Lubrizol

The Bright Stock Shortage: Polymers as Cost-Efficient Alternatives

Preface

Declining Group I base oil production in favor of Group II and III base stocks in recent years is behind an emerging supply challenge for industrial lubricant manufacturers: Group I availability is shrinking, putting manufacturer product lines that depend on these base stocks at risk.

That includes supply of conventional bright stock, a very high viscosity base oil with heavy use in the industrial industry.

With supply of Group I bright stock expected to fall globally, demand steady, prices rising, and the trend expected to continue, manufacturers are exploring cost-efficient bright stock alternatives that offer the same or better quality to ensure product line continuity.

Polymer alternatives are appearing as workable replacements for conventional material, with alternative adoption likely to bridge the Group I gap in the next decade.

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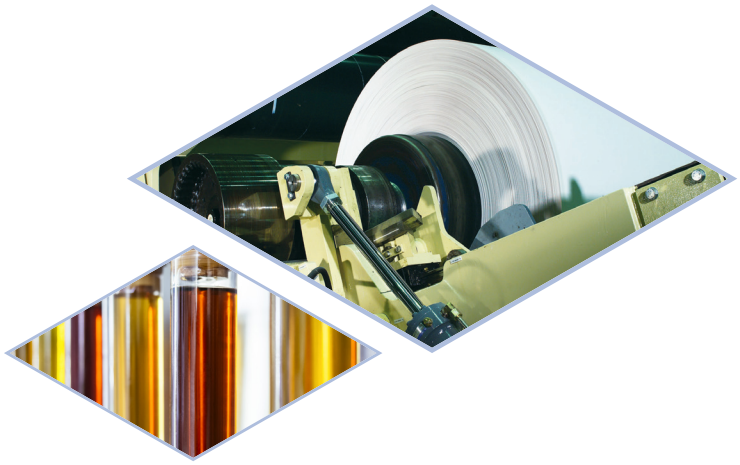
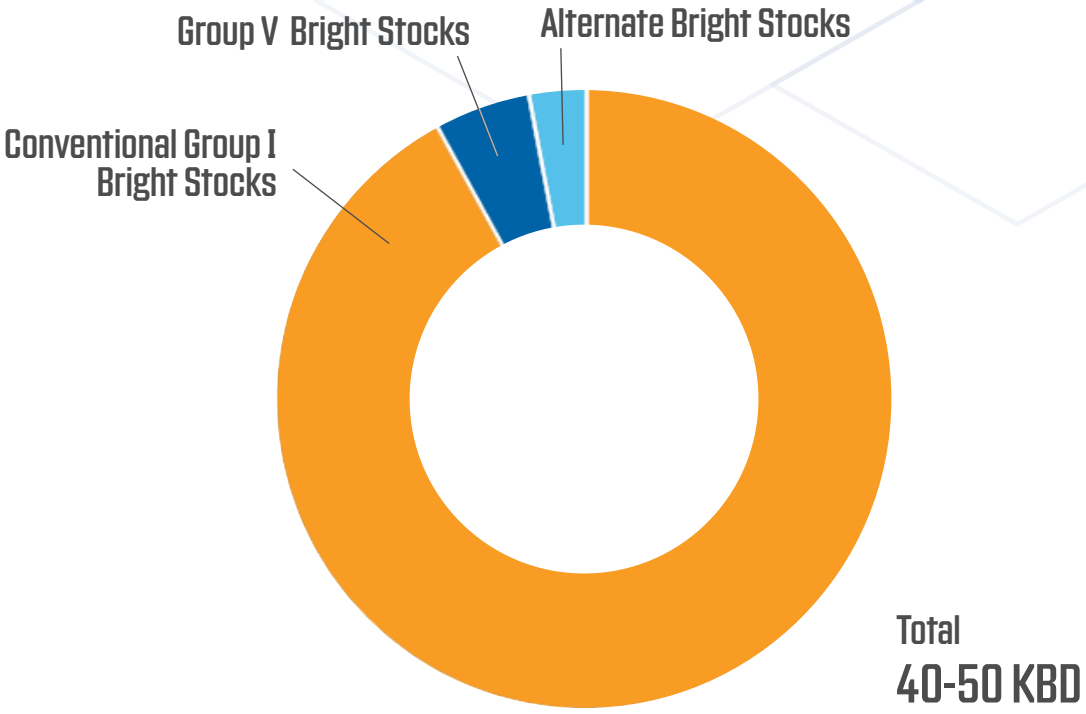


Introduction

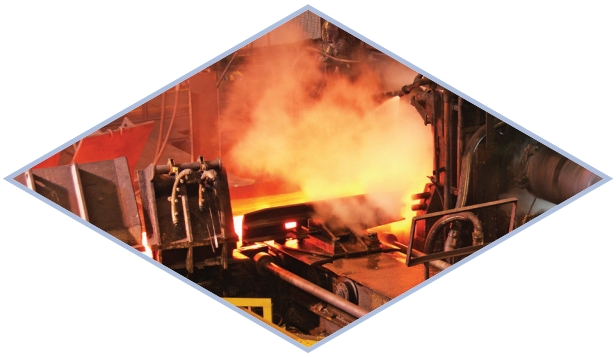
Group I bright stock, a very high viscosity base oil prevalent for decades in industrial applications (e.g., bearings, gears, and compressors), is among a growing list of materials negatively affected by declining Group I production.

With estimates showing that heavier-viscosity Group I oil accounts for more than 90% of global bright stock demand[1], some businesses are exploring alternatives to mitigate the risk.



Source: Kline & Company, February 2021, Global Business Outlook for Bright Stocks

[1] Kline & Company, February 2021, Global Business Outlook for Bright Stocks



A Changing Market

Group I Erosion

Group I base oil production began sliding in the early 2000s with the introduction of Group II/III base stocks. Adoption of the latter quickly took off in North America and Europe, followed closely by Asia, as manufacturers developed more efficient vehicles and equipment that needed better-quality, lower-sulfur base stocks with thinner viscosities.

High demand for Group II/III led to the closure of several Group I refineries, many of which produced conventional bright stock.

The Net Result

Production of Group I bright stock fell by more than 40 percent during that time, from 70,000 barrels a day in 2000 to fewer than 40,000 barrels a day in 2020[1].

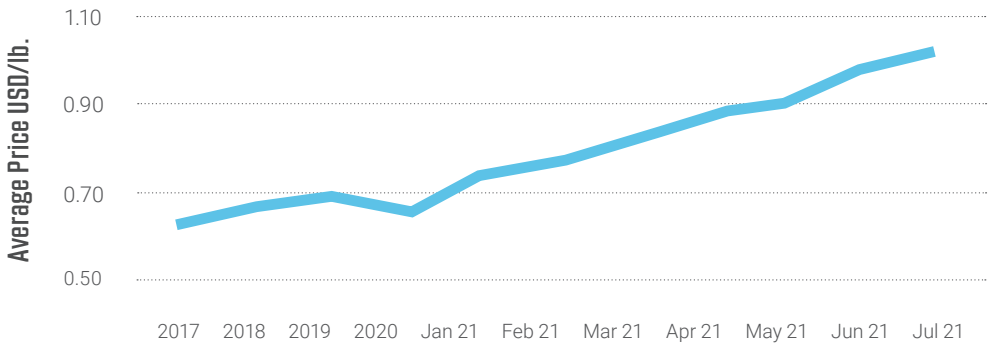
Looking ahead, it's possible that this trend will continue as many Group I plants are old and would require significant infrastructure enhancements to continue efficient operation. Given the market dynamics at play, it's logical to expect that remaining Group I plants will continue to dwindle by either upgrading to Group II/III facilities or closing altogether.

Rising Costs

While supply of Group I bright stock wanes, demand is steady, escalating prices across the globe.

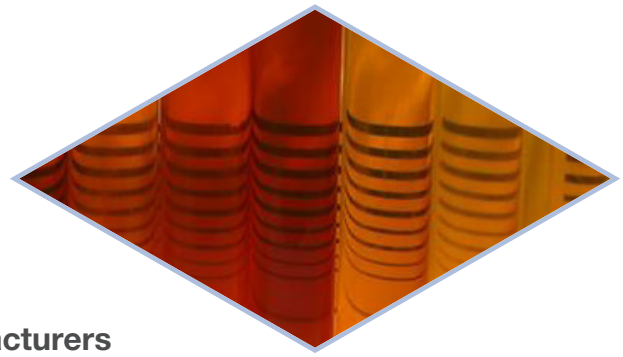
In the past few years alone, average costs have risen more than 60 percent, from $0.63 USD per pound in 2017 to $1.02 USD per pound as of July 2021[2].

Group I Bright Stock U.S. - Calumet



Source: ICIS, July 2021, ICIS Dashboard Price History

[1] Kline & Company, February 2021, Global Business Outlook for Bright Stocks
[2] ICIS, July 2021, ICIS Dashboard Price History



Consequences for Lubricant Manufacturers

The Group I production downtrend is expected to continue as increasing regulatory and end-use demands for reduced emissions and better fuel efficiency support the need for higher-performing, thinner viscosity base oils.

As a result, conventional bright stock will likely continue decreasing in supply and rising in cost, putting strain on lubricant manufacturer product line continuity and profitability.

Options

Simply put, lubricant manufacturers that rely on bright stock in their formulations will have to change and seek alternatives. There are a few possible approaches. Importantly though, not all options are equally viable. Consider some of the advantages and drawbacks in different approaches.

Multiple Conventional Suppliers

While some manufacturers are seeking alternate sources for conventional material, they're often finding the task futile and arduous given the downward supply trend and the time and money that goes into qualifying new vendors, negotiating contracts, and setting up new supply chains.

At best, this is a short-term tactical approach, as this puts a company in the position of having to adjust its operations with every switch to the next conventional supplier. That change from one supplier to the next generates cost and complexity.

Group V

Some manufacturers are also exploring opportunities with bright stock derived from naphthenic base oils (Group V). However, as is the case with Group I, supply is limited, presenting cost challenges.

Polymer Alternatives

Another possibility to offset the conventional shortage, and perhaps the most appealing, is the use of polymer alternatives. Unlike the other options, supply of these engineered substitutes is readily available. Engineered polymers also offer more consistent quality, and, ultimately, performance than conventional materials. As polymers are engineered with a narrow range of molecular weights, they offer better thickening efficiency than conventional material, supporting the potential for lower treat rates that can lead to cost savings – a win-win opportunity for product quality and the bottom line.

Example: Lubrizol® VL970BSA

Lubrizol VL970BSA, for example, a highly shear stable synthetic blending component and polymeric thickener, can be used as a bright stock alternative in industrial gear oil, grease, and automotive applications.

Benefits

- **Consistent Production & Global Supply –** Lubrizol VL970BSA offers consistent production and distribution anywhere in the world, allowing manufacturers to standardize formulations, an especially crucial factor considering supply of and demand for conventional Group I base oils will vary by region.

- **Consistent Quality –** As an engineered product, Lubrizol VL970BSA does not have the impurities and less-than-desirable molecular structure of natural materials. This leads to predictable blending and final product outcomes.

  – **Cost Savings –** Given its wide formulation compatibility, and consistent output and quality, Lubrizol VL970BSA presents potential cost savings opportunities. Notably, treat rate reductions versus Group I bright stock could save manufacturers up to 20 percent in some applications*.

Formulation Example:

The below sample formulation offers a glimpse at the potential savings.

	Lubrizol® VL970BSA Formulation	Bright Stock Formulation
Viscosity Grade	ISO VG 220	ISO VG 220
Base Oil (Chevron 600R)	84.2 wt%	46.13 wt%
Additive (Lubrizol® 5060)	1.8 wt%	1.8 wt%
Bright Stock		52.02 wt% 150BS
Lubrizol® VL970BSA	13.9 wt%	
PPD (Lubrizol® 7749B)	0.1 wt%	0.1 wt%
Total Formulated Cost (TFC)	$1,406/MT	$1,692/MT
Savings	**17%**	

Note: Pricing may vary. For illustrative purposes only.

*Performance varies. Contact your Lubrizol representative for more information and a test sample.

Proof of Performance

Product quality also plays a critical role in product performance. Industrial gear oils formulated with the same additive package and base oil can show stark differences in oxidation results, demonstrated by ASTM D2893 Method B at 121 °C when bright stock is replaced with Lubrizol VL970BSA.

Air Delivery Tubes from ASTM D2993 Method B Oxidation Test at 121 °C"

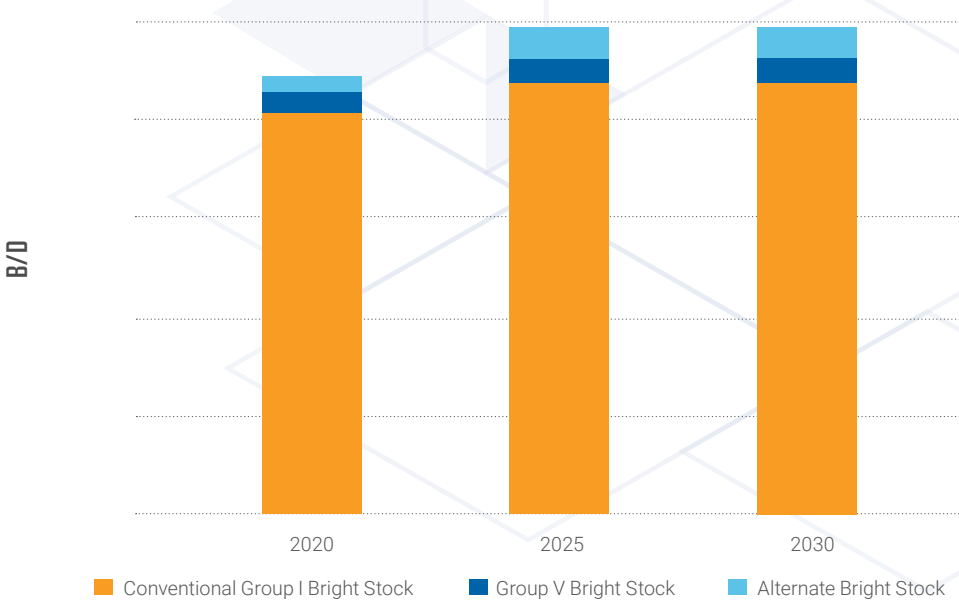
	Lubrizol® VL970BSA	Group I Bright Stock
Base Stock A		
Base Stock B		

*Performance varies. Contact your Lubrizol representative for more information and a test sample.

Alternative Adoption Trends

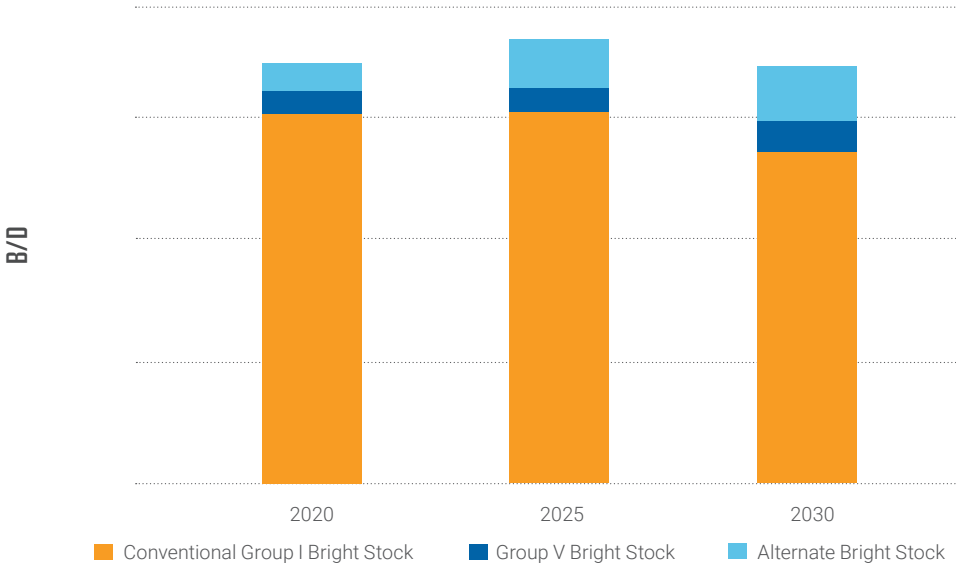
As bright stock demand begins to outpace global supply during the next decade, the charts below show how alternatives could help bridge the gap in conventional supply.

Global Demand



Source: Kline & Company, February 2021, Global Business Outlook for Bright Stocks

Global Supply



Source: Kline & Company, February 2021, Global Business Outlook for Bright Stocks

Conclusion

Polymer alternatives, such as Lubrizol® VL970BSA, have appeared as suitable alternatives to conventional Group I bright stock thanks to ready availability, versatility in application, enhanced performance, and potential for cost savings based on consistent quality.

Lubrizol expects growing market adoption in the coming years, particularly as manufacturers look to mitigate the forecasted dip in Group I production. This is especially true for the Asian, South American, African and Middle Eastern markets, where demand for bright stock is expected to outweigh supply by 2030[1], potentially foreshadowing similar situations in the North American and European markets.

Recommendations

We recommend lubricant manufacturers proactively examine their existing applications that incorporate bright stock to best understand their options and opportunities.

Of course, no operation or application is the same. As such, Lubrizol offers a range of alternative products for formulating with different viscosities and molecular weights, including Lubrizol® VL93IN, Lubrizol® VL96IN, Lubrizol® GR953A, and Lubrizol® 3119A.

Should you want help in evaluating your options or to learn more about polymer alternatives relevant to your specific application(s), Lubrizol representatives are available to support you in those efforts.

[1] Kline & Company, February 2021, Global Business Outlook for Bright Stocks

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