



WHAT DRIVES YOUR
RPO SUPPLY?



What are RPOs?

RPOs, or Rubber Process Oils, are specialty oils that are used as plasticizers in rubber formulations. These oils are also referred to within the industry as “Process Oils”, “Plasticizers” and “Extender Oils.”

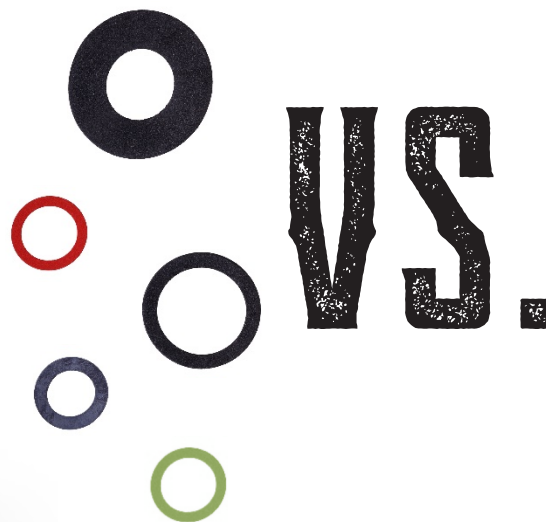


ERGON
REFINING

**Rubber & Tire Industry
Performance &
Regulatory Demands**

**RPO
CHEMISTRY**

**Evolution of the
Refining Industry**



RUBBER PROCESS OILS

High Viscosity
& Solvency

AUTOMOTIVE OILS

Low Viscosity
Low Volatility
High VI & Sats

SHARING DEMAND FOR SOLVENCY & VISCOSITY

Greases
Metalworking fluids
Industrial oils



VS.



PROCESS OILS

8% of Market
Including non-rubber Process Oils

AUTOMOTIVE OILS

57% of Market



REFINING AND RUBBER TIMELINES

Modern GI Solvent Refining Technology established - DAE (Aromatic) extracts produced

1930s

API starts categorizing Engine Oil to establish lubrication & temperature performance parameters

1947

Hydro Processing utilized as method to further clean oils (remove nitrogen & sulfur) and decrease the amount of low value Aromatic extracts

1960s

1940s

FCC (Fluid Catalytic Cracker) technology is improved to convert reactor bottoms into fuel feeds

1950

Multi-grade Engine Oils introduced - Improvements to lubrication properties through additives

1969

First commercial Hydrocracker installed at a lube plant

REFINING

Lube demands for VI & volatility drive hydrocracking (GII)

Majors begin to exit DAE Aromatic Market

Specialty oil refiners & solvent extraction units produce low PAH DAE based RPOs

Clean Air Act

API recognizes GII category

1970

1980

1990

1995

2005

2010

1975

1985

1993

2003

2007

2012

Radial-Ply becomes standard on new American cars

US Café Standards

OSHA parameters around "labeled" oils

CONCAWE IP346

Increasing warranties on rubber

Polymer producers begin using clear GII oils

Modified Ames adopted as ASTM standard

KEMI publishes PAH report on RPO

EU PAH Directive

Global REACH standards

Extender oil PAH limits go into effect

EU Tire labeling; EV market emerges

RUBBER

REFINING

IMO2020
High Sulfur Oil
Regulations

2020



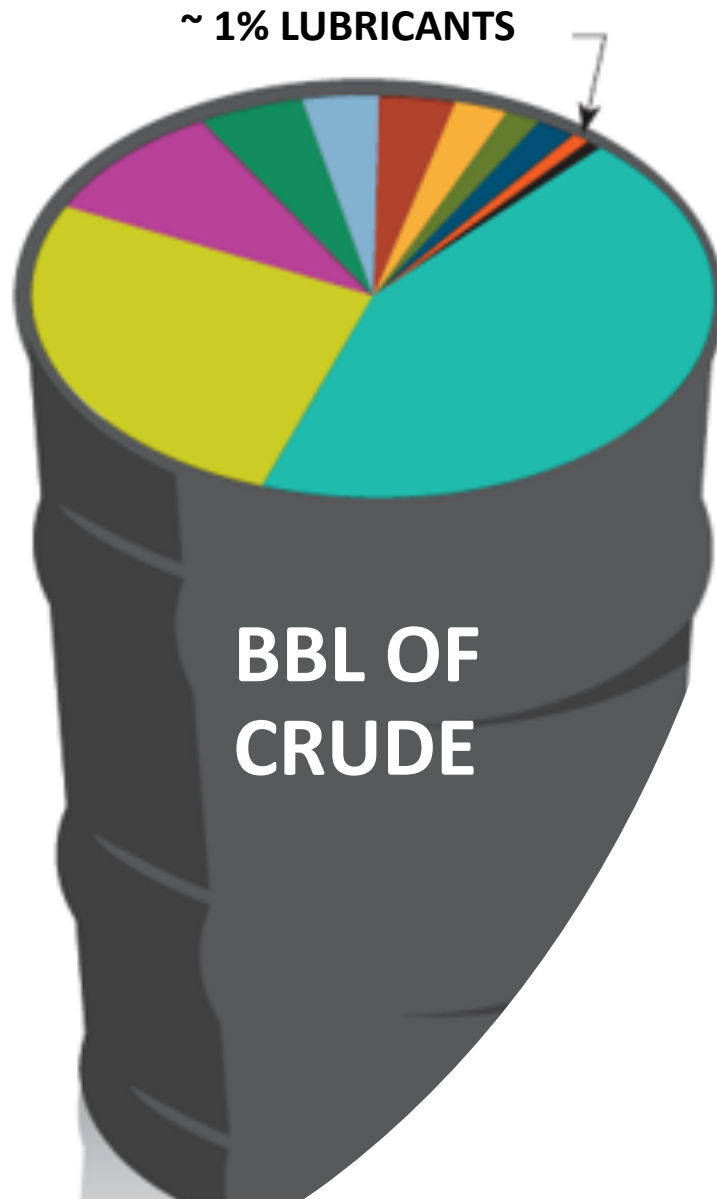
China PAH
Regulations

PAH Regulations
expand from
8 Markers to
16 Markers?

2025

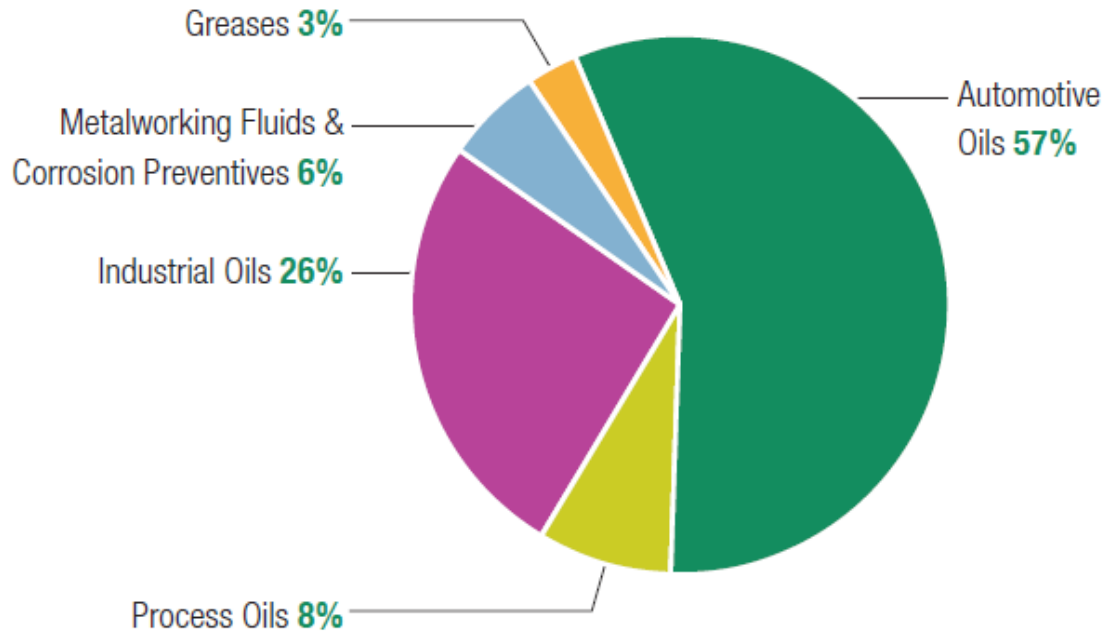


RUBBER



43.7 %	GASOLINE
27.2 %	DIESEL/HOME HEATING OIL
9.4 %	KEROSENE-TYPE JET FUEL
4.9 %	COKE
3.8 %	STILL GAS
3.6 %	LIQUIFIED REFINERY GASES
2.4 %	HEAVY RESIDUAL FUEL OILS
1.8%	ASPAHLT & ROAD OILS
1.8%	PETROCHEMICAL FEEDSTOCKS
0.9%	LUBRICANTS
0.7%	OTHER

2018 Global Lubricant Demand by Product



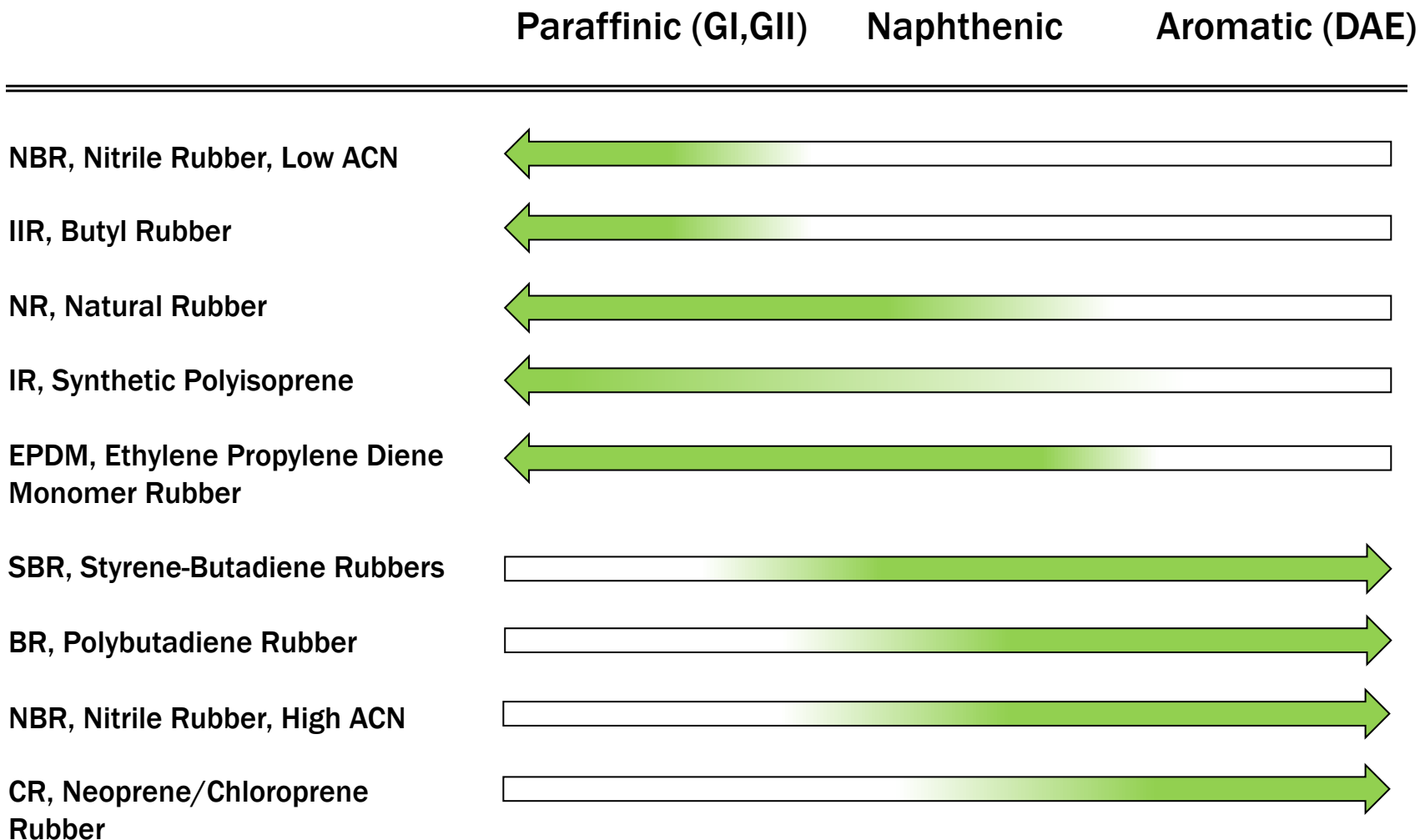
Source for all: Fuchs Petrolub SE

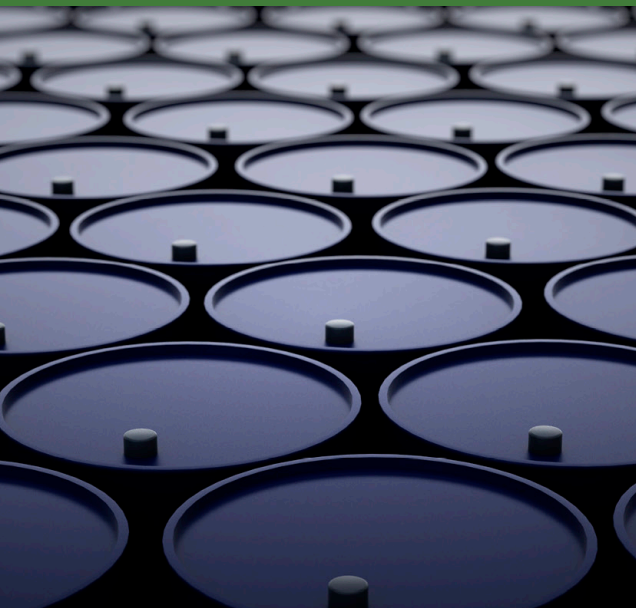


**Solvency/High Viscosity
Naps, GI and GI Derivatives**



**Low Viscosity/Low Volatility
GII/GIII**





CRUDE TYPE

REFINERY PROCESS

PRODUCTS

Paraffinic

Group I Extraction

Paraffinic Oils and DAE,
TDAE, RAE, TRAE, MES, Wax

Paraffinic

Group II Hydrocracking

Paraffinic Oils

Naphthenic

Hydrotreating

Naphthenic & Black Oils

WHETHER PUSHED OR PULLED, REFINERIES CHANGE ACCORDING TO REGULATIONS AND MARKET DEMANDS


ERGON 

**SOLVENT
EXTRACTION
PRODUCES DAE, RAE**

**ADDITIONAL SOLVENT
EXTRACTION
PRODUCES TDAE, TRAE**

**HYDROPROCESSING
TO CLEAN
NAPHTHENIC CRUDE**



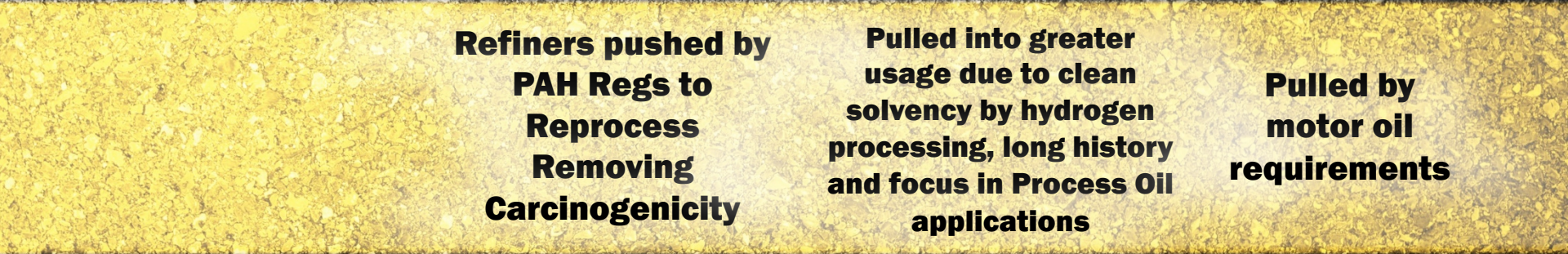
**HYDROPROCESSING
TO PROVIDE HIGH
SATURATION**



**Refiners pushed by
PAH Regs to
Reprocess
Removing
Carcinogenicity**

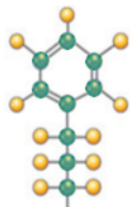
**Pulled into greater
usage due to clean
solvency by hydrogen
processing, long history
and focus in Process Oil
applications**

**Pulled by
motor oil
requirements**



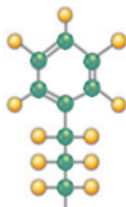
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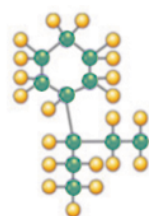
Aromatic

**ADDITIONAL SOLVENT
EXTRACTION
PRODUCES TDAE, TRAE**



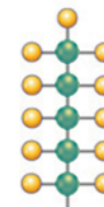
Aromatic

**HYDROPROCESSING
TO CLEAN
NAPHTHENIC CRUDE**



Naphthene

**HYDROPROCESSING
TO PROVIDE HIGH
SATURATION**



Paraffin

**Great for Tire
Rubber, but
restricted (DAE)**

- Superior Solvency
- Disperses Fillers
- Quicker Cures
- Lowest Cost
- Lower Aniline Point
- Better Grip Performance

**Still great for
Tire Rubber, but
Low PAH**

- Still Good Solvency
- Slower Cures
- Higher Aniline Points
- Grip Performance Focused

**Great for Tire,
Better for
Stability**

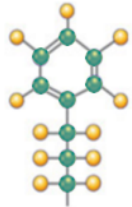
- Less Solvency, but plenty to perform
- Better RR Performance
- Low PAHs

**Poor for Tire,
Great for Saturated
Rubber (EPDM)**

- Lack of Solvency
- Low Volatility
- Light Color
- Strong Temp Aging Properties

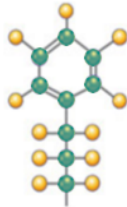
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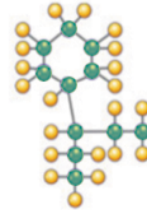
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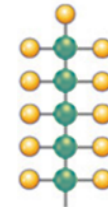
Aromatic

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TO CLEAN
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Naphthene

**HYDROPROCESSING
TO PROVIDE HIGH
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Paraffin

LUBRICANT DEMAND FOR SATURATION, LOW VISCOSITY LEADING TO GII & GIII

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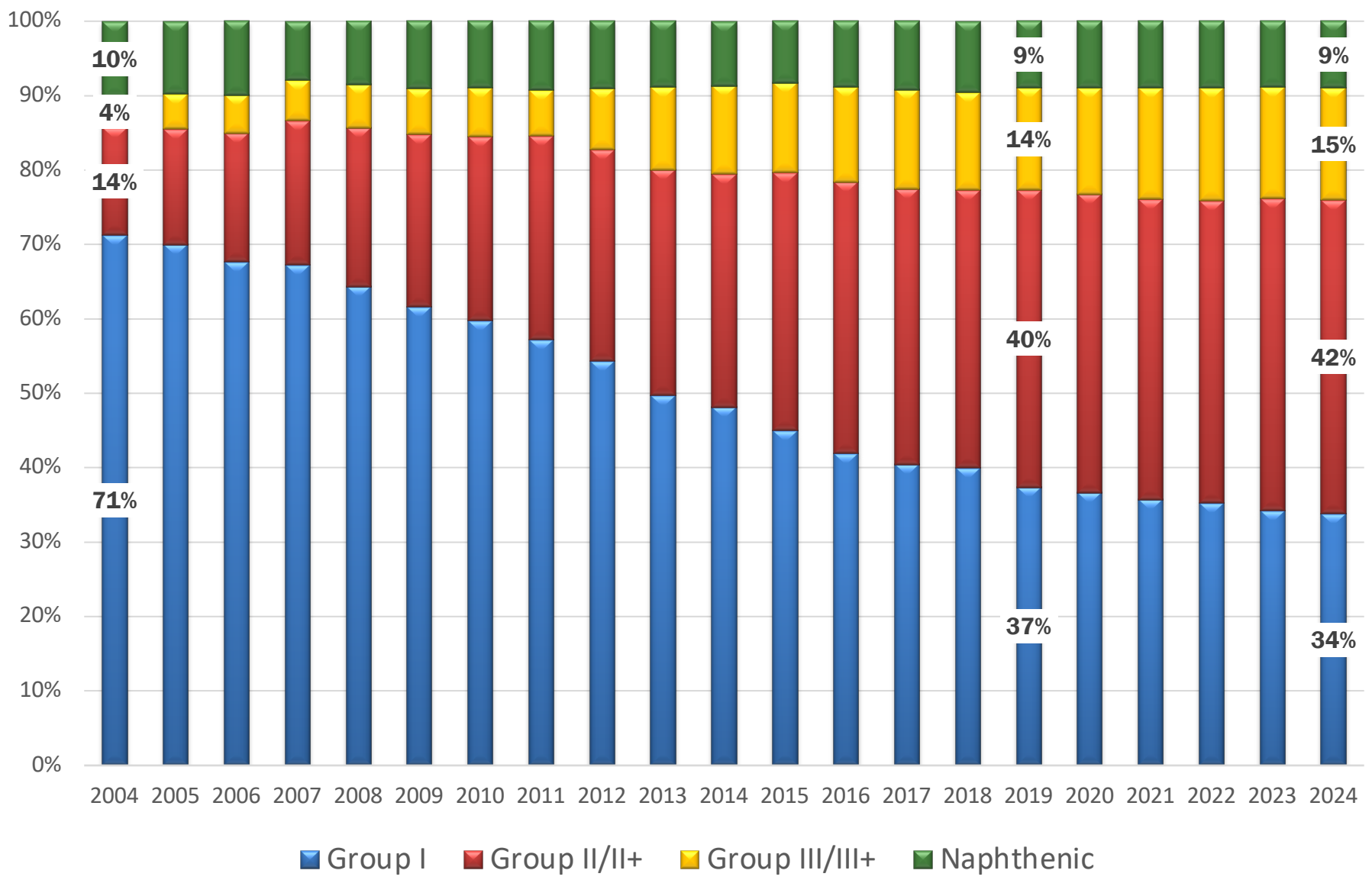
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SHARE OF API GROUPS IN GLOBAL BASESTOCK SUPPLY

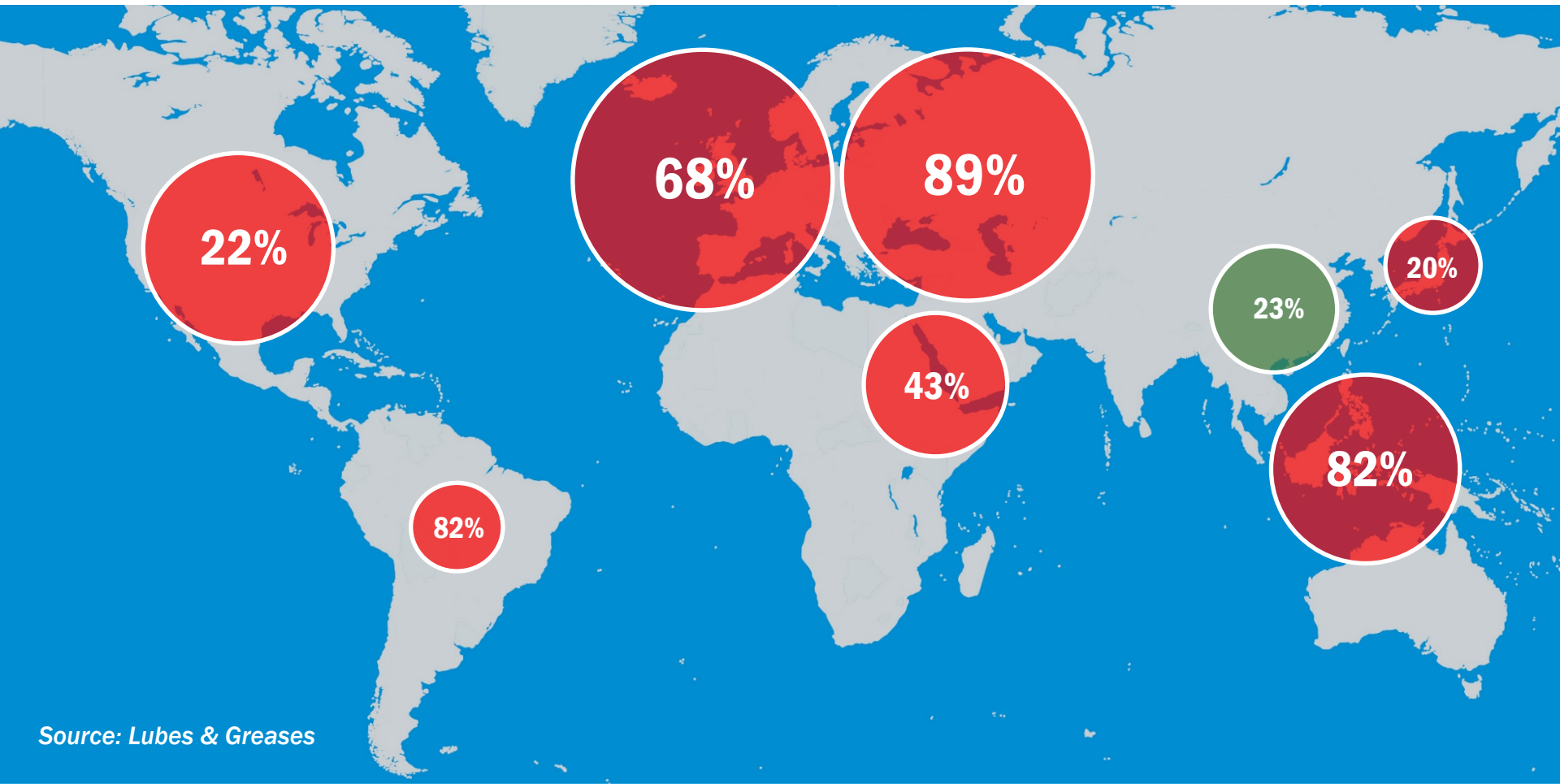


THE MIX OF PRODUCTION VARIES GLOBALLY

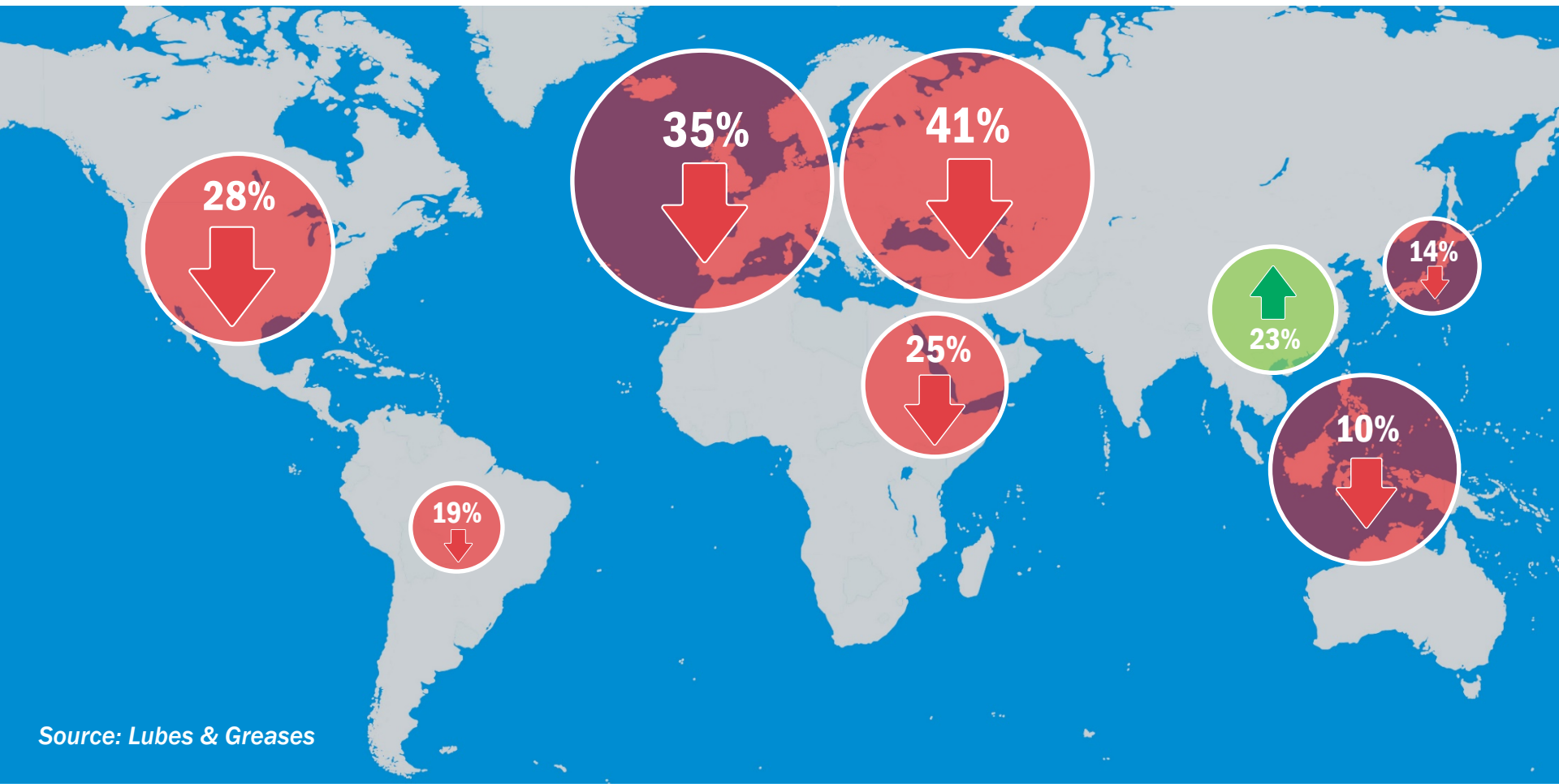
Red = Decline, Green = Increase

Size of the circle = Relative size of GLOBAL GI production

% = REGIONAL GI production relative to regional lubricant production



**IN 15 YEARS, OVER 30 GROUP I BASE OIL PLANTS HAVE CLOSED
A TOTAL CAPACITY DECREASE OF ~26%**

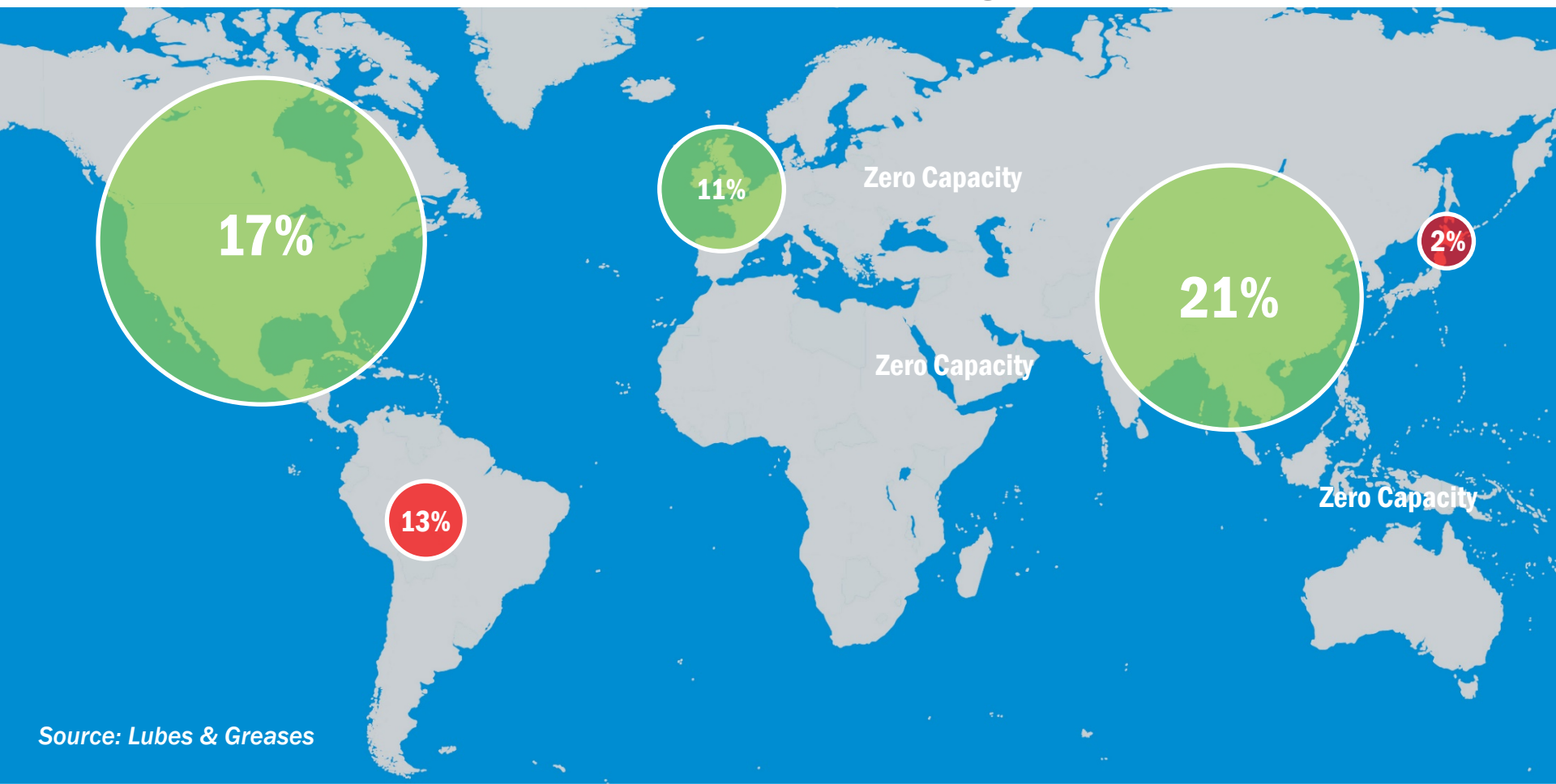


THE MIX OF PRODUCTION VARIES GLOBALLY % OF REGIONAL PRODUCTION = NAPHTHENICS

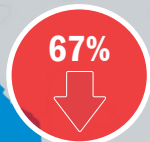
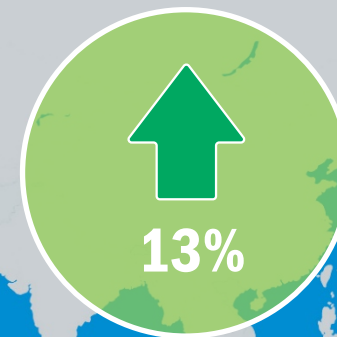
Red = Decline, Green = Increase

Size of the circle = Relative size of GLOBAL Naphthenic production

% = REGIONAL Naphthenic production relative to regional lubricant production



**IN 15 YEARS, THE NUMBER OF NAPHTHENIC REFINERIES HAS DROPPED
FROM 20 TO 18
OVERALL CAPACITY HAS INCREASED BY 2%**



Why are Group I & Naphthenics important to Rubber? Why do RPO users need to be aware of these refining trends?

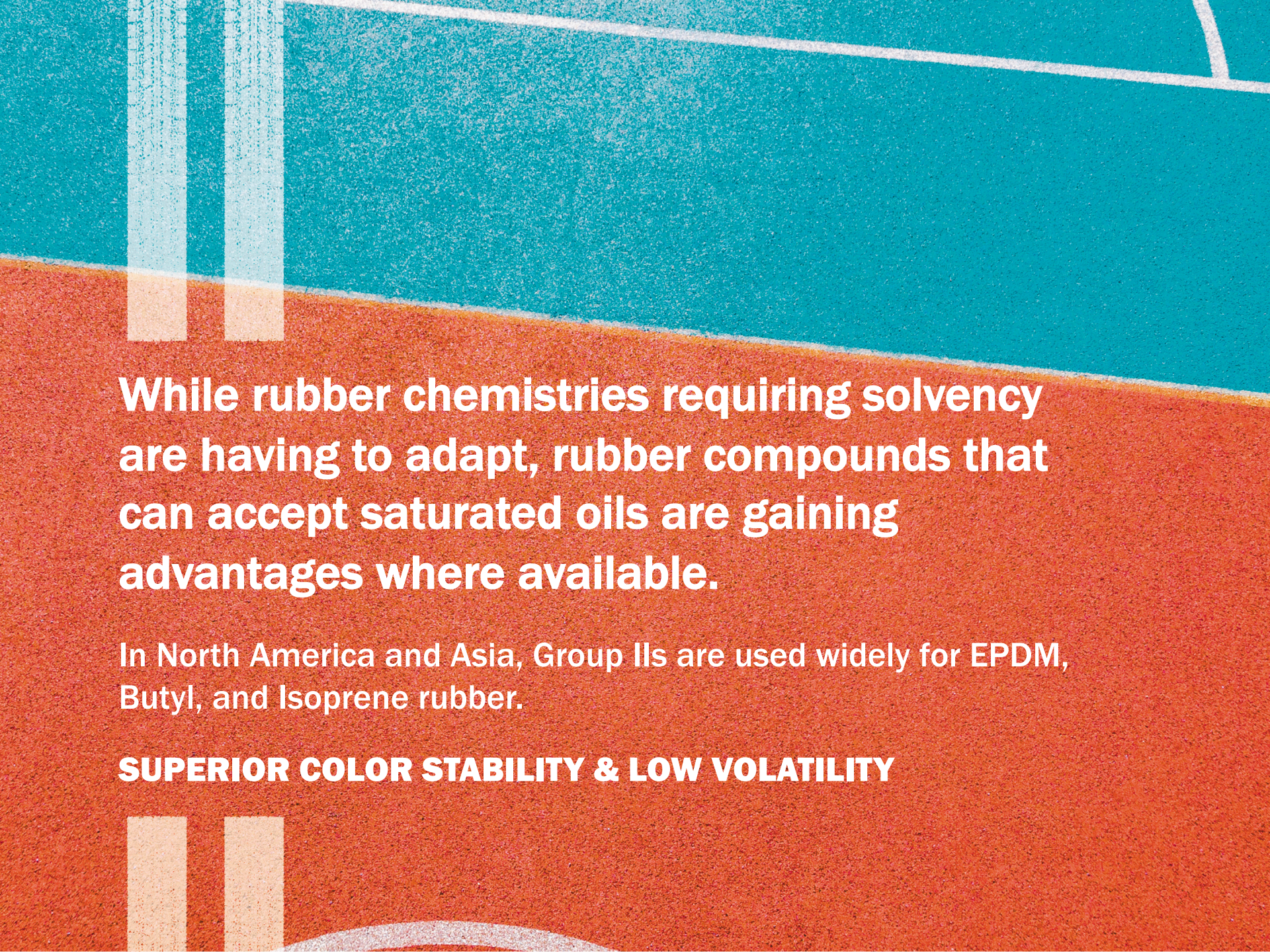
API Classification	Process Technology	Low Viscosity	High Viscosity	Acceptable Flash Points	Solvency Power	Aromatic Extracts & Waxes
Group I	Solvent	Product produced at facility	Product produced at facility	Product produced at facility	Product produced at facility	Product produced at facility
Group II	Hydro	Product produced at facility	Product produced at facility	Product produced at facility	No production	No production
Group III	Hydro	Product produced at facility	No production	No production	No production	No production
Naphthenic	Solvent/ Hydro	Product produced at facility	Product produced at facility	Product produced at facility	Product produced at facility	No production



Product produced at facility



No production



While rubber chemistries requiring solvency are having to adapt, rubber compounds that can accept saturated oils are gaining advantages where available.

In North America and Asia, Group IIs are used widely for EPDM, Butyl, and Isoprene rubber.

SUPERIOR COLOR STABILITY & LOW VOLATILITY



As evolutions within the rubber and refining industries progress, specialty refiners will continue to make the necessary adjustments to provide solvency, flash and viscosity.

A photograph of an industrial refinery at night, illuminated by blue and white lights. The scene features a complex network of pipes, metal structures, and large cylindrical tanks. In the foreground, two tall, vertical distillation columns are visible, with a grid of lights or perforations on their sides. The background shows more industrial structures and a dark sky.

**Over 50% of Global RPO
are supplied by specialty
refiners focused on Rubber
and other Viscosity &
Solvency-dependent industries.**

MOST RPOs ARE SUPPLIED BY LOCAL REFINERIES.

THE RUBBER INDUSTRY IN DIFFERENT REGIONS HAS ADAPTED THEIR RPO CHEMISTRIES WITH LOCAL CHEMISTRIES.



North America

Naphthenics, GI & GII Paraffinics



Europe

**TDAE/RAE,
GI Paraffinics**



Asia

**↓DAE (soon to shift
via China PAH Reg),
TDAE, Naphthenic,
Group II**



South America

**GI Aromatics &
Paraffinics,
Naphthenics**



The macro trends of the refining industry may soon change chemistries available and push companies to seek chemistry solutions outside of regional producers.

IMO 2020 IMPACT

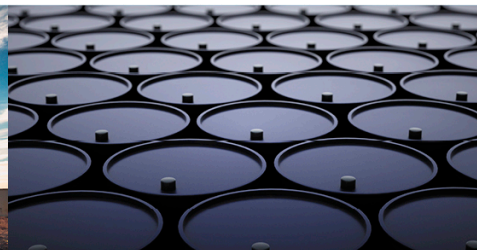
Beginning January 1, 2020, International Maritime Organization (IMO) regulations will cap bunker fuel sulfur content at **0.5%**, a significant reduction from the **current 3.5% limit**. Predictions vary for the impact of this global effort to reduce the amount of sulfur oxide released into the atmosphere. Following are our thoughts on what our industry, Ergon, and the customers we serve can expect.



**MARITIME
INDUSTRY
IMPACT**



**CRUDE AND
REFINING
IMPACT**

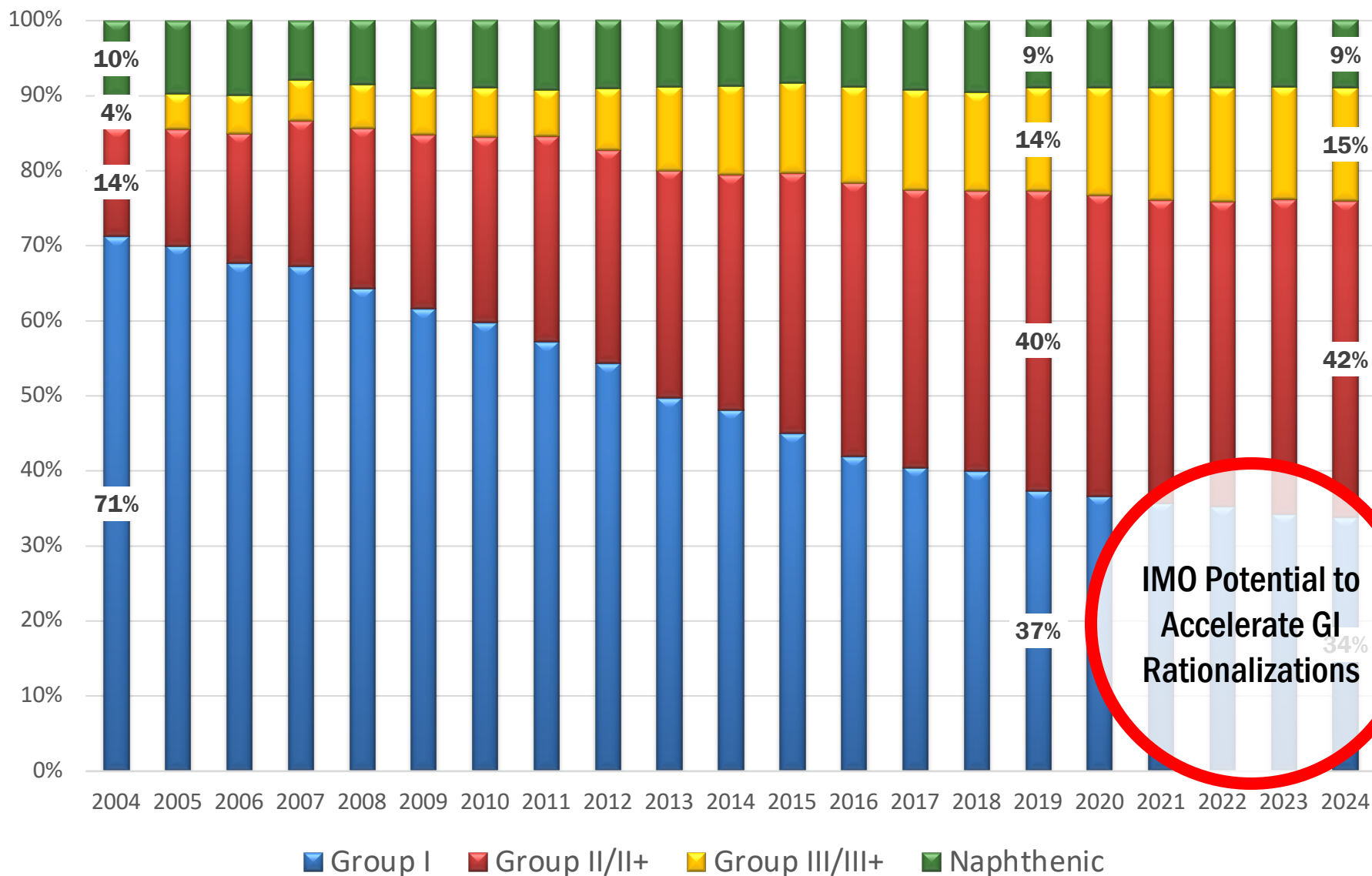


**PRODUCT
AVAILABILITY
IMPACT**



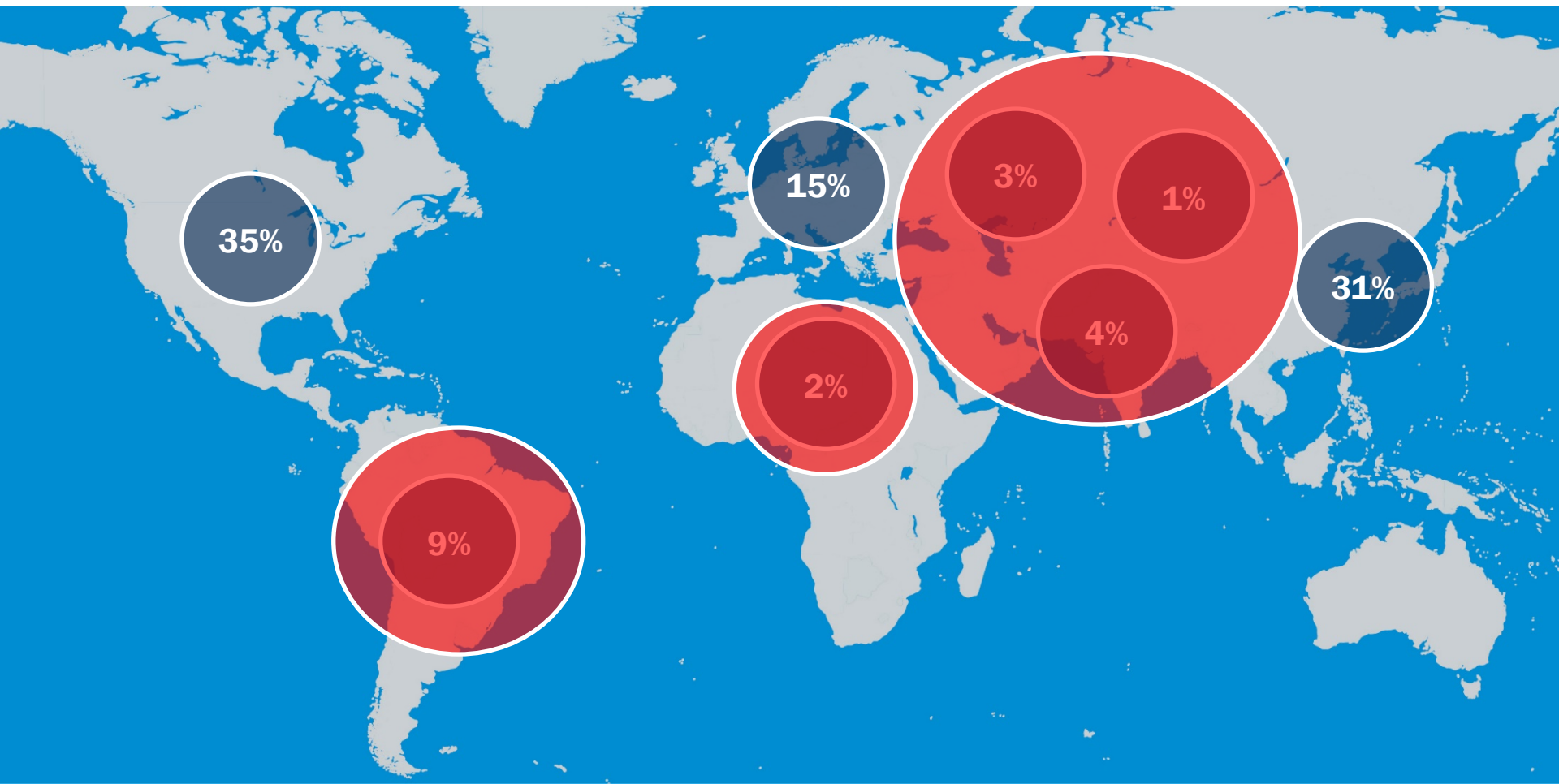
**PRODUCT
DELIVERY
IMPACT**

GI RATIONALIZATION GLOBALLY



IMO Potential to Accelerate GI Rationalizations

LOW COMPLEXITY PRODUCTION IS AT RISK



What trends will continue to affect RPOs into the future?

FROM REFINERS

Solvency

High Viscosities

Low Complexity Refiners (Sulfur)



Saturation for Lubrication

Low Viscosities

High Complexity Refiners (Sulfur)

What trends will continue to affect RPOs into the future?

FROM RUBBER INDUSTRY

**High Aromatic
Content RPO**

Grip/Abrasion Focus

Tires for ICEs



**Global PAH Regulations,
Low Aromaticity**

Low Rolling Resistance Focus

Tires for EVs

Longer Product Warranties



**Ergon wants to be your solutions provider
in an industry that continues to evolve.**

**If we cannot provide you the solution, let us
be a resource that can help you get there.**

