



ARGUS GLOBAL STEAM CRACKER ECONOMICS

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The most up-to-date Argus Steam Cracker Economics Reference and modelling approach guide is available on www.argusmedia.com

Petrochemical production economics

Argus publishes information about the economics of generalised petrochemical production units based on Argus' feedstock and petrochemical price assessments and a set of underlying assumptions outlined in this methodology.

Argus petrochemical production economics are not intended to represent the economics of any particular production unit and are based around a central model, adjusted for regional characteristics.

Argus petrochemical production economics are published via the Argus Direct online platform and are available through various Argus data feeds. Subsets of this data may be included in one or more Argus publications.

A publication schedule is available at www.argusmedia.com

Ethylene steam-cracker margins

Ethylene cash margins measure the profitability of producing ethylene from a variety of feedstocks in different regions, based on a central model.

The central model

Argus uses the same consumption factors and product yields for all regions to allow for an effective comparison across feedstocks and locations. The central model is designed to be regionally generic and not representative of a single technology.

The model calculates the cash cost of production in ethylene terms, less the value of co-products and returns a cash margin.

Assumptions included in the model are under continuous review and may be changed at any time.

Published margins

Argus publishes the following steam cracker economic data for the US, northwest Europe and Northeast Asia online (a selected subset are also published in the monthly Global Steam Cracker Economics report:)

- Co-product credit
- Variable cost
- Cash cost
- Cash margin
- Variable margin

Values are calculated daily for the US, weekly for Northeast Asia and monthly for northwest Europe. Monthly averages are published for each region.

Values are calculated and published in USD/t for all regions. In Europe €/t values are also published.

Economic data is published based on the the following feedstocks for each region:

US:

- Ethane
- Propane
- Ethane-propane mix
- Butane
- Light naphtha

Northwest Europe:

- Ethane
- Propane
- Butane
- Gasoil
- Naphtha

Northeast Asia:

- Ethane
- Propane
- Butane
- Gasoil
- Naphtha

US and Northeast Asia data is calculated and published on a gross basis. Northwest European data is published on a net contract basis.

Model parameters

All in USD/t ethylene unless stated.

Ethylene: the Argus assessment of the ethylene price per tonne, less a representative discount rate where described below and for net margin calculations only.

Ethylene logistics cost: an Argus assessment of the cost of ethylene logistics, includes an inflation adjustment

Capacity: assumed to be 700,000 t/yr in the US and 500,000 t/yr in Europe and 600,00t/yr in Asia

Capex costs: the sum of the following components

- **ISBL (USD mn):** inside battery line costs — assessed per million tonnes of capacity in the US and adjusted to other regions and for the assumed capacity of the plant, includes an inflation adjustment
- **OSBL (USD mn):** outside battery line costs — assessed per million tonnes of capacity in the US and adjusted to other regions and for the assumed capacity of the plant, includes an inflation adjustment
- **Other project costs (USD mn):** assumed to be 25pc of the ISBL and OSBL, includes an inflation adjustment

Feedstock costs: the sum of the following components

- **Feedstocks variable costs:** the Argus assessments for feedstocks (as outlined below) * the number of tonnes of that feedstock required to produce 1t of ethylene in the Argus model
- **Catalysts and chemicals:** the costs of chemicals and catalysts required to produce 1t of ethylene in the Argus model
- **Feedstocks logistics:** logistics costs for feedstocks required to produce 1t of ethylene in the Argus model * the amount of feedstock required to produce 1t of ethylene in the Argus

model, includes an inflation adjustment

Co-products: the sum of the following components

- **Propylene:** the Argus assessment of the propylene price (as outlined below) * the number of tonnes of propylene produced as a result of producing 1t of ethylene in the Argus model, less a representative discount rate for net margin calculations only
- **Butadiene:** the Argus assessment of the butadiene price (as outlined below) * the number of tonnes of butadiene produced as a result of producing 1t of ethylene in the Argus model less a representative discount rate for net margin calculations only
- **Raffinate-1:** the Argus calculation of the raffinate-1 price (as outlined below) * the number of tonnes of raffinate-1 produced as a result of producing 1t of ethylene in the Argus model
- **Pygas:** the Argus calculation of the pygas price (as outlined below)
- **Fuel credit:** the Argus assessment of the fuel price (as outlined below) * the amount of fuel produced as a result of producing 1t ethylene in the Argus model
- **Co-product logistics:** for each co-product a logistic cost per tonne is assumed for the Argus model and is multiplied by the amount of co-product produced as the result of producing 1t of ethylene — this figure is the sum of that outright dollar value for each of the co-products described above, includes an inflation adjustment

Utilities: the sum of the following components

- **Power:** Argus power price assessments (as outlined below) * the amount of electricity required to produce 1t of ethylene in the Argus model
- **Fuel:** the Argus assessment of the fuel price (as outlined below) * the number of tonnes of fuel oil required to produce 1t of ethylene in the Argus model
- **Other:** The Argus assessment of the fuel price (as outlined below) * a constant

Fixed costs: the sum of the following components

- **Labourer salary:** the cost of employing an assumed number of labourers at an assessed annual salary divided by the ethylene capacity of the facility
- **Foreperson salary:** the cost of employing an assumed number of forepersons at an assessed annual salary divided by the ethylene capacity of the facility
- **Supervisor salary:** the cost of employing an assumed number of supervisors at an assessed annual salary divided by the ethylene capacity of the facility
- **Maintenance:** a percentage based on the Argus model of the ISBL costs described above divided by the ethylene capacity of the facility
- **Overheads:** a percentage based on the Argus model of the labour and maintenance costs described above
- **Insurance and tax:** a percentage based on the Argus model of the capex costs described above divided by the ethylene capacity of the facility

Total cash cost: the sum of the variable costs and fixed costs described above

Cash margin: the Argus ethylene price per tonne (outlined below) minus ethylene logistics costs and minus the total cash cost

Currency conversion

Where required, Argus converts the currency of model inputs at the time each input is created, and before that input has been included in the model. For example, a daily electricity price will be converted using a daily exchange rate before being included in the model, and a monthly price will be converted using a month-average exchange rate.

Timing

Margins are calculated using the latest available Argus price assessments for feedstocks and product prices.

Monthly averages of daily (US) spot cracker margins are also published for the named month on the first working day of the next month. For example, the January average cracker margin will be published on the first publication date in February.

Monthly contract margins will be published for the named month on the first working day of the next month. For example, the January average cracker margin will be published on the first publication date in February.

Forecast

Each monthly report will contain a three-month forecast. For example, the February report will contain monthly steam cracker economics updated to January, with a forecast for February, March and April.

The forecasts are based on the latest Argus Outlook reports.

Selected forecast values are published in the monthly PDF report and the Data and Download spreadsheet, but are not published in the Argus Direct database.

Corrections to assessments

Argus will on occasion publish corrections after the publication date. We will correct errors that arise from clerical mistakes, calculation errors, or a misapplication of our stated modelling approach.

If an Argus price assessment or other input to the model is corrected, the model will be re-run and corrected values distributed to subscribers.

Ethics and compliance

Argus operates according to the best practices in the publishing field, and maintains thorough compliance procedures throughout the firm. We want to be seen as a preferred provider by our sub-subscribers, who are held to equally high standards, while at the same time maintaining our editorial integrity and independence. Argus has a strict ethics policy that applies to all staff. The policy can be found on our website at

www.argusmedia.com. Included in this policy are restrictions against staff trading in any energy commodity or energy related stocks, and guidelines for accepting gifts. Argus also has strict policies regarding central archiving of email and instant messenger communication, maintenance and archiving of notes, and archiving of spreadsheets and deal lists used in the price assessment process. Argus publishes prices that report and reflect prevailing levels for open-market arms length transactions (please see the [Argus Global Compliance Policy](#) for a detailed definition of arms length).

Regional and feedstock specific inputs to the central model

Northwest Europe

Ethylene

Ethylene	Ethylene del NWE contract month 1	See the Argus Ethylene methodology
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Feedstock variable costs

Naphtha	Naphtha 65 para NWE cif	See the Argus European Products methodology
Ethane	Ethane Mt Belvieu Enterprise month	See the Argus NGL Americas methodology
Propane	Propane ARA large cargo	See the Argus International LPG methodology
Butane	Butane coaster ARA cif	See the Argus International LPG methodology
Gasoil	Gasoil heating oil French NWE cif	See the Argus European Products methodology

Co-products

Propylene	Propylene polymer grade del Europe contract (MCP)	See the Argus Propylene methodology
Butadiene	Butadiene delivered NWE contract month	See the Argus Butadiene methodology
Raffinate-1	Calculated based on the Argus assessment of naphtha 65 para NWE cif	See the Argus European Products methodology
Pygas	Calculated based on the Argus assessment of naphtha 65 para NWE cif and Benzene cif NWE contract less an extraction cost	See the Argus European Products methodology and the Argus Benzene and Derivatives methodology
Fuel credit	Fuel oil 1% NWE fob cargoes	See the Argus European Products methodology

Utilities

Power	Dutch OTC base load day ahead	See the Argus European Electricity methodology
Fuel	fuel oil 1% NWE fob cargoes	See the Argus European Products methodology
Other	fuel oil 1% NWE fob cargoes	See the Argus European Products methodology

US

Ethylene

Ethylene	January 2010-April 2014 ethylene del USGC pipeline, May 2014-present Ethylene pipeline Mont Belvieu month 1	See the Argus Ethylene methodology
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Feedstock variable costs

Ethane	Ethane Mt Belvieu Enterprise month 1	See the Argus NGL Americas methodology
Ethane-propane mix	An 80/20pc weighting of ethane/propane mix Mt Belvieu Enterprise month 1 and propane Mt Belvieu Enterprise month 1	See the Argus NGL Americas methodology
Propane	Propane Mt Belvieu Enterprise month	See the Argus NGL Americas methodology
Butane	Butane Mt Belvieu Enterprise month	See the Argus NGL Americas methodology
Light naphtha	Naphtha 70 min paraffin LSR/LV USGC waterborne del \$/t	See the Argus US Products methodology
Full-range naphtha	Naphtha full-range USGC waterborne del	See the Argus US Products methodology
Gasoil	Heating oil USGC waterborne fob	See the Argus US Products methodology

Co-products

Propylene	January 2010-May 2014 propylene polymer grade del USGC pipeline, June 2014-present US Gulf coast polymer-grade propylene (PGP)	See the Argus NGL Americas methodology
Butadiene	Butadiene fob US contract month 1	See the Argus Butadiene methodology
Raffinate-1	Naphtha full-range USGC waterborne del	See the Argus NGL Americas methodology
Pygas	Gasoline 87 conv USGC waterborne fob lowest RVP and Benzene US Gulf coast less an extraction cost	See the Argus US Products methodology
Fuel credit	Fuel oil No 6 3% USGC fob	See the Argus US Products methodology

Utilities		
Power	The average of Power ERCOT Houston Off-peak day-ahead and Power ERCOT Houston Peak day-ahead	See the Argus US Electricity methodology
Fuel	Natural gas hub Henry Hub day-ahead index	See the Argus Natural Gas Americas methodology
Other	Natural gas hub Henry Hub day-ahead index	See the Argus Natural Gas Americas methodology
Northeast Asia		
Ethylene		
Ethylene	Ethylene fob northeast Asia USD/t	See the Argus Ethylene methodology
Feedstock variable costs		
Ethane	Ethane Mt Belvieu Enterprise month	See the Argus NGL Americas methodology
Propane	Propane Japan cargo	See the Argus International LPG methodology
Butane	Butane Japan cargo	See the Argus International LPG methodology
Full range naphtha	Naphtha Japan c+f	See the Argus Asia-Pacific Products methodology
Gasoil	Gasoil 0.005% Japan c+f	See the Argus Asia-Pacific Products methodology
Co-products		
Propylene	Propylene polymer grade fob Northeast Asia	See the Argus Propylene methodology
Butadiene	Butadiene fob northeast Asia	See the Argus Butadiene methodology
Raffinate-1	Calculated based on the Argus assessment of Naphtha Japan c+f	See the Argus Asia-Pacific Products methodology
Pygas	Calculated based on the Argus assessment of naphtha Japan c+f and benzene fob South Korea half-month	See the Argus Asia-Pacific Products methodology and the Argus Benzene and Derivatives methodology
Fuel credit	Fuel oil 3.5%S 180cst cargo Japan c+f	See the Argus Asia-Pacific Products methodology
Utilities		
Power	JEPX System Price base load day-ahead	See the Argus Japan Utility Markets methodology
Fuel	Fuel oil 3.5%S 180cst cargo Japan c+f	See the Argus Asia-Pacific Products methodology
Other	Fuel oil 3.5%S 180cst cargo Japan c+f	See the Argus Asia-Pacific Products methodology