

Consistent Solutions
From a Trusted Partner.

Bright Stock in the Age of Group II/III: Why Heavy Viscosity Still Matters in a Volatile World

17.06.2026

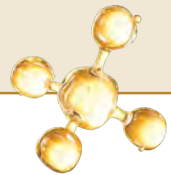
ERGON | **HyGold**
| Base Oils





Today's Agenda

- Intro to Ergon
- Group I Rationalization
- Group I Closures Implications
- What Can fill the Void?
- Generalities, Sustainability and Strategy





**3 operating segments.
60+ companies.**

**Meeting a wide variety
of market needs.**

Energy & Specialty Solutions

We transform molecules into high-value solutions our customers utilize to improve the performance of products people use every day around the world.

Pavement & Coating Resources

Our asphalt solutions extend the life of roadways around the world.

Integrated Services & Logistics

Our service companies are essential to North America's manufacturing supply chain and construction industry.





We transform molecules that may otherwise be combusted into **high-value solutions** our customers utilize to improve the performance of **products** people use **every day** around the world.

Ergon Refining, Inc.
Ergon International, Inc.
Ergon Oil (Singapore) Pte. Ltd.
PT Ergon Oil Indonesia
Ergon Latin America, LLC
Ergon Mexico, S. de R.L. de C.V.
Ergon - West Virginia, Inc.
Process Oils, Inc.
MOGoil GmbH
Resinall Corp

Focused on the needs of specialty markets since our beginning, Ergon has grown from one small crude oil refinery to one of the world's largest manufacturers of specialty base oils and waxes. Our specialty oils are sold in more than 100 countries around the globe.

Energy & Specialty Solutions consists of Ergon's refinery operations and the marketing of various refined products, including specialty naphthenic, paraffinic, vegetable and renewable products for niche markets, as well as fuel and specialty chemical products.

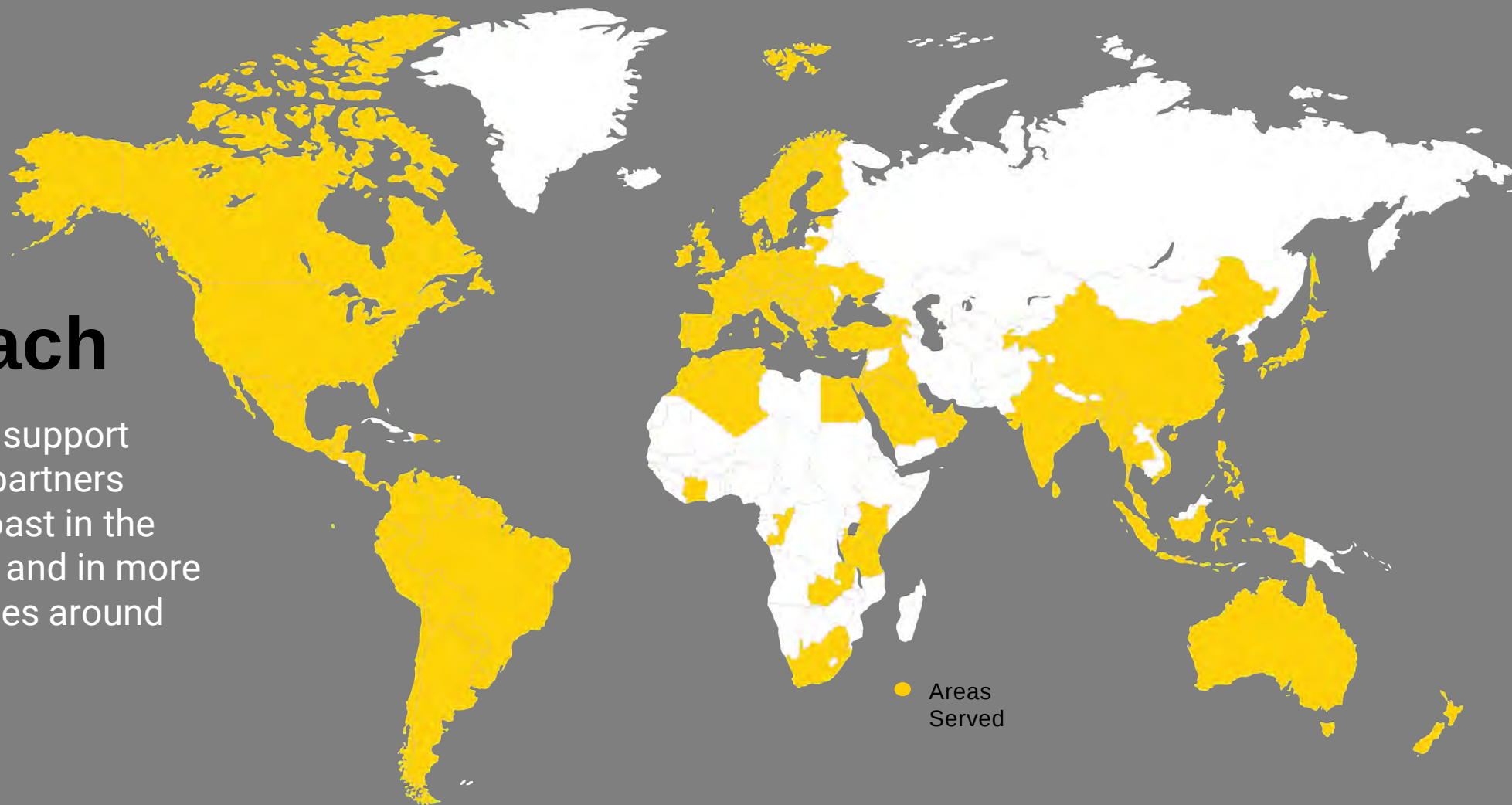
Formerly within Ergon's Specialty Chemicals segment, Resinall Corp is now part of Energy & Specialty Solutions. Resinall utilizes both natural and synthetic raw materials, chemical reactions and process equipment to manufacture binders, agents, rejuvenators, additives and lubricating oils for a wide range of industrial applications.

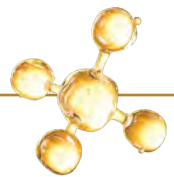




Our Reach

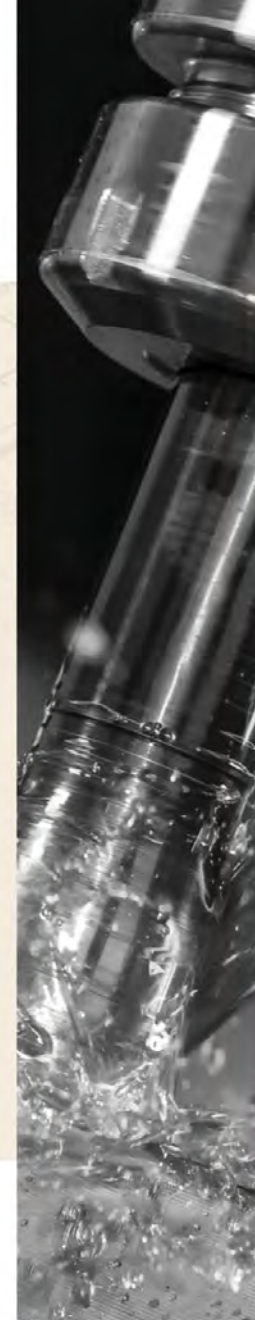
We are proud to support customers and partners from coast to coast in the U.S. and Mexico and in more than 100 countries around the world.





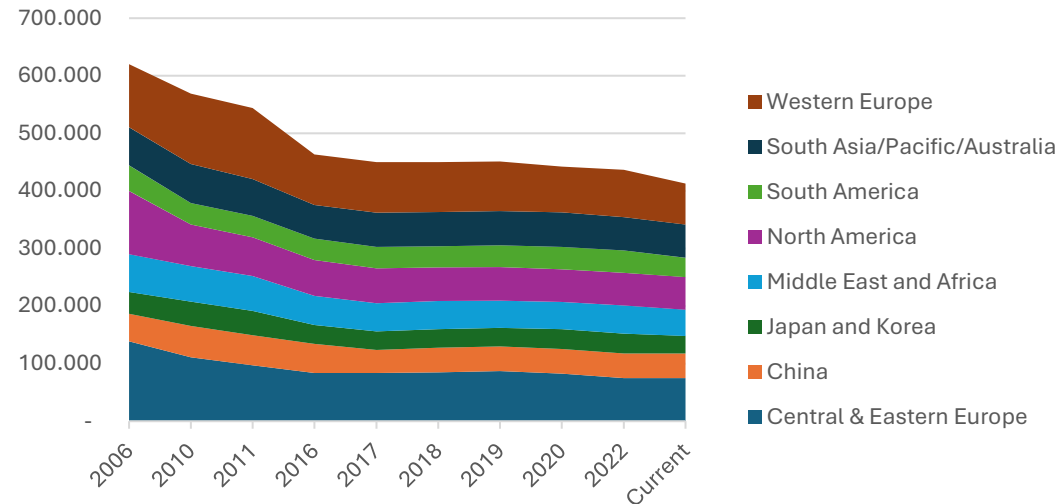
Group I Global Rationalization

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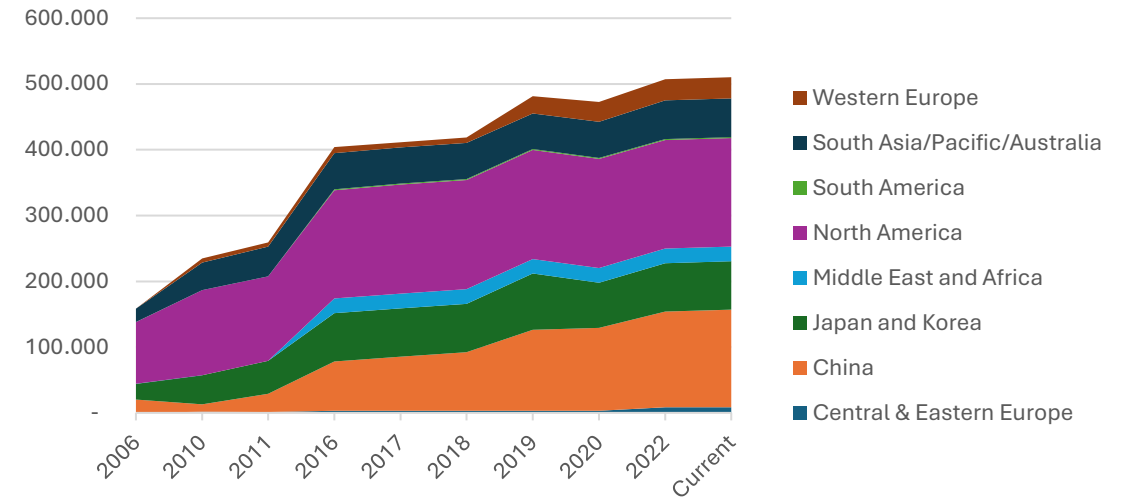




Group I Capacity (Barrels/Day)

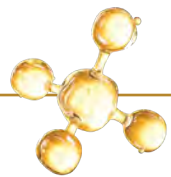
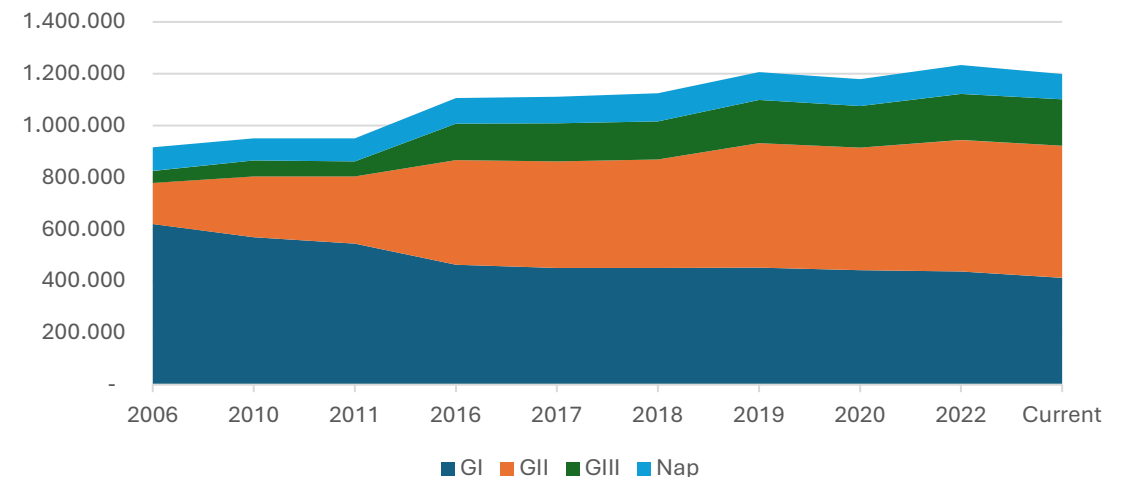


Group II Capacity (Barrels/Day)



- Capacity is shifting away from GI to GII
- The demand for GI product applications continues to grow.

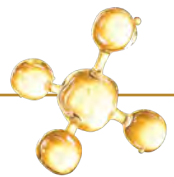
Global Capacity (Barrels/Day)





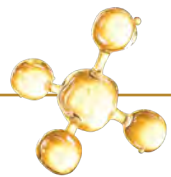
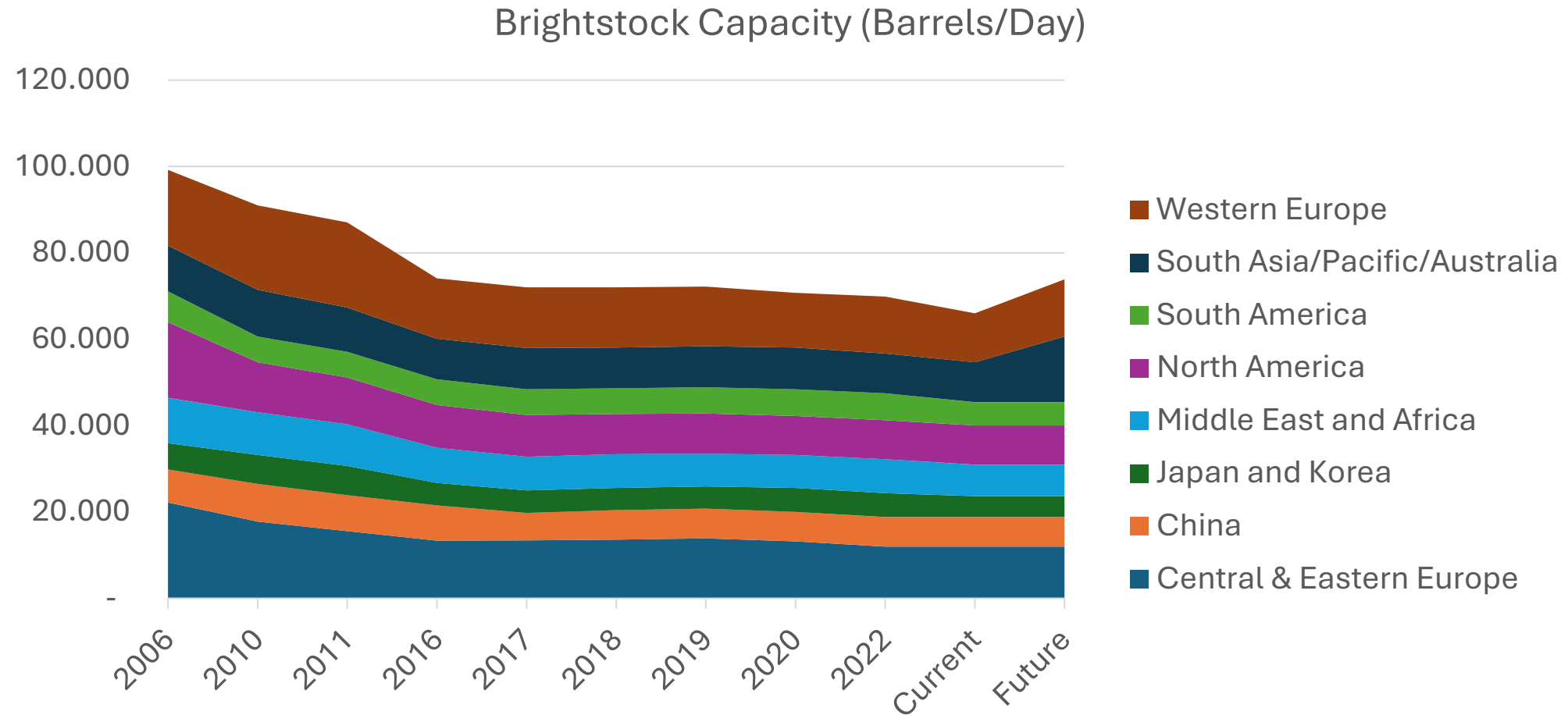
- The majority of the base oil capacity taken offline over the past decade has been API Group I
- While the grade still has a firm place in the finished lubricants market, it is slowly being pushed out by Group II stocks, which can often be less expensive

Company	Location	Size (Barrels/Day)
2023		
Eneos	Japan - Wakayama	6,900 Group I
Sapref	South Africa - Durban	3,300 Group I
2022		
Eneos	Japan - Negishi	4,400 Group I
2021		
Galp	Portugal - Matosinhos	2,900 Group I
2020		
SK Enmove	South Korea - Ulsan	14,000 Group II
Total	France - Gonfreville	5,600 Groups I/III
2019		
LyondellBasell	U.S. - Houston, Texas	4,600 Group II/Naphthenic
2018		
Imperial Oil	Canada - Strathcona	2,400 Group I
2017		
Avista Oil	Denmark	800 Group I
2016		
ExxonMobil	U.S. - Beaumont, Texas	10,000 Group I
Gunvor (Kuwait Petroleum)	Netherlands - Rotterdam	4,650 Group I
Shell	Netherlands - Pernis	7,100 Group I
2015		
Colas (ExxonMobil)	France	6,600 Group I/III
Lukoil	Russia	5,500 Group I
Oil Ministries North Ref.	Iraq	2,500 Group I
Samir	Morocco	2,500 Group I
Shandong Quishing	China	2,750 Group I
Sinopec	China	1,000 Group I
Total	France (partial)	5,000 Group I
2014		
Azerneftiyag	Azerbaijan (partial)	8,000 Group I
CPC - Shell	Taiwan	5,400 Group I
Safor	South Africa	3,000 Group I



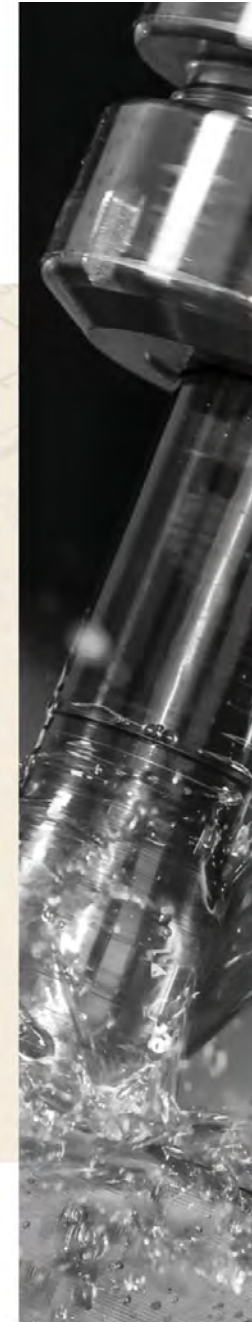


THE GROUP I MARKET IS TIGHTENING AROUND THE GLOBE



Group I Closures Implications

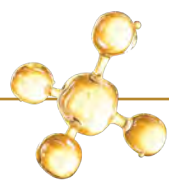
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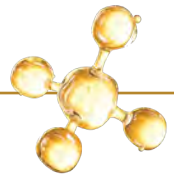
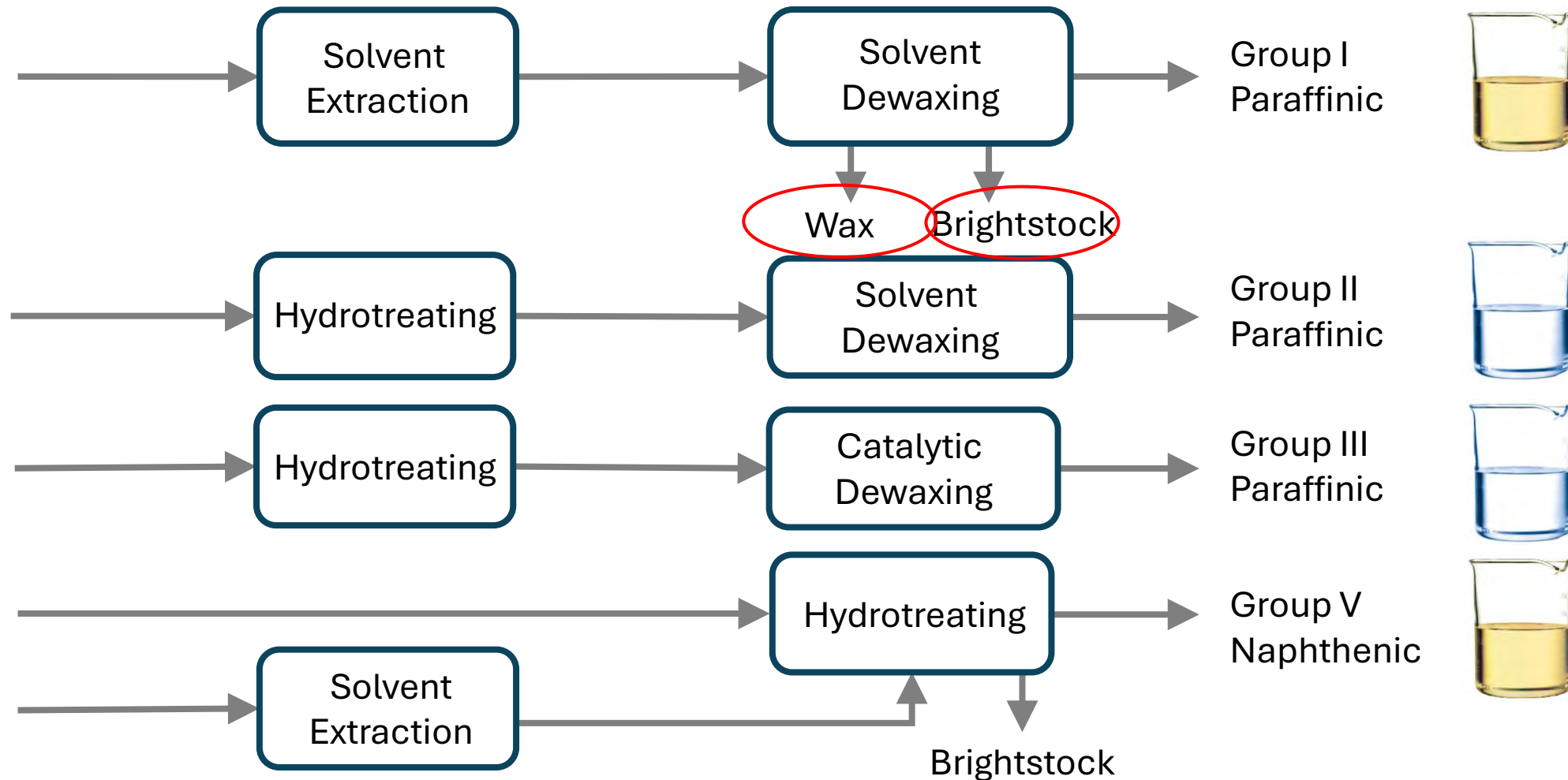
MID-RANGE SOLVENCY PRODUCTS BECOME LESS AVAILABLE

HIGH TO VERY HIGH SOLVENCY	MID SOLVENCY	LOW TO VERY LOW SOLVENCY
▪ Esters ▪ Naphthenic oils ▪ PAGs	▪ Group I paraffinic oils	▪ Group II and III paraffinic oils ▪ Silicones ▪ PAOs



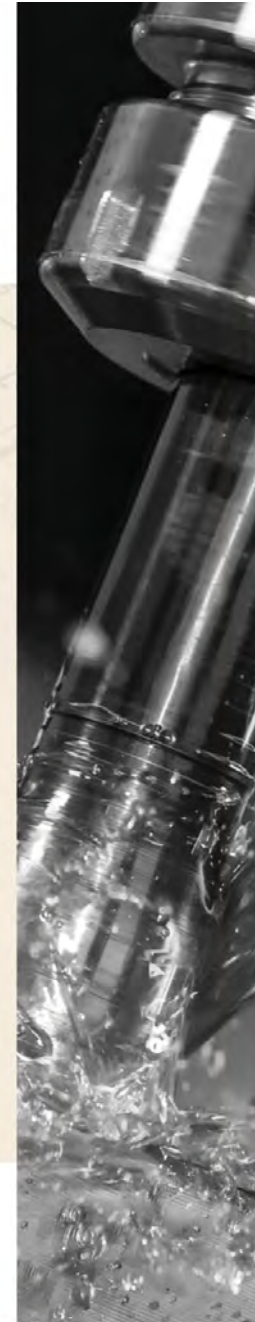


WHAT WE LOSE WITH GROUP I CLOSURES



What Products Can Fill the Void?

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WHEN GROUP I HEAVY FRACTIONS DISAPPEAR, FORMULATORS LOSE MORE THAN VISCOSITY.

Viscosity architecture

High KV and film body without excessive VM dependency.

Solvency & additive response

Ability to carry polar additives, resins and thick components.

Film persistence

Resistance to squeeze-out in slow-speed/high-load contacts.

Cost-performance balance

Economical route for severe-duty grades in value-sensitive markets.

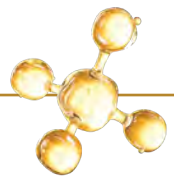
Approval continuity

Avoiding requalification risk when changing base oil chemistry.

Supply resilience

Multiple feasible blend paths when imports, freight or geopolitics shift.

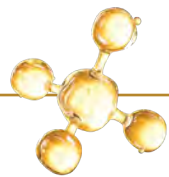
**Strategic implication: the substitute must solve the application,
not just match the kinematic viscosity.**





Candidate Molecules: Each Solves a Different Part of the Problem

OPTION	BEST CONTRIBUTION	TECHNICAL LIMITS	COMMERCIAL IMPLICATION
Naphthenic heavy oils	Solvency, low-temp behavior, blend flexibility	Lower VI and oxidation response need correction	Strong bridge molecule when solvency matters
Extra-heavy Group II	Oxidation, color, low-temp torque	Lower solvency; not always drop-in	Powerful for gear oils; validation required
PIB	Very high viscosity, clean burning, volume efficiency	Low solvency; additive compatibility must be validated	Techno-commercially attractive in selected grades
High-vis PAO	Low-temp, oxidation, high VI	High cost; supply constraints	Best for premium severe duty
PAG / ester	Polarity, high-temp performance, biodegradability options	Compatibility, water behavior, seal/material issues	Selective high-value applications
Re-refined/vegetable blends	Sustainability claims and circularity	Oxidation/compatibility/approval constraints	Useful for ESG portfolio expansion





A PRACTICAL WAY TO RECOVER FORMULATION CUSHION WHEN PARAFFINIC SOLVENCY DECLINES.

Why it matters

- Higher solvency than Group II/III helps carry additives, resins and polar components.
- Naturally strong low-temperature behavior improves blend flexibility.
- Can complement Group II/III in formulations where cleanliness alone is not enough.
- Useful in process oils, greases, MWF, rubber/process applications and selected industrial oils.

Solvency

Low-temp

Compatibility

Blend flexibility

COMMERCIAL USE CASE

Use naphthenics to reduce reformulation friction when moving from Group I-heavy slates to cleaner paraffinic architectures.

Source: ChemBizR/Ergon market study, 2024; Ergon technical positioning.



IT IS ATTRACTIVE WHERE VISCOSITY
EFFICIENCY MATTERS; LESS
ATTRACTIVE WHERE SOLVENCY IS
THE PERFORMANCE DRIVER.

Relative substitution preference

Application	PIB	PAO	GII/III
Gear oils	5	3	2
Marine cylinder	4	2	1
Greases	4	3	1
Rubber process	1	1	4
Engine oils	1	2	4

Why PIB is attractive

Very high viscosity, broad viscosity range, potentially lower treat rate, clean-burning characteristics in selected applications.

Why PIB is not enough

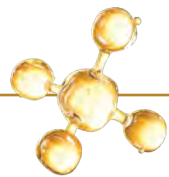
Low solvency vs Group I bright stock can affect additive response, dispersion and formulation robustness.

Commercial rule

Use PIB when volume efficiency creates economic value; avoid blind substitution where solvency, approval or field history are critical.

PIB may reduce volume need, but bright stock still carries formulation behavior that is difficult to replicate in solvency-sensitive systems.

Source: ChemBizR/Ergon market study, 2024, opportunity analysis for bright stock applications and replacement trends.





GPO II EXTRA HEAVY TYPE MOLECULES IMPROVE OXIDATION AND LOW-TEMPERATURE BEHAVIOR, BUT SOLVENCY AND EQUIVALENCE STILL NEED VALIDATION.

Attribute	Group I Bright Stock	Extra-heavy Group II
Viscosity contribution	Very high	Very high
Solvency / polarity	Higher	Lower
Oxidation stability	Moderate	High
Color / appearance	Darker	Cleaner
Low-temperature torque	Limited	Improved
Drop-in equivalence	Application-dependent	Not automatic

Where it creates value

- Industrial and automotive gear oils requiring high viscosity plus oxidative stability.
- Applications where color, low-temperature torque and durability become differentiators.
- Potential to reduce co-base stock or thickener dependency in selected formulations.

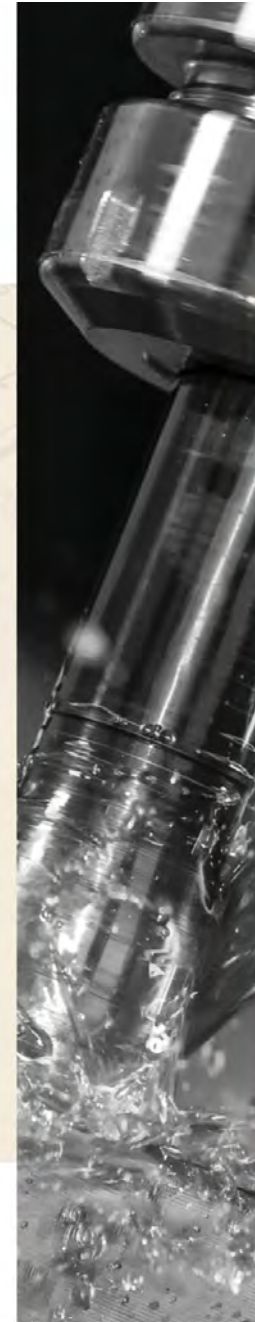
Where caution is required

- Solvency-sensitive additive systems.
- Legacy approvals or field-proven Group I formulas.
- Rubber/process-oil systems where compatibility dominates performance.

Source: ChemBizR/Ergon market study, 2024.

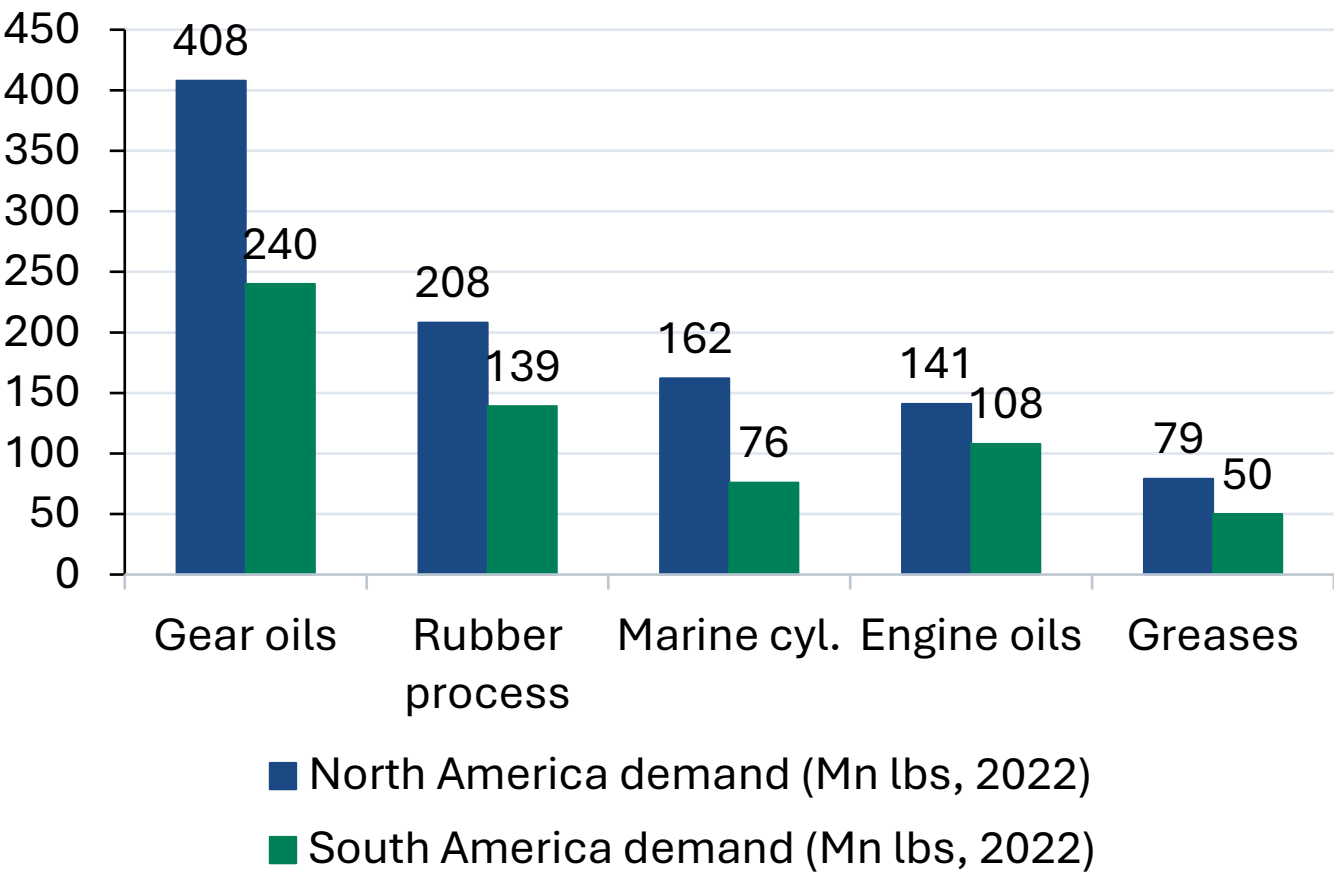
Generalities, Sustainability and Strategy

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APPLICATION DEMAND AND COMMERCIAL VALUE



Gear oils

Highest volumetric bright stock use; viscosity body and shear-stable architecture remain key.

Marine cylinder oils

Future fuels change chemistry, but cylinder lubrication still requires film, cleanliness and deposit control.

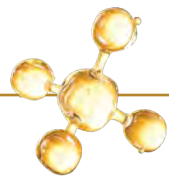
Greases

Base oil viscosity controls film strength after oil release from thickener matrix.

Rubber/process oils

Compatibility and solvency can matter as much as viscosity.

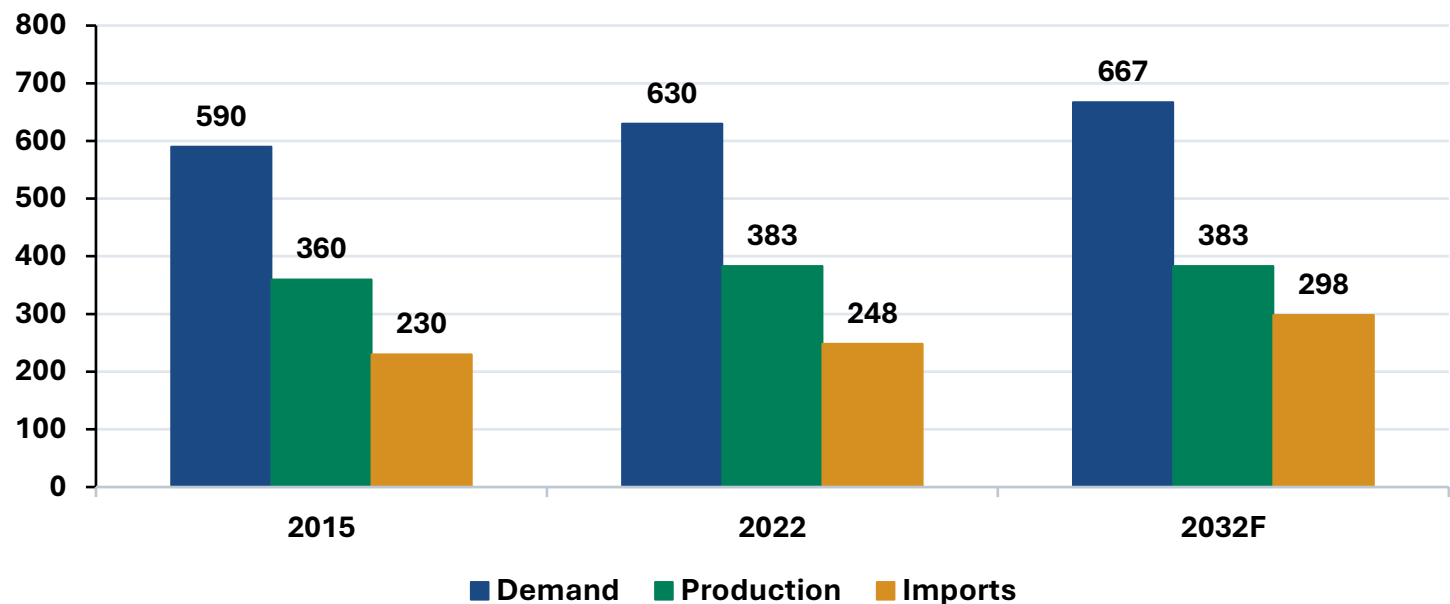
Source: ChemBizR/Ergon market study, 2024, bright stock application demand estimates, pp. 38 and 41.





DEMAND GROWS WHILE LOCAL PRODUCTION STAYS FLAT,
INCREASING IMPORT DEPENDENCY AND STRATEGIC OPPORTUNITY.

REGIONAL MARKET EVIDENCE



Market signal

Imports account for ~40% of regional demand in 2022 and are expected to rise as demand grows.

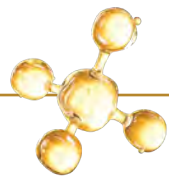
Strategic implication

A reliable supplier with heavy-stock expertise can support regional blenders facing limited local expansion.

Commercial relevance

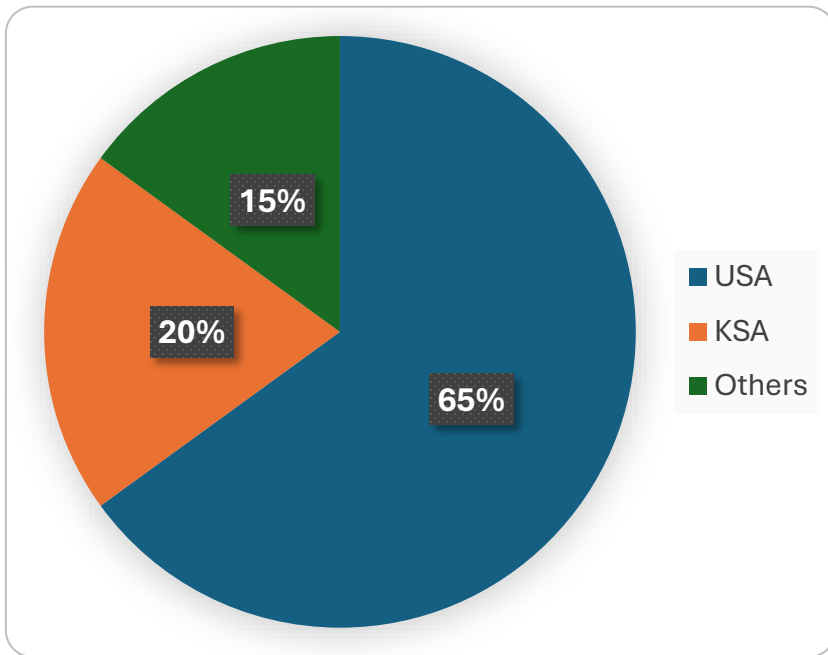
The opportunity is not only volume. It is continuity, formulation stability and customer retention.

Source: ChemBizR/Ergon market study, 2024, South America bright stock supply-demand dynamics, p. 42.





SOUTH AMERICA RELIES ON EXTERNAL SUPPLY WHILE SEVERE-DUTY APPLICATIONS REMAIN ACTIVE.



What the import split means

- The US is the dominant external source, while KSA adds a meaningful secondary flow.
- Longer supply chains increase exposure to freight, port delays, inventory planning and FX volatility.
- A supply strategy based on one molecule or one origin is vulnerable when demand is stable but supply routes are volatile.

Commercial thesis

A resilient bright stock strategy protects production continuity in industrial gear oils, greases, marine oils and process oils.

Import dependency turns Bright Stock into a resilience molecule

Source: ChemBizR/ERGON market study, 2024, South America bright stock import split, p. 42.



AVAILABILITY, FREIGHT AND ROUTE RELIABILITY NOW INFLUENCE THE REAL COST OF A MOLECULE.



Hormuz exposure

EIA: ~20 million b/d of petroleum liquids moved through the Strait of Hormuz in 2024 - about 20% of global liquids consumption.

Red Sea / Suez disruption

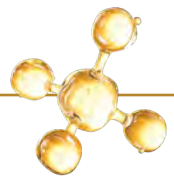
UNCTAD: rerouting around the Cape of Good Hope increased distances, delays and freight-rate volatility in 2024-2025.

Base oil implication

The molecule with the best datasheet is not the best commercial solution if it cannot arrive reliably, repeatedly and competitively.

Supply resilience is becoming a formulation variable.

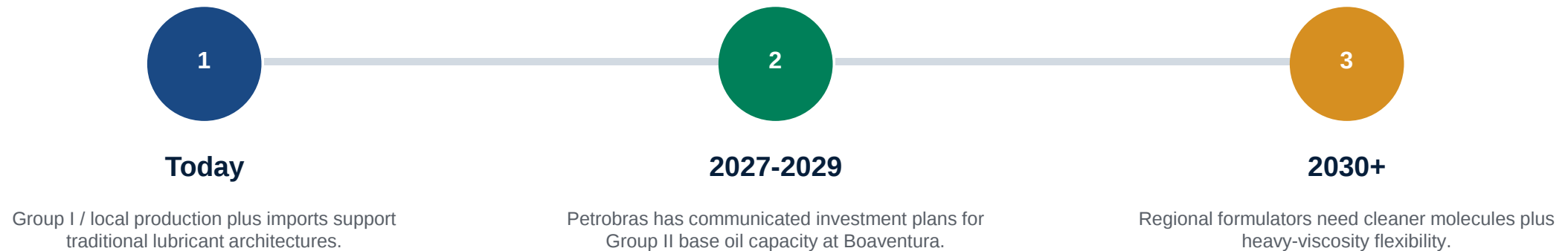
Source: EIA, "Strait of Hormuz remains critical," 2025; UNCTAD Review of Maritime Transport 2025; presenter analysis.





GROUP II CAPACITY WILL MODERNIZE THE SLATE — BUT IT DOES NOT ELIMINATE HEAVY-VISCOSITY NEEDS.

BRAZIL AND LATAM RELEVANCE



Key message for Brazil

Modernization toward Group II improves oxidation stability and cleanliness, but severe-duty sectors still need heavy viscosity, film strength and formulation resilience.

Source: Petrobras 2025-2029 plan / public announcements; Reuters and BaseOilNews 2025; ChemBizR/Ergon market analysis.



BUILDING A MORE SUSTAINABLE FUTURE

Blending today for a cleaner tomorrow



Government regulations around sustainability have increased the demand for **Bio-based and Eco-friendly formulations.**



Heavy base oils producers are forced to find ways to **include these products into their portfolio** to meet these demands.



Blending is one the **easiest** ways for heavy base oil producers to meet these demands.

BIO-BASED CONTENT



Heavy Base Oils with Vegetable Oils for Bio-based Content

BLENDING
The Smart Path to Sustainability

RECYCLED CONTENT

Heavy Base Oils with Re-refined Oils for Recycled Content



IDEAL FOR BLENDING

Increased solubility of **naphthenic base oils** make them **ideal for blending** with different sustainable options.



Through smart blending, heavy base oil producers can meet regulatory demands, expand their portfolio, and drive a more sustainable tomorrow.



MEET REGULATIONS



EXPAND PORTFOLIO



REDUCE ENVIRONMENTAL
IMPACT



CREATE LONG-TERM
VALUE



THE WINNING APPROACH IS NOT “GREEN CLAIM FIRST” — IT IS VALIDATED PERFORMANCE PLUS CREDIBLE SUSTAINABILITY CONTRIBUTION.

Bio-based content

Blend heavy base oils with vegetable/renewable components where oxidation, polarity and compatibility can be controlled.

Re-refined content

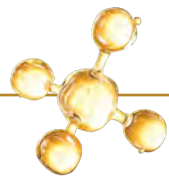
Use re-refined base oils to add circularity while protecting performance and approval requirements.

Lower-carbon use phase

Optimize viscosity to reduce energy loss while maintaining film thickness and durability.

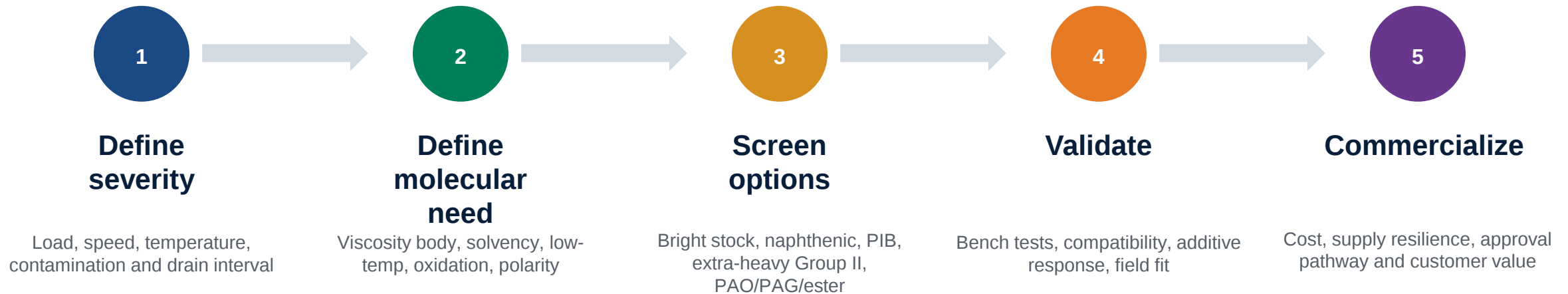
Sustainability lever	Technical risk to manage	Commercial proof needed
Vegetable oils	Oxidation stability, hydrolysis, seal compatibility	Clear bio-content claim + field performance
Re-refined oils	Contaminants, consistency, additive response	Quality assurance + OEM/spec fit
Lower viscosity optimization	Film thickness vs energy efficiency trade-off	Performance equivalence + measurable savings
Longer drain / durability	Oxidation, cleanliness, viscosity retention	TCO evidence + customer validation

Source: Ergon/ChemBizR market study, 2024; presenter technical-commercial synthesis.





USE HEAVY MOLECULES SMARTER: SELECT, VALIDATE, DUAL-SOURCE AND PROTECT CUSTOMER CONTINUITY.



Final commercial test

Can the formula be manufactured repeatedly, pass performance requirements, survive supply disruptions and protect customer economics?

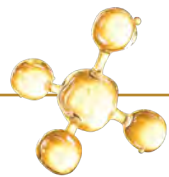
Source: Presenter technical-commercial framework derived from ChemBizR/Ergon study findings.



POSITION HEAVY BASE OILS AS A RESILIENCE PLATFORM
FOR INDUSTRIAL, MARINE AND PROCESS APPLICATIONS.

Opportunity space	Technical offer	Commercial angle	Target customers
Industrial gear oils	Bright stock + naphthenic/Group II architectures	Reduce reformulation risk; maintain ISO VG 320-680 capability	Blenders, mining, cement, steel
Greases	Heavy oil phase + solvency support	Improve durability, tackiness and field reliability	Grease manufacturers, OEM service
Marine cylinder/system oils	Film durability + cleanliness strategy	Support future-fuel transition and validation	Marine lubricant blenders, ports
Rubber/process oils	Solvency and compatibility portfolio	Help compounders balance processability and properties	Rubber, tires, adhesives
Supply resilience	Multiple molecules, multiple blend paths	Protect customer production continuity	Regional distributors and blenders

Source: ChemBizR/Ergon market study, 2024; presenter strategy synthesis for LATAM.





MARINE ALTERNATIVE FUELS AND LUBRICATION IMPLICATIONS

The transition to low- and zero-carbon fuels is reshaping marine propulsion and the role of lubricants



THE SHIFT IN MARINE FUELS

DRIVERS OF CHANGE



REGULATORY PRESSURE

IMO GHG strategy targeting net-zero emissions by ~2050



MARKET & ECONOMICS

Fuel availability, price volatility and energy security



ENVIRONMENTAL IMPACT

Need to reduce GHG, SOx, NOx and particulate emissions

EMERGING ALTERNATIVE FUELS



LNG

Lower CO₂ and NOx; proven technology



BIOFUELS

Drop-in potential; feedstock and sustainability dependent



METHANOL

Liquid at ambient conditions; toxic and corrosive



AMMONIA

Zero carbon; toxic and requires high handling rigor



HYDROGEN

Zero carbon; low volumetric energy density; storage challenge

KEY CHALLENGES FOR LUBRICANTS



MATERIAL COMPATIBILITY

Corrosion, embrittlement and seal compatibility vary by fuel



LUBRICITY & WEAR

Different fuels impact boundary lubrication and wear behavior



THERMAL & OXIDATION STABILITY

Higher operating temperatures and combustion characteristics demand robust formulations



SYSTEM CLEANLINESS

Deposits, sludge and varnish control remain critical



SAFETY & HANDLING

Toxicity, flammability and new handling protocols require lubricant adaptations

LUBRICATION IMPLICATIONS



ENGINE LUBRICANTS

Formulations must be tailored to fuel type, operating temperatures and emissions control technologies



CYLINDER LUBRICATION

Critical to prevent wear, scuffing and corrosive attack; base number optimization is key



FUEL SYSTEM COMPATIBILITY

Lubricants must be compatible with new fuel chemistries and system materials



MONITORING & ANALYTICS

Used oil analysis and condition monitoring are essential to ensure reliability



COLLABORATION

Close collaboration between OEMs, fuel suppliers and lubricant providers is vital



THE RIGHT LUBRICANT STRATEGY IS ESSENTIAL TO UNLOCK THE FULL POTENTIAL OF ALTERNATIVE FUELS AND ENSURE RELIABLE, EFFICIENT AND SUSTAINABLE OPERATIONS.





1. Heavy viscosity is still a mechanical requirement

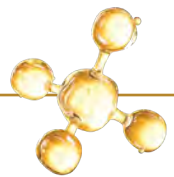
Many machines still need film thickness, load support and oil-phase durability.

2. Bright Stock is a formulation lever

It should be used selectively where viscosity architecture, solvency and robustness create value.

3. Resilience is now part of performance

A formula that cannot be manufactured reliably is not a winning formula.



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Thank you.

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