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ARGUS AMERICAS BASE OILS

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The most up-to-date Argus Americas Base Oils methodology is available on www.argusmedia.com

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 base oils market, Argus publishes physical market prices in the open market, and refiners' posted prices 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. In those methodologies, the deals are also published in the daily report.

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.

Publications and price data

Argus Americas base oil prices are published in the Argus Americas Base Oils report and the global Argus Base Oils report. 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

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 sub-scribers, 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).

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.

Argus Americas Base Oils

Argus Americas Base Oils contains domestic spot, bulk export, and posted base oil prices, market commentary and information on relevant crude oil and petroleum products prices.

The report is published on Friday, or on Thursday if Friday is a holiday in all regions where base oil prices are assessed.

Spot price assessments

Assessments are of the price of product loading 1-30 days forward from the day of publication. Price information is received in volumetric (US dollars/US gallon) and gravimetric (US dollars/metric tonne) terms. Pricing information is converted using the indicated conversion factor.

Pricing procedure

Base oil price assessments are based on two elements — a survey of market participants' and a volume-weighted average of validated trades which fit the standard industry specifications listed below. The final price is based on an average of the survey result and the volume-weighted average. This final price is the midpoint price between the published low and high price. Argus applies editorial judgment to arrive at an intelligent assessment of the spread between the low and high price.

Price assessment schedule

Reporters monitor the market on each working day of the week and the assessment includes all relevant trades reported to Argus during the week.

Argus has instituted a cut-off time of 4:30pm Houston on the day prices are assessed for the submission of data by market participants.

Spot physical prices are assessed on Thursday, or on Wednesday if either Thursday is a US holiday or if Friday is a holiday in all regions in which base oil prices are assessed.

Base oil specifications						
	Viscosity index	Viscosity at 40°C	Viscosity at 100°C	Flash point	Sulphur content	Pour point
Group I						
Group I SN 150	95-100	28-32 cst	4.4-5.6 cst	min. 195°C	0.15-0.6%	max. -6°C
Group I SN 500	95-100	90-105 cst	9.7-12 cst	min. 210°C	0.15-0.6%	max. -6°C
Bright stock	min. 95		min. 28 cst	min. 276°C	0.15-0.6%	max. -9°C
Group II						
Group II N100	95-105	18-21 cst	3.8-4.3 cst	min. 199°C	max. 0.015%	max. -12°C
Group II N220	95-110	40-46 cst	6.1-6.7 cst	min. 214°C	max.0.015%	max. -12°C
Group II N600	95-110	104-120 cst	11.7-12.65 cst	min. 250°C	max. 0.025%	max. -12°C
Group III						
Group III 4cst	min. 120	19-20 cst	4.1-4.4 cst	min. 220°C	max. 0.001%	max. -12°C
Group III 6cst	min. 120	32-37 cst	5.7-6.5 cst	min. 220°C	max. 0.001%	max. -12°C
Group III 8cst	min. 120	43.8-50.1 cst	7.6-8.2 cst	min. 220°C	max. 0.001%	max. -12°C
US naphthenic base oils						
Pale oil 60		7.83-12.00 cst	2.31-3 cst	min. 138°C	max. 0.05%	max. -43°C
Pale oil 100		19.64-20.50 cst	3.54-3.58 cst	min. 154°C	max. 0.05%	max. -34°C
Pale oil 500		91.00-99.00 cst	7.38-8.8 cst	min. 182°C	max. 0.06%	max. -12°C
Pale oil 2000		349.50-383.00 cst	13.93-25 cst	min 204°C	max. 0.55%	max. -1°C

Specifications			
Assessment	Basis	USG/t conversion factor	Volume (t) minimum
Paraffinic base oil prices			
Group I — domestic prices			
Solvent neutral 150 (SN 150)	fob USGC	303USG/t	50
Solvent neutral 500 (SN 500)	fob USGC	298USG/t	50
Bright stock	fob USGC	294USG/t	50
Group I — bulk export prices			
Solvent neutral 150 (SN 150)	fob USGC	303USG/t	1,000
Solvent neutral 500 (SN 500)	fob USGC	298USG/t	1,000
Bright stock	fob USGC	294USG/t	1,000
Group II — domestic prices			
Neutral 100 (N100)	fob USGC	310USG/t	50
Neutral 220 (N220)	fob USGC	305USG/t	50
Neutral 600 (N600)	fob USGC	300USG/t	50
Group II — bulk export prices			
Neutral 100 (N100)	fob USGC	310USG/t	1,000
Neutral 220 (N220)	fob USGC	305USG/t	1,000
Neutral 600 (N600)	fob USGC	300USG/t	1,000
Group III — domestic prices			
4cst	fob USGC	315USG/t	50
6cst	fob USGC	315USG/t	50
8cst	fob USGC	315USG/t	50
Naphthenic base oil prices			
Naphthenic — domestic prices			
Naphthenic pale 60	fob USGC	296.3USG/t	20
Naphthenic pale 100	fob USGC	293.1USG/t	20
Naphthenic pale 500	fob USGC	287.3USG/t	20
Naphthenic pale 2000	fob USGC	285.3USG/t	20
Naphthenic — bulk export prices			
Naphthenic pale 60	fob USGC	296.3USG/t	1,000
Naphthenic pale 100	fob USGC	293.1USG/t	1,000
Naphthenic pale 500	fob USGC	287.3USG/t	1,000
Naphthenic pale 2000	fob USGC	285.3USG/t	1,000

Crude and products

Crude oil prices are published in US dollars/barrel and US dollars/gallon and are taken from Argus reports on the day corresponding with the base oils assessment.

Nymex WTI crude front month

The New York Mercantile Exchange (Nymex) West Texas Intermediate Light Sweet Crude front-month contract settlement price as published in Argus Crude. See the [Argus Crude methodology](#).

SN 500 premium to WTI

The premium of SN 500 fob US export price over front-month WTI crude. Prices are published in US dollars/gallon and US dollars/barrel.

The conversion factor used for SN 500 is 7.10 bl to a metric tonne.

Oil products

Oil products prices are published in US dollars/gallon and US dollars/barrel and are taken from *Argus US Products* on the day corresponding with the base oils assessment.

NYH heating oil barge

See the [Argus US Products methodology](#)

Low sulphur vacuum gasoil 0.5% cargo

See the [Argus US Products methodology](#)

High sulphur vacuum gasoil 2% cargo

See the [Argus US Products methodology](#)

USGC 10ppm diesel 62 cargo

See the [Argus US Products methodology](#)

Oil product price premiums

The profitability of SN 500 base oils and heating oil versus each other and versus feedstock vacuum gasoil.

Heating oil premium to crude

The premium of New York Harbour heating oil barges to WTI crude. Prices are published in US dollars/gallon and US dollars/barrel. The conversion rate for heating oil is 7.46 bl to a metric tonne.

Heating oil premium to VGO 2%

The premium of New York Harbour heating oil barges over high sulphur vacuum gasoil. Prices are published in US dollars/gallon and US dollars/barrel.

SN 500 premium to heating oil

The premium of SN 500 fob US export over New York Harbor heating oil barges. Prices are published in US dollars/gallon and US dollars/barrel. The conversion rate for SN 500 is 7.10 bl to a metric tonne.

SN 500 premium to VGO 2%

The premium of SN 500 fob US export over high sulphur vacuum gasoil. Prices are published in US dollars/gallon and US dollars/barrel. The conversion rate for SN 500 is 7.10 bl to a metric tonne.

Posted prices

The grades included in each refiner's posted prices are determined independently by each refiner. See Annex I for a list of refiners by grade.

The posted prices are determined independently by each refiner. The prices are provided to Argus directly or indirectly by each refiner. When provided with the prices indirectly, Argus confirms the prices with market participants when a change is announced by a refiner. When provided with the prices directly, Argus is provided with an announcement from the refiner with the updated price.

Posted prices are updated in the Argus report on the date when the new prices take effect, as determined by each refiner.

Prices are for paraffinic base oils.

US and Canadian posted prices are in US dollars/tonne and US dollars/gallon.

Mexican posted prices are in Mexican pesos/tonne. Argus also publishes converted prices in US dollars/tonne and US dollars/gallon using exchange rates from Ice Data Services as of 6pm UK time on Thursday.

The gallons-to-tonnes conversion rates, provided either directly by the refiner or based on a market survey of the product's conversion rate, are listed in Annex II below.

Annex I: Posted prices - refiners by grade

Group I base oils

ExxonMobil, HollyFrontier, Paulsboro Refining, Calumet and Pemex

Group II base oils

Excel Paralubes, Chevron, Motiva, ExxonMobil, Calumet, Avista Oil and Petro-Canada

Group II+ base oils

ExxonMobil, SK Lubricants, Phillips 66, Safety-Kleen and Petro-Canada

Group III base oils

SK Lubricants, Phillips 66, Avista Oil, Petro-Canada and Motiva

Annex II: Conversion factors - Americas posted prices

Group I						USG/t
Sus @ 100°F	ExxonMobil Gulf coast	HollyFrontier	Paulsboro Refining east coast	Calumet Shreveport	Pemex Salamanca	
70/75	na	310.00	na	na	na	na
100	308.00	308.00	307.00	na	308.00	
150	307.00	307.00	302.00	na	307.00	
250	na	304.00	na	na	304.00	
300/350	303.00	na	na	na	na	
500	na	302.00	300.00	na	302.00	
600/650	298.00	na	na	298.00	298.00	
700	na	na	296.00	na	na	
Bright stock	297.00	297.00	296.00	296.79	297.00	

Group II - US Gulf coast				USG/t
Sus @ 100°F	Excel Paralubes Gulf coast	Chevron Gulf coast	Motiva Gulf coast	
70	310.00	na	na	na
100/110	312.00	309.00	310.00	310.00
220/225	307.00	305.00	305.00	305.00
600	302.00	301.50	302.00	302.00

Group II					USG/t
Sus @ 100°F	ExxonMobil Gulf coast	Calumet Shreveport	Petro-Canada Mississauga	Avista Oil midwest/east coast	
70	na	na	310	na	na
80	na	308.60	na	na	na
100	na	307.26	307.86	na	na
150	na	306.36	na	311.18	na
200/220	305.00	na	305.4	na	na
325	na	304.67	na	na	na
350	na	na	303.29	na	na
650	na	na	303.65	na	na

Group II+						USG/t
Sus @ 100°F	ExxonMobil Gulf coast	SK Lubricants Gulf coast	Phillips 66 Gulf coast	Safety-Kleen	Petro-Canada Mississauga	
50/60	na	na	322.50	na	na	na
65	na	na	na	na	317	na
70/80	na	315.00	320.00	na	na	na
100	na	na	na	na	314.49	na
110/130	313.00	na	na	311.70	na	na
240	na	na	na	309.90	na	na

Group III						USG/t
cSt @ 100°C	SK Lubricants Gulf coast	Phillips 66 Gulf coast	Avista Oil midwest/east coast	Petro-Canada Mississauga	Motiva Gulf coast	
4cst	315.00	317.50	314.47	314.11	316.94	
6cst	315.00	na	na	314.86	313.00	
8cst	315.00	313.00	na	311.89	na	