

Ethylene China Margin Report Methodology

30 September 2015

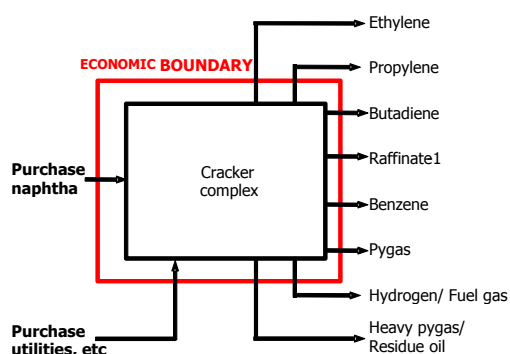


This document is intended to provide methodology support for customers receiving the ICIS Margin – Ethylene China report.

THE BUSINESS MODEL

The simplified diagram below shows the main method of making ethylene from naphtha, a product mainly derived from crude oil. Naphtha with steam is fed into the cracker unit where ethylene and other co-products (such as propylene, butadiene and benzene) are made. The ethylene from the cracker unit is separated from other co-products and then typically piped to other chemical plants where it is further processed into derivative products such as polyethylene. The other co-products are also separated and sold for use in other chemical plants or used for fuel.

A simplified illustration of material flows is as follows:



THE MARGIN CALCULATION

- Margin measure provides 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 such as power and steam. This measure can also be termed as a variable margin, contribution or benefit.
- It represents a cash margin measure available for supporting the direct and allocated fixed manufacturing costs, working capital, taxes, royalties, corporate costs, debt service costs, capital costs and owner's returns from the business, which are not included.
- This margin measure provides simple signals on the direction of business margins, as dictated by the environment alone, thus informing market positioning by sellers, buyers and traders.
- ICIS chooses not to model beyond raw material costs, credit for selling co-products and key variable manufacturing costs as this ceases to be generic to

the industry and 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.

- In this analysis, ethylene is assumed to be a pipeline stream. The netbacks used take account of local tariffs and handling charges.
- Plant manufacturing and feedstock yield model data has been provided by Linde Engineering, a division of Linde AG. Linde Engineering (www.linde-engineering.com) is a leading international chemical plant designer, process engineering, procurement and construction contractor. It has extensive experience in ethylene plant design.
- The process model is generic and not referenced to any individual operation, so that the contribution measure is only indicative. It can be most valuably referenced in index and step-change terms as opposed to absolute value terms.
- Ex-works product price assessments are linked to domestic pricing quotations for large-volume commodity products with netbacks assessed using typical local tariff and logistic cost assessments.

Below is a detailed calculation of how the ethylene margin is calculated for China. The figures refer to averages for 2012. Figures indicated in red are those found in the tables of the margin report; others relate to underlying assumptions of the model.

Ethylene margin calculation (\$/tonne) – averaged for 2012

Ethylene ex-works price	1,283
Purchase feedstock (naphtha) ¹	(3,165)
Co-product sales ²	<u>2,285</u>
	(879)
Ethylene margin	404

¹The model assumes 3.278 tonnes of naphtha are required to produce 1 tonne of ethylene. The average net naphtha price (including handling costs) for 2012 was \$965/tonne.

²Co-product sales include credits for propylene, butadiene, raffinate-1, benzene, pygas and a fuel export balance.

Note: “Ethylene cost naphtha feed” is the difference between the purchase feedstock costs (\$3,165/tonne ethylene) and the co-product credits (\$2,285 /tonne ethylene), ie \$879/tonne ethylene.

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 produced, a cracker requires 3.2 tonnes naphtha feedstock, and will produce co-products (such as but not limited to propylene, butadiene and benzene) of 2.2 tonnes in addition to the 1 tonne of ethylene. This plant manufacturing and feedstock yield model data has been provided by Linde Engineering, a division of Linde AG.

- Naphtha is the dominant cracker feedstock in China.
- This analysis demonstrates the volatility of the business and the influence of price floors since an uneconomic margin generally forces supply reductions.

The exact yield patterns of the cracker used cannot be published in an unrestricted document such as this methodology statement. However, for ICIS Weekly Margin – Ethylene China report subscribers with a specific requirement to see this data, it can be shared on a case-by-case basis.

Please contact the [Global ICIS Customer Support Centre](#) if this data is required.

ASSESSMENT INPUTS

The following pricing inputs are used to generate the full content of the ICIS Weekly Margin – Ethylene China report.

- Naphtha in China ex-works price (ICIS China monthly assessment) (\$/tonne)
- Ethylene in China ex-works price (ICIS China weekly assessment) (\$/tonne)
- Propylene in China ex-works price (ICIS China weekly assessment) (\$/tonne)
- Butadiene in China ex-works price (ICIS China weekly assessment) (\$/tonne)
- Benzene in China ex-works price (ICIS China weekly assessment) (\$/tonne)
- Toluene in China ex-works price (ICIS China weekly assessment) (\$/tonne)
- Gasoline 90 Unleaded China ex-works price (ICIS China weekly assessment) (\$/tonne)
- Fuel Oil in China ex-works price (ICIS China weekly assessment) (\$/tonne)

Note: assessed prices are for a typical producer in China, denominated in Chinese RMB converted to USD using weekly exchange rates and adjusted to remove VAT.

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

A key objective of the calculation procedure is to provide a weekly summary that is most strongly aligned to the reported market price positions on the date of publication.

Where price quotations are not available for individual days or weeks due to public holidays, then prior day or week data is carried forward for the specific purpose of populating the model and preventing model inconsistency. This form of data interpolation is inferring some limited data points that may not be market derived, and customers should be aware of this assumption.

All data in the ICIS Weekly Margin – Ethylene China report is denominated in US dollars.

PUBLICATION FREQUENCY

The ICIS Weekly Margin – Ethylene China report is produced on a Monday morning using prices from close of business the previous Friday in China and Asia and distributed to customers on the Monday afternoon, subject to schedule planning. When the Monday is a public holiday in China, the report is distributed on the following working day in China. The report is not published on some public holidays. Holiday dates and days of publication may be subject to revision.

For information on ICIS' full portfolio of margin reports, visit <http://www.icis.com/chemicals/channel-info-about/margin-reports/>