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## ARGUS BENZENE AND DERIVATIVES

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The most up-to-date Benzene and Derivatives methodology is available on [www.argusmedia.com](http://www.argusmedia.com)

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## Methodology overview

### Methodology rationale

Argus strives to construct methodologies that reflect the way the market trades. Argus aims to produce price assessments which are reliable and representative indicators of commodity market values and are free from distortion. As a result, the specific currencies, volume units, locations and other particulars of an assessment are determined by industry conventions.

In the benzene and derivatives markets, Argus publishes physical market prices in the open market as laid out in the specifications and methodology guide. Argus uses the trading period deemed by Argus to be most appropriate, in consultation with industry, to capture market liquidity.

In order to be included in the assessment process, deals must meet the minimum volume, delivery, timing and specification requirements in our methodology. In illiquid markets, and in other cases where deemed appropriate, Argus assesses the range within which product could have traded by applying a strict process outlined later in this methodology.

### Survey process

Argus price assessments are informed by information received from a wide cross section of market participants, including producers, consumers and intermediaries. Argus reporters engage with the industry by proactively polling participants for market data. Argus will contact and accept market data from all credible market sources including front and back office of market participants and brokers. Argus will also receive market data from electronic trading platforms and directly from the back offices of market participants. Argus will accept market data by telephone, instant messenger, email or other means.

Argus encourages all sources of market data to submit all market data to which they are a party that falls within the Argus stated methodological criteria for the relevant assessment. Argus encourages all sources of market data to submit transaction data from back office functions.

Throughout all markets, Argus is constantly seeking to increase the number of companies willing to provide market data. Reporters are mentored and held accountable for expanding their pool of contacts. The number of entities providing market data can vary significantly from day to day based on market conditions.

For certain price assessments identified by local management, if more than 50pc of the market data involved in arriving at a price assessment is sourced from a single party the supervising editor will engage in an analysis of the market data with the primary reporter to ensure that the quality and integrity of the assessment has not been affected.

### Market data usage

In each market, Argus uses the methodological approach deemed to be the most reliable and representative for that market. Argus will utilise various types of market data in its methodologies, to include:

- Transactions
- Bids and offers
- Other market information, to include spread values between grades, locations, timings, and many other data.

In many markets, the relevant methodology will assign a relatively higher importance to transactions over bids and offers, and a relatively higher importance to bids and offers over other market information. Certain markets however will exist for which such a hierarchy would produce unreliable and non-representative price assessments, and so the methodology must assign a different relative importance in order to ensure the quality and integrity of the price assessment. And even in markets for which the hierarchy normally applies, certain market situations will at times emerge for which the strict hierarchy would produce non-representative prices, requiring Argus to adapt in order to publish representative prices.

### Verification of transaction data

Reporters carefully analyse all data submitted to the price assessment process. These data include transactions, bids, offers, volumes, counterparties, specifications and any other information that contributes materially to the determination of price. This high level of care described applies regardless of the methodology employed. Specific to transactions, bids, and offers, reporters seek to verify the price, the volume, the specifications, location basis, and counterparty. In some transactional average methodologies, reporters also examine the full array of transactions to match counterparties and arrive at a list of unique transactions. In some transactional average methodologies, full details of the transactions verified are published electronically and are accessible by subscribers.

Several tests are applied by reporters in all markets to transactional data to determine if it should be subjected to further scrutiny. If a transaction has been identified as failing such a test, it will receive further scrutiny. For assessments used to settle derivatives and for many other assessments, Argus has established internal procedures that involve escalation of inquiry within the source's company and escalating review within Argus management. Should this process determine that a transaction should be excluded from the price assessment process, the supervising editor will initiate approval and, if necessary, documentation procedures.

### Primary tests applied by reporters

- Transactions not transacted at arm's length, including deals between related parties or affiliates.
- Transaction prices that deviate significantly from the mean of all transactions submitted for that day.
- Transaction prices that fall outside of the generally observed lows and highs that operated throughout the trading day.
- Transactions that are suspected to be a leg of another transaction or in some way contingent on an unknown transaction.
- Single deal volumes that significantly exceed the typical transaction volume for that market.
- Transaction details that are identified by other market participants as being for any reason potentially anomalous and perceived by Argus to be as such.

- Transaction details that are reported by one counterparty differently than the other counterparty.
- Any transaction details that appear to the reporter to be illogical or to stray from the norms of trading behaviour. This could include but is not limited to divergent specifications, unusual delivery location and counterparties not typically seen.
- Transactions that involve the same counterparties, the same price and delivery dates are checked to see that they are separate deals and not one deal duplicated in Argus records.

### **Secondary tests applied by editors for transactions identified for further scrutiny**

#### **Transaction tests**

- The impact of linkage of the deal to possible other transactions such as contingent legs, exchanges, options, swaps, or other derivative instruments. This will include a review of transactions in markets that the reporter may not be covering.
- The nature of disagreement between counterparties on transactional details.
- The possibility that a deal is directly linked to an offsetting transaction that is not publicly known, for example a "wash trade" which has the purpose of influencing the published price.
- The impact of non-market factors on price or volume, including distressed delivery, credit issues, scheduling issues, demurrage, or containment.

#### **Source tests**

- The credibility of the explanation provided for the outlying nature of the transaction.
- The track record of the source. Sources will be deemed more credible if they
  - Regularly provide transaction data with few errors.
  - Provide data by Argus' established deadline.
  - Quickly respond to queries from Argus reporters.
  - Have staff designated to respond to such queries.
- How close the information receipt is to the deadline for information, and the impact of that proximity on the validation process.

### **Assessment guidelines**

When insufficient, inadequate, or no transaction information exists, or when Argus concludes that a transaction based methodology will not produce representative prices, Argus reporters will make an assessment of market value by applying intelligent judgment based on a broad array of factual market information. Reporters must use a high degree of care in gathering and validating all market data used in determining price assessments, a degree of care equal to that applying to gathering and validating transactions. The information used to form an assessment could include deals done, bids, offers, tenders, spread trades, exchange trades, fundamental supply and demand information and other inputs.

The assessment process employing judgment is rigorous, replicable, and uses widely accepted valuation metrics. These valuation metrics mirror the process used by physical commodity traders

to internally assess value prior to entering the market with a bid or offer. Applying these valuation metrics along with sound judgment significantly narrows the band within which a commodity can be assessed, and greatly increases the accuracy and consistency of the price series. The application of judgment is conducted jointly with the supervising editor, in order to be sure that guidelines below are being followed. Valuation metrics include the following:

#### **Relative value transactions**

Frequently transactions occur which instead of being an outright purchase or sale of a single commodity, are instead exchanges of commodities. Such transactions allow reporters to value less liquid markets against more liquid ones and establish a strong basis for the exercise of judgment.

- Exchange one commodity for a different commodity in the same market at a negotiated value.
- Exchange delivery dates for the same commodity at a negotiated value.
- Exchange a commodity in one location for the same commodity at another location at a negotiated value.
- Bids and offers

If a sufficient number of bids and offers populate the market, then in most cases the highest bid and the lowest offer can be assumed to define the boundaries between which a deal could be transacted.

#### **Comparative metrics**

The relative values between compared commodities are readily discussed in the market and can be discovered through dialogue with market participants. These discussions are the precursor to negotiation and conclusion of transactions.

- Comparison to the same commodity in another market centre.
- Comparison to a more actively traded but slightly different specification commodity in the same market centre.
- Comparison to the same commodity traded for a different delivery timing.
- Comparison to the commodity's primary feedstock or primary derived product(s).
- Comparison to trade in the same commodity but in a different modality (as in barge versus oceangoing vessel) or in a different total volume (as in full cargo load versus partial cargo load).

#### **Volume minimums and transaction data thresholds**

Argus typically does not establish thresholds strictly on the basis of a count of transactions, as this could lead to unreliable and non-representative assessments and because of the varying transportation infrastructure found in all commodity markets. Instead, minimum volumes are typically established which may apply to each transaction accepted, to the aggregate of transactions, to transactions which set a low or high assessment or to other volumetrically relevant parameters.

For price assessments used to settle derivatives, Argus will seek to establish minimum transaction data thresholds and when no such

threshold can be established Argus will explain the reasons. These thresholds will often reflect the minimum volumes necessary to produce a transaction-based methodology, but may also establish minimum deal parameters for use by a methodology that is based primarily on judgment.

Should no transaction threshold exist, or should submitted data fall below this methodology's stated transaction data threshold for any reason, Argus will follow the procedures outlined elsewhere in this document regarding the exercise of judgment in the price assessment process.

## Transparency

Argus values transparency in energy markets. As a result, where available, we publish lists of deals in our reports that include price, basis, counterparty and volume information. The deal tables allow subscribers to cross check and verify the deals against the prices. Argus feels transparency and openness is vital to developing confidence in the price assessment process.

## Swaps and forwards markets

Argus publishes forward assessments for numerous markets. These include forward market contracts that can allow physical delivery and swaps contracts that swap a fixed price for the average of a floating published price. Argus looks at forward swaps to inform physical assessments but places primary emphasis on the physical markets.

## Publications and price data

Benzene and derivatives prices are published in the Benzene and Derivatives report. Subsets of these prices appear in other Argus market reports and newsletters in various forms. The price data are available independent of the text-based report in electronic files that can feed into various databases. These price data are also supplied through various third-party data integrators. The Argus website also provides access to prices, reports and news with various web-based tools. All Argus prices are kept in a historical database and available for purchase. Contact your local Argus office for information.

A publication schedule is available at [www.argusmedia.com](http://www.argusmedia.com)

## Corrections to assessments

Argus will on occasion publish corrections to price assessments after the publication date. We will correct errors that arise from clerical mistakes, calculation errors, or a misapplication of our stated methodology. Argus will not retroactively assess markets based on new information learned after the assessments are published. We make our best effort to assess markets based on the information we gather during the trading day assessed.

## 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 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](http://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).

## Consistency in the assessment process

Argus recognises the need to have judgment consistently applied by reporters covering separate markets, and by reporters replacing existing reporters in the assessment process. In order to ensure this consistency, Argus has developed a programme of training and oversight of reporters. This programme includes:

- A global price reporting manual describing among other things the guidelines for the exercise of judgment
- Cross-training of staff between markets to ensure proper holiday and sick leave backup. Editors that float between markets to monitor staff application of best practices
- Experienced editors overseeing reporting teams are involved in daily mentoring and assisting in the application of judgment for illiquid markets
- Editors are required to sign-off on all price assessments each day, thus ensuring the consistent application of judgment.

## Review of methodology

The overriding objective of any methodology is to produce price assessments which are reliable and representative indicators of commodity market values and are free from distortion. As a result, Argus editors and reporters are regularly examining our methodologies and are in regular dialogue with the industry in order to ensure that the methodologies are representative of the market being assessed. This process is integral with reporting on a given market. In addition to this ongoing review of methodology, Argus conducts reviews of all of its methodologies and methodology documents on at least an annual basis.

Argus market report editors and management will periodically and as merited initiate reviews of market coverage based on a qualitative analysis that includes measurements of liquidity, visibility of market data, consistency of market data, quality of market data and industry usage of the assessments. Report editors will review:

- Appropriateness of the methodology of existing assessments
- Termination of existing assessments
- Initiation of new assessments.

The report editor will initiate an informal process to examine viability. This process includes:

- Informal discussions with market participants
- Informal discussions with other stakeholders
- Internal review of market data

Should changes, terminations, or initiations be merited, the report editor will submit an internal proposal to management for review and approval. Should changes or terminations of existing assessments be approved, then formal procedures for external consultation are begun.

### Changes to methodology

Formal proposals to change methodologies typically emerge out of the ongoing process of internal and external review of the methodologies. Formal procedures for external consultation regarding material changes to existing methodologies will be initiated with an announcement of the proposed change published in the relevant Argus report. This announcement will include:

- Details on the proposed change and the rationale
- Method for submitting comments with a deadline for submissions
- For prices used in derivatives, notice that all formal comments will be published after the given consultation period unless submitter requests confidentiality.

Argus will provide sufficient opportunity for stakeholders to analyse and comment on changes, but will not allow the time needed to follow these procedures to create a situation wherein unrepresentative or false prices are published, markets are disrupted, or market participants are put at unnecessary risk. Argus will engage with industry throughout this process in order to gain acceptance of proposed changes to methodology. Argus cannot however guarantee universal acceptance and will act for the good order of the market and ensure the continued integrity of its price assessments as an overriding objective.

Following the consultation period, Argus management will commence an internal review and decide on the methodology change. This will be followed by an announcement of the decision, which will be published in the relevant Argus report and include a date for implementation. For prices used in derivatives, publication of stakeholders' formal comments that are not subject to confidentiality and Argus' response to those comments will also take place.

### Benzene and derivatives market prices

Argus publishes prices that report and reflect prevailing levels for open-market arms length transactions. Price assessments include market information over the course of the trading week.

Various methodological approaches are employed in reporting benzene and derivatives markets to produce the most representative price assessments. These include volume-weighted averages of deals done, lows and highs of deals done, and other methods.

In illiquid markets, Argus assesses the range within which benzene and derivatives could have traded, based on bids and offers through the week, movements of similar or related grades, and extensive polling of market participants.

Formula-priced deals, market fundamentals and information regarding trade in material that does not meet specifications also informs assessments but a primary emphasis is placed on the physical markets.

To be included in the price formation process, deals must meet the strict delivery, timing, and specification requirements in the methodology, and must be executed at arms length between a willing buyer and seller.

Posted prices are based on official price postings by producers or marketers for the appropriate time period and region.

### Survey method and verification

Price assessments in the Benzene and Derivatives report rely on a wide variety of sources for information, including refiners, marketers, importers, traders and brokers.

Argus does not restrict itself to one subsection of the market, such as a single trading platform or single informational channel for the market information collected. The market surveys are intended to be balanced in approach and are conducted by experienced industry specialists.

### Trading and assessment period

Weekly price assessments and formulas refer to prices for the week to Thursday, with the exception of holidays or noted scheduling changes.

### US and Europe

Unless noted below, Argus considers the prompt month to be the calendar month if the publication date is before the 15th of the current month. On or after the 15th of the month, the prompt month is defined to be the balance of the current month, plus any deals done for delivery during the preceding month.

### Asia

Prompt-month assessments roll off and the next month becomes prompt on the first business day following the 15th of the month. Half months roll on the first publishing day after the first and 15th of the calendar month Argus considers the prompt month for East China ex-tank and includes listed prices announced by Sinopec.

### Unit and currency

Prices are reported in the currency and units in which they typically trade. Prices are also converted to US dollar per metric tonne (\$/t) for regional comparisons.

## Americas

### Benzene

Prices are assessed and published in US cents per gallon (¢/USG). Market information in ¢/USG is converted using a factor of 299.3 USG/t.

### Daily

Prices are published separately for ddp Houston/Texas City, fob US Gulf coast and ddp Lower Mississippi River during the named month and conform to the following specifications.

**Quality:** ASTM 2359 compliant

**Trading day:** 8am-5:30pm Houston time

**Minimum trade size:** 10,000bl

#### Location definitions:

- **Houston/Texas City:** terminals at either Houston or Texas City
- **USGC:** terminals along the US Gulf, excluding Mississippi River terminals
- **Lower Mississippi River:** terminals along the Mississippi, not upriver of Baton Rouge

Four price series are published for each location:

- **Low:** the lowest price traded, or in the absence of trade, the lowest price that could have been traded
- **High:** the highest price traded, or in the absence of trade, the highest price that could have been traded
- **Mean:** the mean of the low and high price assessments described above
- **Volume-weighted average (VWA):** a volume-weighted average of transactions meeting the criteria listed above. If Argus validates less than 30,000 bl of trade, the VWA defaults to the mean price described above

*Note: If a single trade meeting the specifications and aggregate volume is reported, that trade can set the low, high, mean and VWA price for a given market. On days in which the market moves significantly over the course of the day, but on which only one trade has been reported, the trade may set the low or high price assessment, with bids and offers used to assess the other.*

### Timing and roll date

Prices are assessed for three forward months for ddp Houston/Texas City. Prices are assessed for two forward months for fob US Gulf coast and ddp Lower Mississippi River.

Prompt month assessments roll off and the next month becomes prompt five calendar days before the end of the month. For example, on 25 April, April is the prompt month, but May becomes the prompt month on 26 April.

### Weekly

#### Spot price assessments

Prices are the low-high range of transactions completed in a particular week. A mathematical midpoint of the low-high range is also published. At times, only one transaction, or many transactions at the same price, will result in the low and high for the week being published at the same price.

### USGC spot

**Specification:** ASTM D2359

**Timing:** nominally for loading five business days forward but will include any period within the working calendar month. For the last reporting week of a month, front-month transaction data will be used as well.

**Basis:** fob USGC and ddp USGC and Lower Mississippi river

**Minimum trade size:** one barge lot, generally 10,000 bl

**Trading week:** the week to 5pm Houston time on Thursday

### Contract/posted reference prices

Publicly announced reference prices provided by major marketers and/or producers specific to particular regions. Reference pricing is understood to be the result of multilateral discussions between marketers/producers and end-use consumers. These posted prices are most often used as a basis for contractual sales agreements between companies. Posted prices are monthly in duration.

### USGC fob contract, non-discount

**Specification:** ASTM D2359

**Timing:** current month

**Basis:** fob USGC or Lower Mississippi river

**Size:** generally one barge lot or 10,000 bl

### Styrene

Prices are assessed and published in US cents per pound (¢/lb). Market information in ¢/lb is converted using a factor of 2,204.62 lb/t.

### Daily

Prices are a volume-weighted average of validated deals transacted during the trading day on the day of publication. Trades are for loading at the named location during the named month and conform to the following specifications.

**Location:** US Gulf coast (Texas and Louisiana waterborne cargoes)

**Basis:** fob

**Timing:** during the named calendar month

**Trading day:** 8am-5:30pm Houston time

**Minimum trade size:** 1,500 metric tonnes

**Minimum aggregate volume:** 3,000 metric tonnes

**Specification:** ASTM D-2827

If the aggregate volume of validated trade falls below 3,000t, Argus will make an intelligent assessment of the styrene price for delivery during the named month, in line with the assessment guidelines listed above.

### Timing and roll date

Prices are assessed for two forward months.

Prompt month assessments roll off and the next month becomes prompt five calendar days before the end of the month. For example, on 25 April, April is the prompt month, but May becomes the prompt month on 26 April.

## Weekly

**Specification:** ASTM D2827

**Timing:** current month

**Basis:** fob USGC or Lower Mississippi river

**Size:** generally one barge lot — 10,000 bl, or 1,500t minimum

**Trading week:** the week to 5pm Houston time on Thursday

### USGC fob contract

The USGC contract marker is a contract price agreed by buyers and sellers. The month-to-month differentials are established through conversations with large producers and consumers regarding the magnitude of changes to prices in their freely negotiated contract volumes.

### USGC fob spot

Basis is fob USGC and ddp USGC and Lower Mississippi river.

If no transactions are confirmed during the period, Argus will report the previous range.

### USGC fob running VWA

Calculated as a running, volume-weighted average (VWA) of all validated fob USGC, waterborne styrene transactions for at least 1,000t, loading during the named calendar month and transacted any time from the first day of the preceding month until five days before the end of the named month.

### Large Buyer Index, Styrene

A volume-weighted average of two components based on the ratio of local US styrene consumption and exports.

- **Full production cost:** calculated based on raw material and production costs including the US benzene contract price, US ethylene net transaction prices for the named month (settled or as estimated by Argus), the Henry Hub natural gas price for the named month and a variable production adder that is reviewed quarterly
- **Spot price:** the USGC styrene VWA for the named month

### Ethylbenzene

Prices are assessed and published weekly in US cents per gallon (¢/USG) as outright values and as differentials to Nymex RBOB gasoline. Market information in ¢/USG is converted using a factor of 303.75 USG/t.

### Spot prices assessments

Ethylbenzene spot prices are the low-high range of transactions completed in a particular week. A mathematical midpoint of the low-high range is also published. At times, only one transaction, or many transactions at the same price, will result in the low and high for the week being published at the same price.

### USGC spot

**Specification:** ASTM D3193

**Timing:** nominally for loading five business days forward but will include any period within the working calendar month. Front-month transaction data will be used following the 15th of the current month.

**Basis:** ddp USGC

**Minimum size:** 25,000 bl

**Trading week:** the week to 5pm Houston time on Thursday

### Cumene

Calculated based on raw material and production costs including the US benzene contract price, the previous month's average price for refinery grade propylene and a variable production adder that is reviewed quarterly. Published in US cents per pound (¢/lb).

### Phenol

The USGC contract marker is a contract price agreed between buyers and sellers. The month-to-month differentials are established through conversations with large producers and consumers regarding magnitude of changes to prices in their freely negotiated contract volumes. Published in US cents per pound (¢/lb).

### Cyclohexane

#### USGC fob contract

Calculated based on raw material and production costs including the US benzene contract price and a variable production adder that is reviewed quarterly. Published in US cents per gallon (¢/USG).

#### Marker with natural gas escalator

Calculated based on raw material and production costs including the US benzene contract price, the Henry Hub day-ahead index for the previous month and a variable production adder that is reviewed quarterly. Published in US cents per gallon (¢/USG).

### Polystyrene

#### Contract prices

There is no single contract price for any individual polymer — independent producers and consumers agree their own starting gross contract prices and negotiate monthly movements on an independent, arms length basis.

Discounts to the gross contract may also be negotiated. Discounts may be based on factors such as volume, volume flexibility, delivery, payment terms or any other factor agreed between the buyer and seller. These discounts may be dependent on reaching contract targets, on volume, for example. The exact terms will usually be private and confidential between buyer and seller.

The different polymer grades are not assessed in isolation and the premiums and discounts between different polymer grades are used in the assessment process.

#### Argus monthly delta

Argus surveys participants on the change in contract prices from month to month and publishes assessments of the month-on-month price changes designed to capture the monthly change in price most representative of the market as a whole, called the Argus Delta or Argus  $\Delta$ . This is in keeping with the nature of monthly negotiations between buyers and sellers, which focus on monthly price movement rather than outright price levels. Low-high ranges for the movements are also published.

The Argus Delta will not necessarily be the midpoint of the published high and low contract price change.

## Argus contract price

Argus also publishes monthly outright gross contract prices that move in line with the corresponding Argus Delta, except when an annual reassessment of the outright price is made in March for publication in the first published report in April.

The annual reassessment is intended to capture rebates within existing contracts and renegotiations of long-term contracts between buyers and suppliers that can lead to changes in the outright prices in the market outside of the usual monthly negotiation process.

## Timing

Argus publishes an assessment of the monthly deltas and contract prices from the third Thursday publication of the month in question until the first Thursday publication of the following month, when the final monthly contract price assessments are typically made. The second Thursday publication of the following month republishes the final monthly contract price assessment.

In the event that the monthly contract has not settled by the first Thursday publication of the following month, the final monthly price assessment will be published in the second Thursday publication of the month.

The final monthly contract price assessment is not an average of the previous assessments for the month in question.

## Location, specification and products

Contract price assessments are of a negotiated contract price for general-purpose grades meeting the US polymer specifications listed below, delivered east of the Rocky Mountains during the named month.

Monthly delta and contract prices are published for

## Currency/unit

Prices are assessed and published in US cents per pound (¢/lb).

## GPPS

General purpose polystyrene

General purpose crystal grades material with a melt index of 1-20

## HIPS

High impact polystyrene (HIPS)

General purpose high-impact rubber modified polystyrene with a melt flow index of 2 to 20

## Europe

### Benzene

#### Daily

Northwest Europe benzene prices are a volume-weighted average of validated deals transacted during the trading day on the day of publication. Trades are for delivery at the named location during the prompt month and conform to the following specifications.

**Location:** ARA

**Basis:** cif

**Timing:** 5-30 days forward

**Trading day:** 9am CET-6pm CET

**Minimum trade size:** 1,000 metric tonnes

**Minimum aggregate volume:** 3,000 metric tonnes

**Specification:** BASF 2005 specification or similar

If Argus validates less than 3,000 metric tonnes of trade, or if there are no validated trades or a single validated trade the published price will be the mean of an assessed low-high range. The range is the lowest and highest prices that traded or could have traded on the day of publication.

Transactions that are completed on a UK public holiday that is not also a holiday in continental Europe, when no daily assessment is published, will be considered for inclusion in the following day's assessment.

#### Timing and roll date

Prompt month assessments roll off and the next month becomes prompt five calendar days before the end of the month. For example, on 25 April, April is the prompt month, but May becomes the prompt month on 26 April. Price assessments are published for the prompt month and one forward month.

Roll date: five working days before the end of the month

#### Weekly

##### cif ARA spot

Calculated as the arithmetic average of the daily Argus benzene cif ARA (prompt) assessment published in the week prior to publication (Friday-Thursday). The weekly price is an average of all prompt assessments in the publication week, whether or not the trade month rolls during the assessment week. A conversion to €/t is published for the weekly spot assessment, using the spot exchange rate on the day of publication.

#### Supplementary transaction data

Argus publishes a low, high and volume-weighted average price for prompt-month spot transactions reported during the week (Friday-Thursday). In the last five UK working days of the month trades for the next month will be included in addition to trades for the prompt month. A total reported volume is also published.

**Benzene contract cif NWE (basis ARA)****Specification:** ASTM D2359

**Currency/unit:** prices are published in both \$/t and €/t. The price is negotiated in US dollars on the basis of recent spot market activity. Conversion to euros is fixed at the published European Central Bank exchange rate for the day prior to settlement.

**Timing:** negotiation and settlement between producers and buyers habitually takes place on the last working day of the month to settle the reference price for the coming month.

**Basis:** cif ARA. Price adjustments are made by individual parties for other locations.

**Size:** nominally 1,000t lots

**Styrene****Daily**

Northwest Europe styrene prices are a volume-weighted average of validated deals transacted during the trading day on the day of publication. Trades are for delivery at the named location during the named month and conform to the following specifications.

**Location:** ARA**Basis:** fob**Timing:** any dates, calendar month**Trading day:** 9am-6pm CET**Minimum trade size:** 1,000 metric tonnes**Minimum aggregate volume:** 3,000 metric tonnes**Specification:** ASTM D-2827

If Argus validates less than 3,000 metric tonnes of trade, or if there are no validated trades or a single validated trade the published price will be the mean of an assessed low-high range. The range is the lowest and highest prices that traded or could have traded on the day of publication.

**Timing and roll date**

Prompt month assessments roll off and the next month becomes prompt on the first business day following 19th of month.

For example, on 19 April, April is the prompt month, but May becomes the prompt month on 20 April. Price assessments are published for the prompt month and one forward month.

**Weekly****ARA spot****Specification:** ASTM D2827

**Currency/unit:** prices are published in \$/t. Transactions agreed in €/t are converted to \$/t at the published daily rate of the European Central Bank on the date of the transaction.

**Timing:** nominally for loadings five business days forward but will include any period within the working calendar month and if the publication date is after the 15th of the month will include transactions for the following calendar month.

**Basis:** fob ARA**Minimum lot size:** 1,000t**fob ARA Styrene monthly contract**

Assessed and published in €/t.

**Minimum lot size:** 500t**ARA fob VWA**

A volume-weighted average (VWA) of all validated fob ARA styrene transactions for at least 1,000t loading during the named calendar month and transacted any time from the first day of the previous month until five working days before the end of the named month.

For example, the June 2019 VWA will include transactions for June loading completed between 1 May 2019 and 21 June 2019.

The final VWA is published in the first issue after the end of the VWA trading period.

**Specification:** ASTM D2827**Phenol**

The European contract marker is a list contract price, assessed and published in €/t. A \$/t conversion is also published. Differentials to benzene are established on a quarterly or annual basis. The published price reflects the change in the monthly benzene contract price in €/t.

**Cyclohexane**

A quarterly differential is agreed and made public by buyers with sellers, reflecting anticipated production costs and market factors.

The monthly cyclohexane contract price is assessed and published in €/t and is calculated by adding the differential for the calendar quarter to the monthly benzene contract price. A \$/t conversion is also published.

**Polystyrene****Contract prices**

There is no single contract price for any individual polymer; independent producers and consumers agree their own starting gross contract prices and negotiate monthly movements on an independent arm's length basis.

Discounts to the gross contract may also be negotiated. Discounts may be based on factors such as volume, volume flexibility, delivery, payment terms or any other factor agreed between the buyer and seller. These discounts may be dependent on reaching contract targets, on volume, for example. The exact terms will usually be private and confidential between buyer and seller.

The different polymer grades are not assessed in isolation and the premiums and discounts between different polymer grades are used in the assessment process.

**Argus monthly delta**

Argus surveys participants on the change in contract prices from month to month and publishes assessments of the month-on-month

price changes designed to capture the monthly change in price most representative of the market as a whole, called the Argus Delta or Argus  $\Delta$ . This is in keeping with the nature of monthly negotiations between buyers and sellers, which focus on monthly price movement rather than outright price levels.

Low-high ranges for the movements are also published. The Argus Delta will not necessarily be the midpoint of the published high and low contract price change.

### Argus contract price

Argus also publishes monthly outright gross contract prices that move in line with the corresponding Argus Delta, except when an annual reassessment of the outright price is made in March for publication in the first published report in April.

The annual reassessment is intended to capture rebates within existing contracts and renegotiations of long-term contracts between buyers and suppliers that can lead to changes in the outright prices in the market outside of the usually monthly negotiation process.

### Timing

Argus publishes an assessment of the monthly deltas and contract prices from the third Thursday publication of the month in question until the first Thursday publication of the following month, when the final monthly contract price assessments are typically made. The second Thursday publication of the following month republishes the final monthly contract price assessment.

In the event that the monthly contract has not settled by the first Thursday publication of the following month, the final monthly price assessment will be published in the second Thursday publication of the month. The final monthly contract price assessment is not an average of the previous assessments for the month in question.

### Location, specification and products

The contract is typical of the major markets in Germany, Benelux and France, and is based on "general purpose grades" and does not allow for any surcharges associated with more advanced grades. The price assessment does not cover break-bulk activities and does not reflect the geographic variations across the smaller European markets (Spain and Italy typically have lower pricing).

**Contract terms:** gross (before any discounts are applied)

**Delivery:** delivered mid-northwest Europe

**Load size:** "full load deliveries" – typically a 20-25t load depending on local regulations

**Currency/unit:** €/t

Monthly delta and contract prices are published for

### GPPS

General purpose polystyrene

GGPS material with a melt flow index of 1-20

### HIPS

High impact polystyrene

Material with a melt flow index of 2-20

## Asia-Pacific

### Benzene

#### Daily

Prices are assessed on the basis of trades, bids and offers reported during the day of publication.

In the absence of trades, the published price range will be formed based on bids and offers in the market at 5pm Singapore time.

In the absence of trades or bids and offers, published prices will take into account indications of buying and selling prices in the market and other market information including but not limited to movements in European and US benzene prices, styrene monomer (SM) prices in Asia, crude and naphtha prices, the trend in other aromatics markets and supply and demand fundamentals.

### fob South Korea

Price assessments are published for five forward half months and two forward calendar months

**Location:** South Korea

**Timing:** half months roll on the first publishing day after the first and 15th of the calendar month

**Trading day:** 9am-5pm Singapore time

**Minimum trade size:** 3,000 metric tonnes

**Specification:** ASTM 2359

#### Example:

On Friday, 16 September, Argus will publish assessments for

- the second half of October
- the first half of November
- the second half of November
- the first half of December
- the second half of December

Calendar month prices are the average of relevant half-month assessments. In the above example, calendar-month prices would be published for November and December.

### Argus fob Korea marker

The Argus fob Korea marker is an arithmetic average of the midpoint of the published price assessments for the first four published half-month assessments.

### cfr China

Prompt prices are published

**Location:** China

**Timing:** 15-45 days forward

**Trading day:** 9am-5pm Singapore time

**Minimum trade size:** 3,000 metric tonnes

**Specification:** ASTM 2359

Netback calculations are not included in the price assessment process

**Sinopec ex-works China**

Sinopec listed prices on an ex-works basis would be updated as and when the producer announces new prices.

**ex-tank East China**

Prompt prices are published

**Location:** east China

**Timing:** 0-15 days forward

**Minimum trade size:** 500-1,000 metric tonnes

**Specification:** ASTM 2359

**Trading day:** 9am-5pm Singapore time

**Weekly****Contract prices**

Published weekly on Thursday, these are publicly announced reference prices provided by major marketers and/or producers specific to particular regions. Reference pricing is understood to be the result of multilateral discussions between marketers/producers and end-use consumers. These posted prices are most often used as a basis for contractual sales agreements between companies.

Argus will publish a contract price range consisting of:

- The confirmed contract price negotiated by Eneos with its customers; and
- A calculated price for each region based on the prevailing contract formula, which is the average of the weekly published prices fob South Korea for the previous month plus a premium for each region.

Major producers and marketers such as Phillips 66 and Exxon-Mobil do not readily confirm contract price settlements in the US, and Argus will confirm the contract settlement with large contract consumers such as BASF, Styrolution, Ineos Phenol, Total, Sabic and Huntsman

**cfr South Korea contract**

**Specification:** ASTM D2359

**Timing:** current month

**Basis:** cfr South Korea main port

**Size:** generally one barge lot 3,000t

**cfr Taiwan contract**

**Specification:** ASTM D2359

Reported as the range of daily prices during the week. The weekly marker is the mathematical average of the daily markers.

**cfr Asean contract**

**Specification:** ASTM D2359

**Timing:** current month

**Basis:** cfr Singapore

**Size:** generally one barge lot 3,000t

**fob South Korea**

Reported as the range of daily prices during the week. Prices are published for five forward half months and two calendar months. The weekly marker is the mathematical average of the daily markers.

**cfr China spot**

Reported as the range of daily prices during the week.

**fob Southeast Asia spot**

**Specification:** ASTM D2359

**Timing:** nominally for current month and current month plus one

**Basis:** fob Southeast Asia

**Minimum size:** one barge lot — 3,000t

If no transactions are confirmed, Argus will report based on the prevailing market premium or discount from to fob South Korea prices

**ex-tank East China spot**

Reported as the range of daily prices during the week.

**Sinopec ex-works spot**

The latest listed price announced or rolled over from the previous week/s by the producer.

**Specification:** ASTM D2359

**Currency/unit:** yuan/t

**Timing:** nominally for current month

**Basis:** ex-works

**Minimum size:** one barge lot — 500-1,000t

**cfr India spot**

**Location:** Kandla, Mumbai

**Basis:** cfr India

**Ports:** including but not limited to Kandla, Mumbai, Mangalore, Chennai and JNTP

**Timing:** 10-35 days forward

**Cargo size:** 3,000 metric tonnes

**Specification:** ASTM D2827h

**Styrene****Daily**

The price assessment for cfr east China styrene is an average of two elements — a survey of market participants and a volume-weighted average of validated deals transacted during the trading day on the day of publication. Trades are for delivery at the named location during the named month and conform to the following specifications.

**Location:** east China

**Basis:** cfr

**Timing:** 10-35 days forward

**Trading day:** 9am-5pm Singapore time

**Minimum trade size:** 2,000 metric tonnes

**Minimum aggregate volume:** 6,000 metric tonnes

**Specification:** ASTM D- 2827

**Timing and roll date**

Prices are assessed for two forward months. Prompt month assessments roll on the first business day following the 15th of month.

## Weekly

### Contract prices

Published weekly on Thursday, these are publicly announced reference prices provided by major marketers and/or producers specific to particular regions. Reference pricing is understood to be the result of multilateral discussions between marketers/producers and end-use consumers. These posted prices are most often used as a basis for contractual sales agreements between companies.

Argus will publish a contract price range consisting of:

- The confirmed contract price negotiated by Eneos with its customers; and
- A calculated price for each region based on the prevailing contract formula, which is the average of the weekly published prices fob South Korea for the previous month plus a premium for each region.

Major producers and marketers such as Phillips 66 and Exxon-Mobil do not readily confirm contract price settlements in the US, and Argus will confirm the contract settlement with large contract consumers such as BASF, Styrolution, Ineos Phenol, Total, Sabic and Huntsman

### cfr Taiwan contract

The agreed and confirmed price between major producers and end-users in Taiwan for the previous month.

**Specification:** ASTM D2827

**Timing:** previous month

**Basis:** cfr Taiwan main port

**Minimum size:** 2,000t

### cfr South Korea/Taiwan

**Specification:** ASTM D- 2827

**Location:** South Korea, Taiwan

**Basis:** cfr

**Timing:** 10-35 days forward

**Minimum size:** 2,000 metric tonnes

Absent sufficient trade, bid/offer or other information, prices are derived from the premium or discount to the average cfr China spot price assessment.

### cfr China spot

Reported as the range of daily prices during the week. The weekly marker is the mathematical average of the daily markers.

### cfr India spot

**Specification:** ASTM D- 2827h

**Location:** Kandla, Mumbai

**Ports:** including but not limited to Kandla, Mumbai, Mangalore, Chennai and JNTP

**Basis:** cfr India

**Timing:** 10-35 days forward

**Cargo size:** 3,000 metric tonnes

Absent sufficient trade, bid/offer or other information, prices are derived

from the premium or discount to the average cfr China spot price assessment used in spot formula transactions. Indian domestic prices would also be taken into consideration in the assessment process.

### fob northeast Asia spot

**Specification:** ASTM D- 2827

**Location:** Japan, South Korea, Taiwan

**Basis:** fob northeast Asia

**Timing:** 10-35 days forward

**Minimum size:** 2,000 metric tonnes

Absent sufficient trade, bid/offer or other information, prices are derived from the premium or discount to the average cfr China spot price assessment.

### ex-tank China spot

Reported as the range of daily prices during the week.

### ex-tank India spot

**Basis:** ex-tank

**Currency/unit:** Indian rupees/kg

**Cargo size:** 100-1000 kilogram basis

**Specification:** ASTM D2827

## Polystyrene

### Weekly

**Timing:** delivered 5-35 days forward from assessment date

### cfr China spot

China's main ports are mainly located in three regions:

- east China: Shanghai, Ningbo, Nanjing and Qingdao
- south China: Xiamen, Fuzhou, Shenzhen, Guangzhou and Shantou
- north China: Tianjin and Dalian

Argus assessments mainly cover these three regions.

**Size:** at least 50t.

Argus generally maintains a \$20-50/t assessment range for the polyvinyl chloride cfr China price assessment. Assessment ranges can be widened by \$10-20/t when the market is in wide discussion or large volume transactions are concluded out of the mainstream range.

### ex-works China spot

Ex-works China spot prices include a 17pc value-added tax.

The Chinese domestic market consists of the following regions:

- east China: Shanghai, Zhejiang and Jiangsu
- south China: Guangdong and Fujian
- north China: Tianjin, Beijing, Hebei and Shandong
- northeast China: Liaoning, Jilin and Heilongjiang
- west China: Xinjiang, Gansu and Shaanxi
- southwest China: Sichuan and Chongqing.

**Size:** at least 5,000t

**Currency/unit:** yuan/t

**Import parity China spot current**

Import parity China spot prices (\$/t) are ex-works (Yn/t) adjusted for the currency exchange rate, VAT, tariff and clearance cost. Clearance cost is at Yn100/t. In that case, the formula is: ex-works adjusted (import parity) = (ex-works-100) / (exchange rate\*VAT\*import tariff)

Prices are published for

**GPPS**

General purpose polystyrene

Material with a melt flow index of 1-20

**HIPS**

High impact polystyrene

Material with a melt flow index of 2-20

**ABS resin**

Weekly

**cfr China**

**Specification:** natural colour, melt-flow index (MFI) between 10-40

**Origin:** any

**Cargo size:** 100-500t

**Timing:** 15-30 days forward, letter of credit up to 30 days

**Location:** Shanghai, Ningbo, Nanjing, Qingdao, Xiamen, Fuzhou, Shenzhen, Guangzhou, Shantou, Tianjin, and Dalian ports

**ex-works China spot**

Ex-works China spot prices include value-added tax

The Chinese domestic market consists of the following regions:

- East China: Shanghai, Zhejiang, Jiangsu
- South China: Guangdong and Fujian
- North China: Tianjin, Beijing, Hebei and Shandong
- Northeast China: Liaoning, Jilin and Heilongjiang
- West China: Xinjiang, Gansu and Shaanxi
- Southwest China: Sichuan and Chongqing

**Specification:** natural colour, melt-flow index (MFI) between 10-40

**Cargo size:** 10-50t

**Timing:** 0-7 days forward

**Currency/unit:** yuan/t

**Import parity China spot current**

Import parity China spot prices (\$/t) are ex-works (Yn/t) adjusted for the currency exchange rate, VAT, tariff and clearance cost. Clearance cost is at Yn100/t. In that case, the formula is: ex-works adjusted (import parity) = (ex-works-100) / (exchange rate\*VAT\*import tariff)

**Phenol**

Weekly

**China domestic ex-tank spot**

See the [Argus Propylene methodology](#).

**Freight**

Freight rate assessments are published as the cost of spot chartering a vessel to load benzene 30-90 days from the date of publication.

Argus surveys market participants including charterers, ship owners and ship brokers in assessing freight rates. Freight rates are published weekly.

**Routes and cargo sizes**

- South Korea-China – up to 3,000t
- Thailand-China – up to 3,000t
- South Korea-Houston – up to 6,000t
- South Korea-Houston – up to 12,000t

Included ports	
Country	Ports
South Korea	Daesan, Yosu, Ulsan, Onsan
China	Ningbo, Shanghai, Caojing, Taicang, Nantong, Jiangyin, Zhangjiagang, Huizhou
Thailand	Map Ta Phut, Sriracha, Rayong
US	Ports in the Texas Gulf area.

**Weekly and monthly averages**

Argus also publishes weekly and monthly averages in some benzene and styrene markets:

**WTD:** a week-to-date average of the daily price assessments. The weekly average from the previous week is also published and is equal to the weekly average on the last working day of the previous week.

**MTD:** a month-to-date average of the daily price assessments. The MTD average is calculated in line with the trading month, and follows the relevant rolling schedule as outlined above. The monthly average from the previous month is also published and is equal to the monthly average on the last working day of the previous month.

**Related markets**

Benzene and Derivatives includes weekly average prices for related markets.

**US**

- Nymex natural gas: see [www.cmegroup.com](#)
- Nymex WTI crude: see [www.cmegroup.com](#)
- Gasoline 87 USGC five-day average: an average of price assessments published in Argus US Products. See the [Argus US Products methodology](#)
- Naphtha full-range USGC waterborne del: see the [Argus US Products methodology](#)

**Europe**

- North Sea dated crude: see the [Argus Crude methodology](#)
- Naphtha 65 para barge fob northwest Europe: see the [Argus European Products methodology](#)
- Eurobob oxy gasoline northwest Europe barge five-day average: an average of price assessments published in Argus European Products. See the [Argus European Products methodology](#)
- Gasoline 10ppm non-oxy northwest Europe cif cargo: see the [Argus European Products methodology](#)
- Butane ARA/UK large cargo: see the [Argus International LPG methodology](#)
- Propane ARA large cargo: see the [Argus International LPG methodology](#)
- NBP gas: see the [Argus European Natural Gas methodology](#)

**Asia Pacific**

- Naphtha Japan c+f: see the [Argus Asia-Pacific Products methodology](#)
- Gasoline 92r Singapore: see the [Argus Asia-Pacific Products methodology](#)
- Naphtha fob India: see the [Argus Asia-Pacific Products methodology](#)
- Naphtha fob Singapore : see the [Argus Asia-Pacific Products methodology](#)
- Dubai front-month crude – see the [Argus Crude methodology](#)