spot CFR China (refrigerated cargo) (ICIS pricing, weekly average) ($/tonne)
- Butane spot CFR Japan/Korea (refrigerated cargo) (ICIS pricing, weekly average) ($/tonne).
- Butane spot CFR China (refrigerated cargo) (ICIS pricing, weekly average) ($/tonne)
- Methanol in China spot CFR, Assessment, Specific Origins, 2-9 Weeks, Full Market Range, Weekly, CFR China ($/tonne)
- Ethylene in Asia Pacific Spot CFR NE Asia (ICIS pricing, weekly average) ($/tonne)
- Propylene in Asia Pacific Spot CFR China Main Port (ICIS pricing, weekly average) ($/tonne)
- Butadiene in Asia Pacific Spot CFR NE Asia (ICIS pricing, weekly average) ($/tonne)
- Benzene in Asia Pacific Spot CFR Main China Ports (ICIS pricing, Friday assessment) ($/tonne)
- Gasoline 92 Spot CFR China (ICIS pricing, weekly average) ($/bbl)
- 180 CST FOB Singapore Spot (weekly assessment) ($/tonne)

The methodology associated with each individual ICIS pricing quotation referenced above is available on the ICIS Compliance and Methodology website.

In addition to the listed ICIS pricing inputs, the model also takes into account logistics costs (calculated through the ICIS logistics model), and utility 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 – Ethylene Glycol Asia model are denominated in USD unless specifically stated otherwise.

ETHYLENE ASIA WEBPAGE

Filter data on the website using the following criteria.

- **Area**: Ethylene glycol variable margins are generated only for North East Asia.
- **Process type**: Select from LPG ethylene glycol generic, naphtha ethylene glycol generic, methanol ethylene glycol generic, and standalone ethylene glycol generic.
- **Price terms**: Variable margins are generated only for spot price terms.
- **Frequency**: Viewable at weekly, monthly, quarterly, or yearly granularity.
- **Currency**: Allows conversion from displayed currency to currency of choice.
- **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 ethylene.

- **Main product value, ex-works**: the estimated ethylene 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, quarterly 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 the ethylene variable margin.

PUBLICATION FREQUENCY

The ICIS Weekly Margin – Ethylene Glycol Asia model is based on the latest data at the close of business in Asia 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. ICIS does not publish an update on some public holidays. Holiday dates and days of publication may be subject to revision.

The new margins feature allows users to select data for the period they are most interested in from January 2014 onwards. Key margins data includes the calculated margins, feedstock and utility costs and the assessed ex-works values for co-product credits and ethylene glycol on a weekly basis. Combined with relevant price history series, also available via ICIS dashboard, this allows subscribers to manipulate ICIS data more easily than was previously possible.

The previous ICIS Weekly Margin – Ethylene Glycol Asia report and model will be retired in 2Q 2019 and replaced with the model outlined above, after formal launch of the new margins feature. Customers will be notified in advance.

From late September 2015, ICIS made available its margin series for download in Excel format. Each week subscribers were able to download the latest 12 months' of weekly data for the calculated margins, the feedstock costs and, where applicable, the co-product credit values. These historic reports will remain available in their current location until further notice.