16th STS-AIChE Southwest Process Technology Conference

- A New Era for Olefins
- Sanjeev Kapur
- Apex PetroConsultants

Sept 22-23, 2025, University of Houston

A New Era for Olefins: A Strategic View of a Changing Industry

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Good afternoon, everyone. Today, we will delve into the dynamic and often turbulent world of light olefins, which serve as fundamental building blocks of the petrochemical industry. We will examine the key forces shaping the future of this vital sector, including market imbalances, global politics, and the strong push towards sustainability. These trends are relevant not only to industry insiders but also affect the products we use daily and the global economy.

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Sanjeev Kapur Bio

Sanjeev is a chemical engineer with over 40 years of global experience in the petrochemical industry, focused on ethylene, propylene, and refinery-petrochemical integration. As Principal Consultant & President of Apex PetroConsultants, he advises clients across the value chain — from project development and technology strategy to operations and optimization.

Before founding Apex, he held leadership roles at Fluor, ABB Lummus Global (now Lummus Technology), Shaw Stone & Webster, and The Kinetics Technology International (now part of Technip Energies). His work has helped shape best-in-class facilities and innovations in light olefins production.

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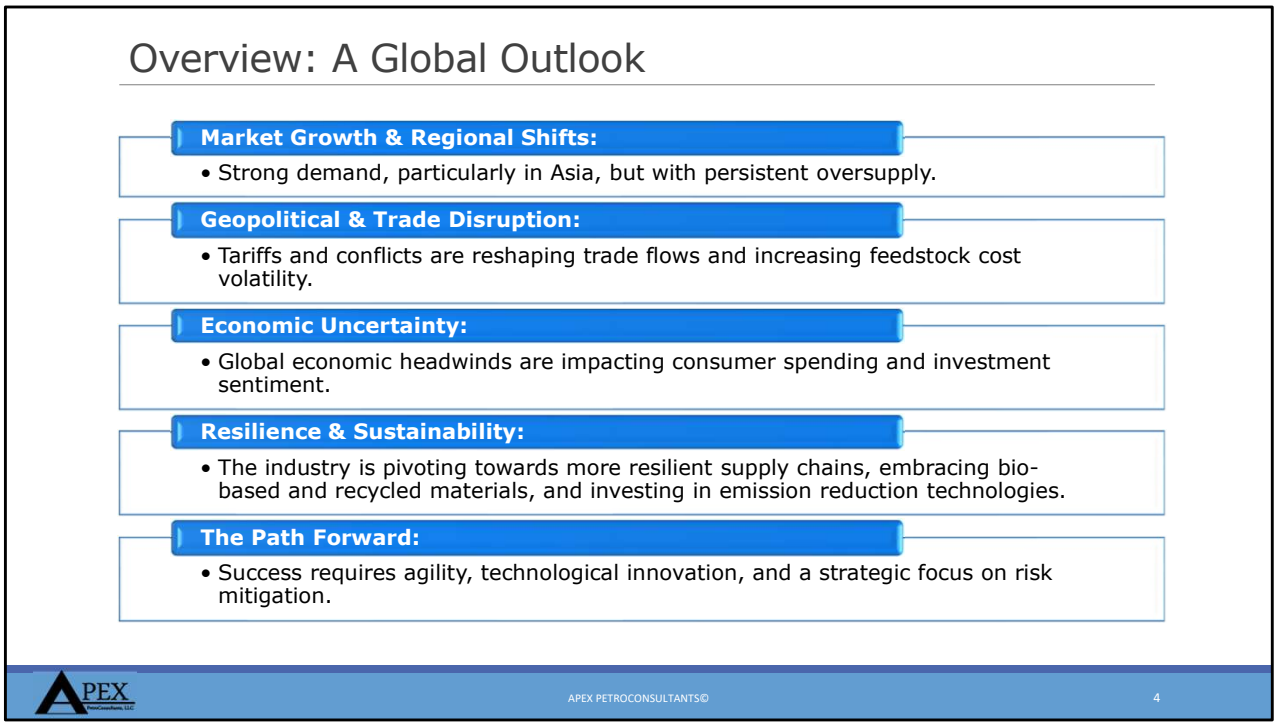
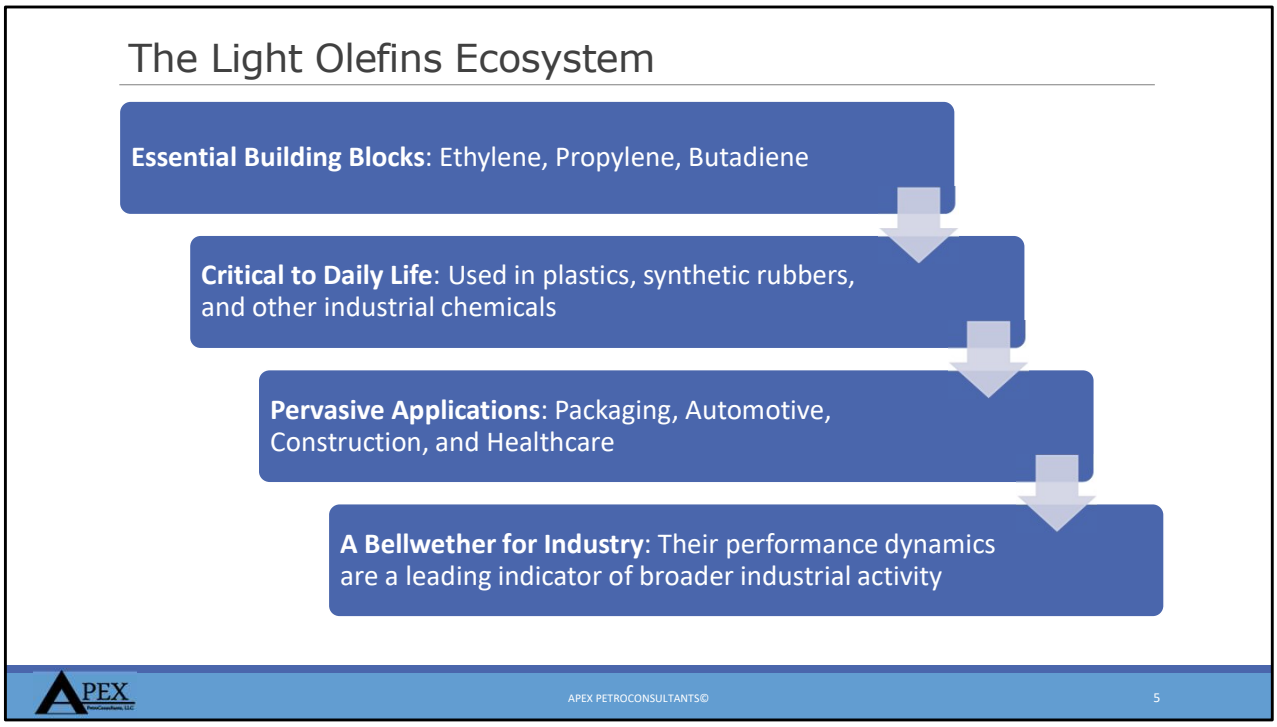


To give you a high-level overview, the light olefins market is experiencing a period of robust growth, but this is happening in parallel with some significant structural challenges. We see a clear shift in production and demand towards Asia, but this is causing a persistent oversupply in some key areas. At the same time, geopolitical tensions and trade wars are causing massive disruption to established supply chains and making feedstock prices highly volatile. The economic outlook is uncertain, which is impacting investment and consumer behavior. As a result, the industry is accelerating its focus on building resilience—from supply chains to production methods—and is making significant strides in sustainability. The key message is that the future belongs to companies that can be agile and innovative in this complex environment.



Light olefins are the chemical industry's workhorses. They are fundamental to almost every major manufacturing sector. Think about the packaging that keeps your food fresh, the lightweight components in your car, or the materials used in medical devices—all start with these three basic chemicals. Because of their central role, any shift in their supply, demand, or cost structure sends a ripple effect through the entire global value chain. Understanding these chemicals is like having a pulse on the global industrial economy.

Growing Market, but with Headwinds

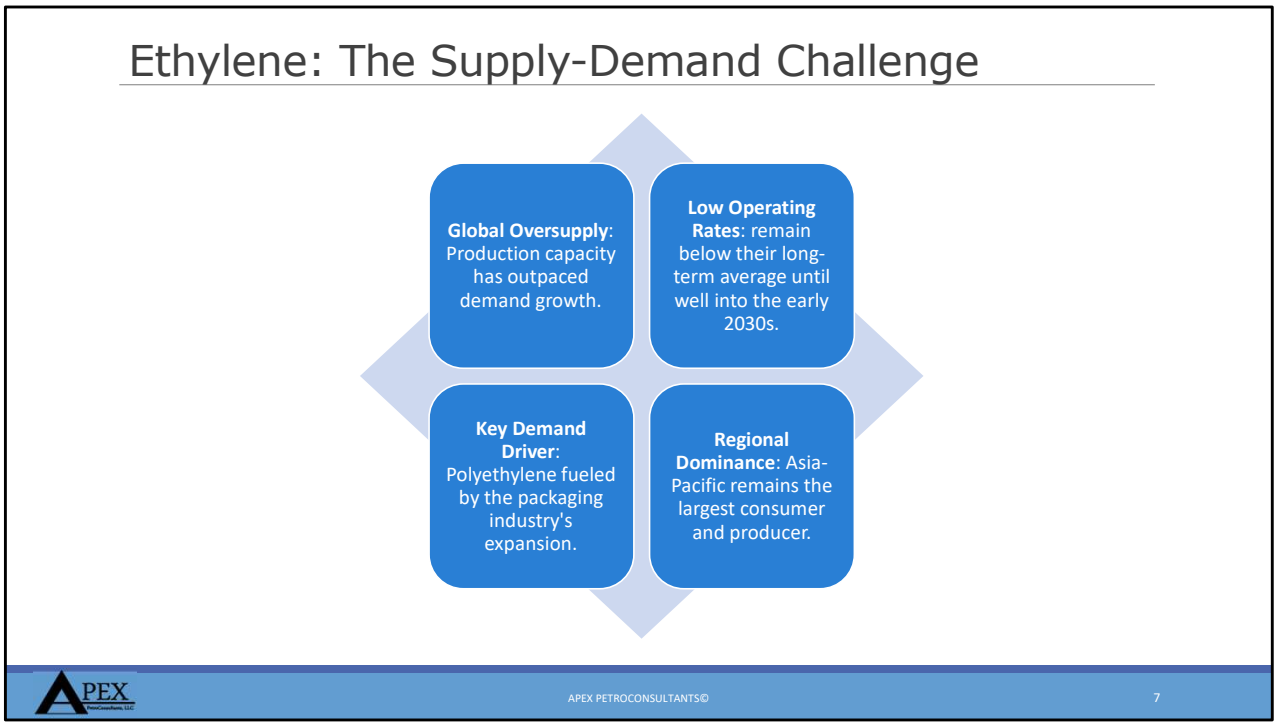
Ethylene Market Value: Projected to grow at a rate of 4.9% CAGR for the next five years.

Propylene Capacity Surge: Global capacity to increase by over 30% between 2024 and 2030, led by Asia.

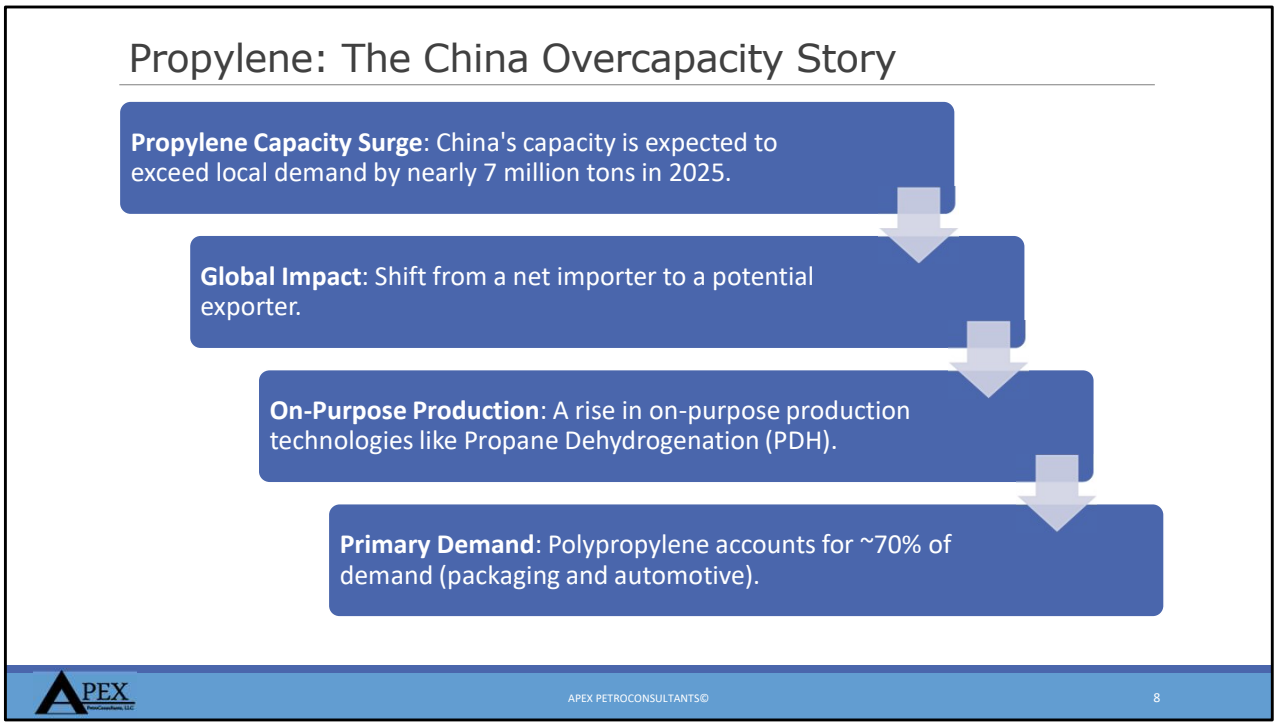
Overall Petrochemical Market: Expected to exceed $1 trillion in the next 8 years.

Key Message: Despite strong long-term growth forecasts, persistent oversupply is a key challenge.

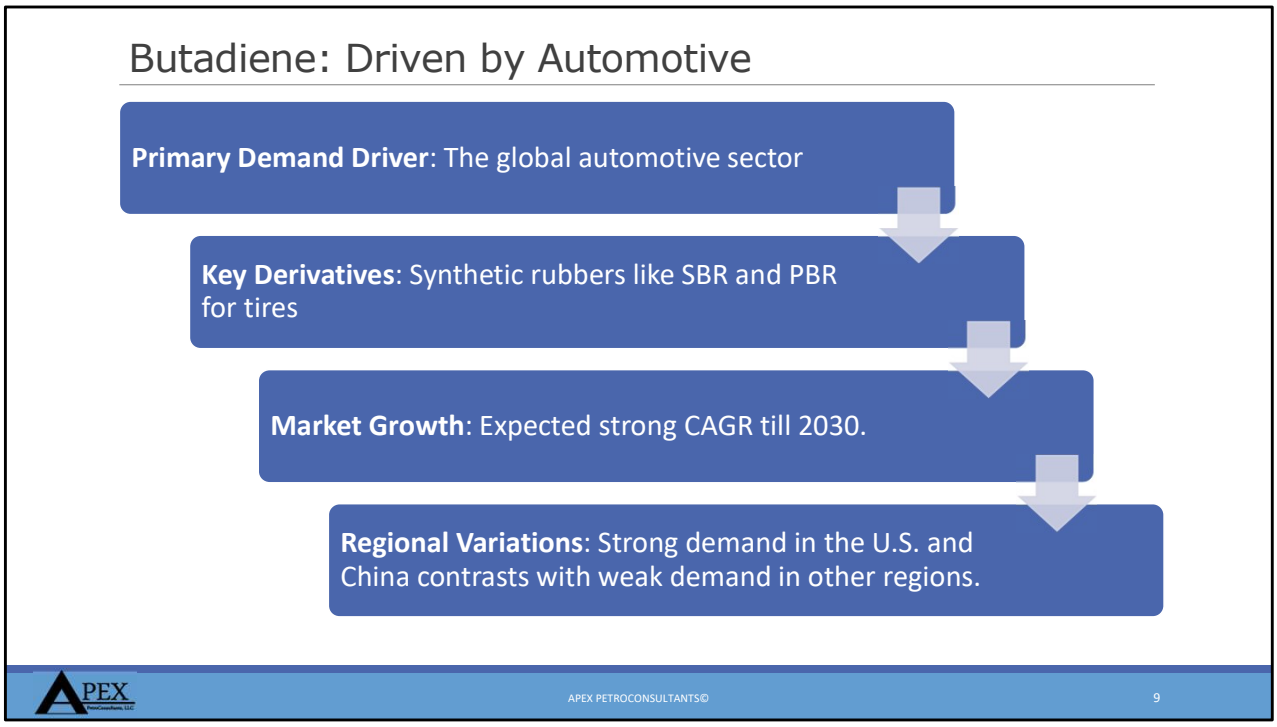
The long-term growth story for the light olefins market is undeniably strong. As you can see from the numbers, ethylene is on a solid growth trajectory, and the overall petrochemical market is projected to be worth over a trillion dollars within the next decade. Propylene capacity is also undergoing a massive expansion. However, these impressive figures don't tell the whole story. Much of this growth is geographically concentrated, primarily in Asia, and it's leading to an oversupply that is putting downward pressure on prices and margins. The key message here is that while the market is growing, it's not a simple upward climb.



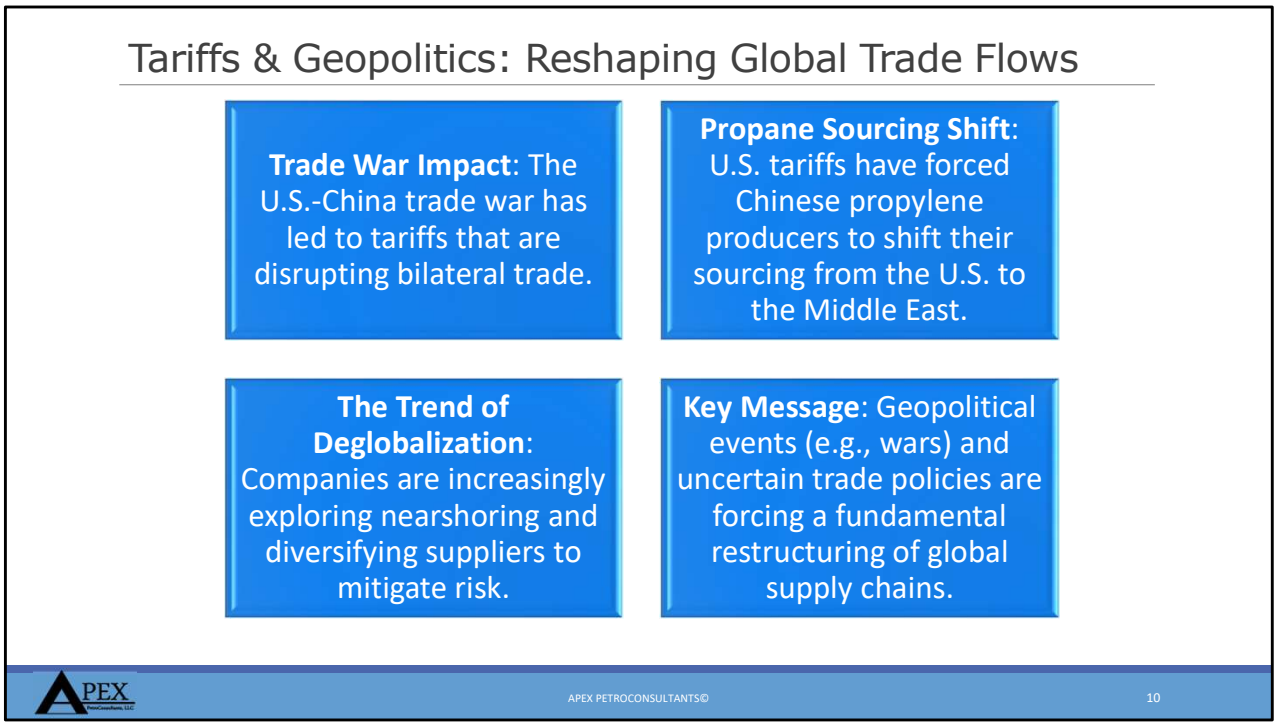
Let's zoom in on ethylene. The primary challenge here is a global oversupply. The rapid expansion of production, particularly in North America due to low-cost ethane from shale gas and in Asia, has created a market where supply is outpacing demand. This is why we are seeing a forecast of low operating rates for crackers for the foreseeable future. The good news is that demand drivers remain strong, especially for polyethylene used in packaging, a sector that is only growing with e-commerce and a rising middle class globally. Asia's continued dominance in both production and consumption underscores its central role in shaping the market.



Propylene presents a unique market dynamic, largely centered on China. The sheer scale of China's capacity build-out means it's on the verge of a massive oversupply. This is a huge shift, as China was a net importer of polypropylene just a few years ago. This oversupply will likely lead to China exporting more, which will create stiff competition for producers worldwide. To address the long-standing "propylene gap," where traditional cracking methods don't produce enough propylene, the industry is increasingly turning to on-purpose technologies like Propane Dehydrogenation, or PDH.



Butadiene is a story of strong ties to a specific sector: automotive. Its derivatives, like Styrene-Butadiene Rubber, are essential for making tires and other critical components. As a result, the market's performance is highly correlated with global automotive production. This leads to regional variations; for instance, strong vehicle sales in the U.S. can drive prices up, while a slowdown in another region can cause prices to fall. This makes the butadiene market particularly sensitive to changes in consumer spending and industrial output.



Trade policy and geopolitics are not just headlines; they are fundamentally reshaping the petrochemical business model. The U.S.-China trade war, for example, has had a direct impact. U.S. tariffs on Chinese imports and retaliatory tariffs by China on U.S. propane have made it more expensive for Chinese producers to purchase U.S. propane, forcing them to shift their focus to other regions, such as the Middle East. This has also led to a broader trend of regionalization, where companies are moving production closer to end markets or diversifying their suppliers to reduce their reliance on a single region or trade route.

Feedstock Prices: The Geopolitical Link

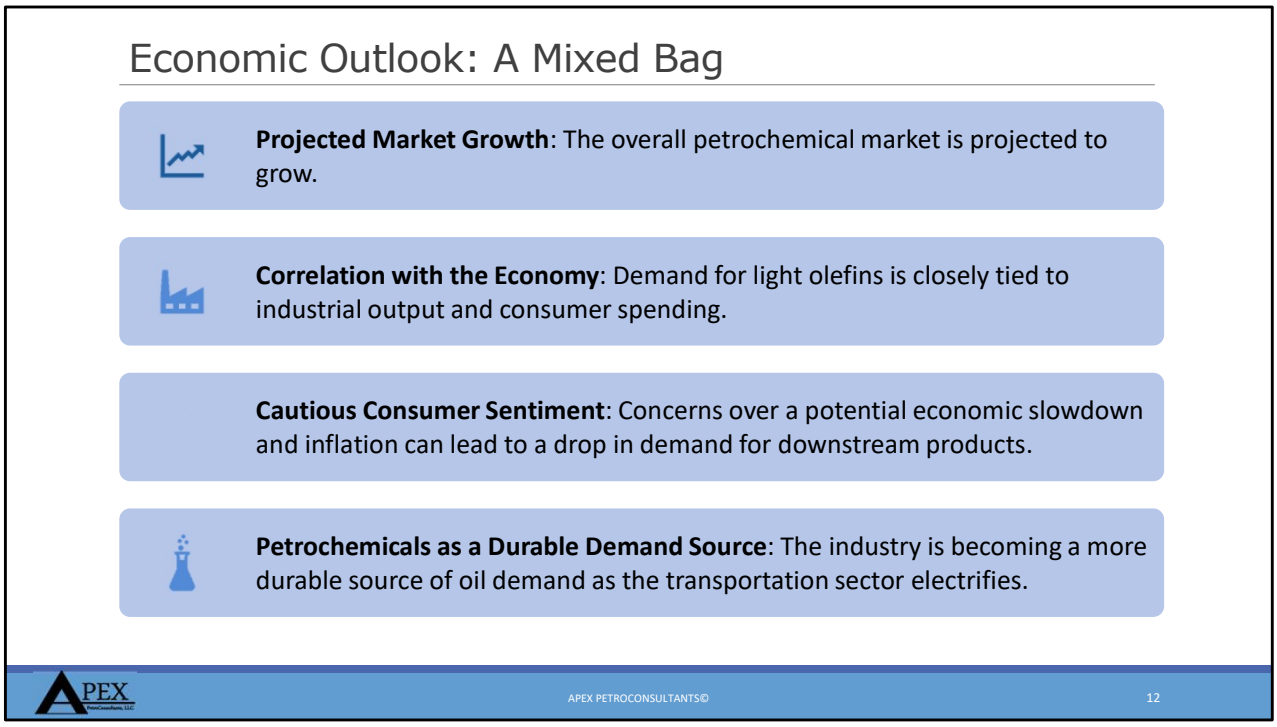
Direct Impact: Geopolitical events and conflicts lead to energy volatility.

Natural Gas Trends: U.S. natural gas prices projected to rise due to strong export growth.

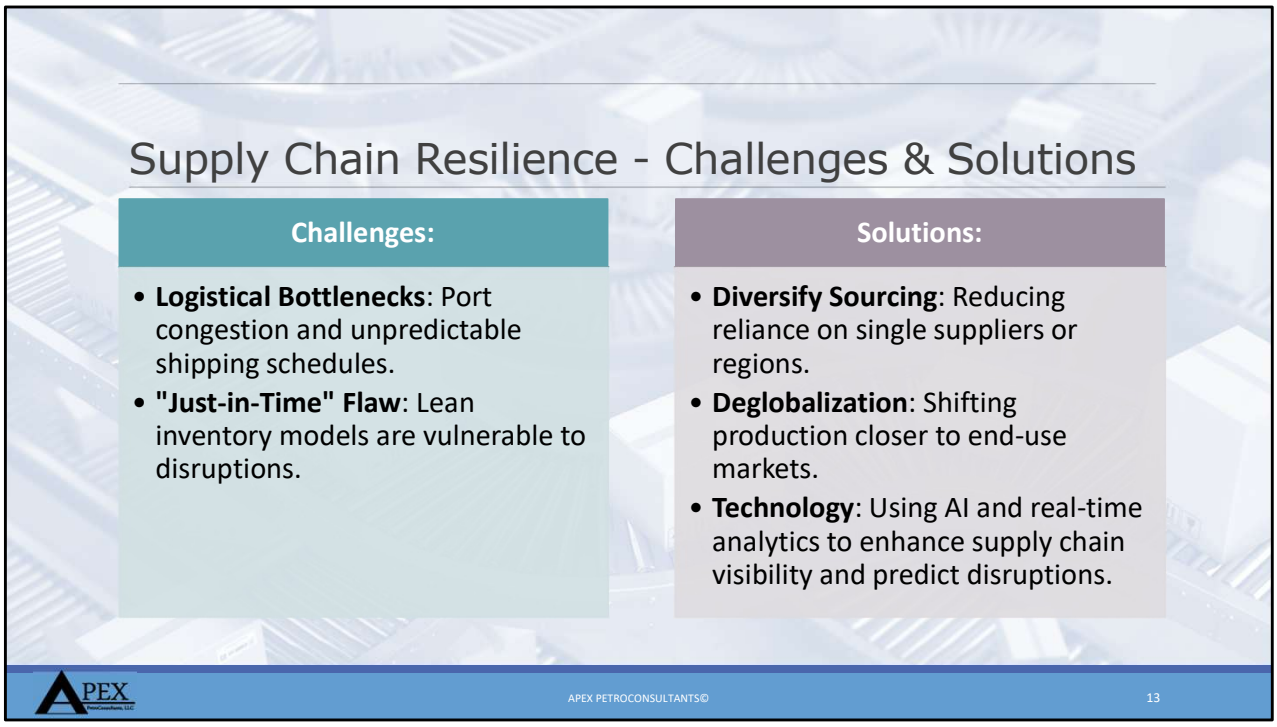
Oil Market Oversupply: The Oil market is expected to have a significant oversupply, which could pressure feedstock prices.

Investment Shift: Higher commodity price volatility is making long-term investments in traditional fossil fuel projects more cautious.

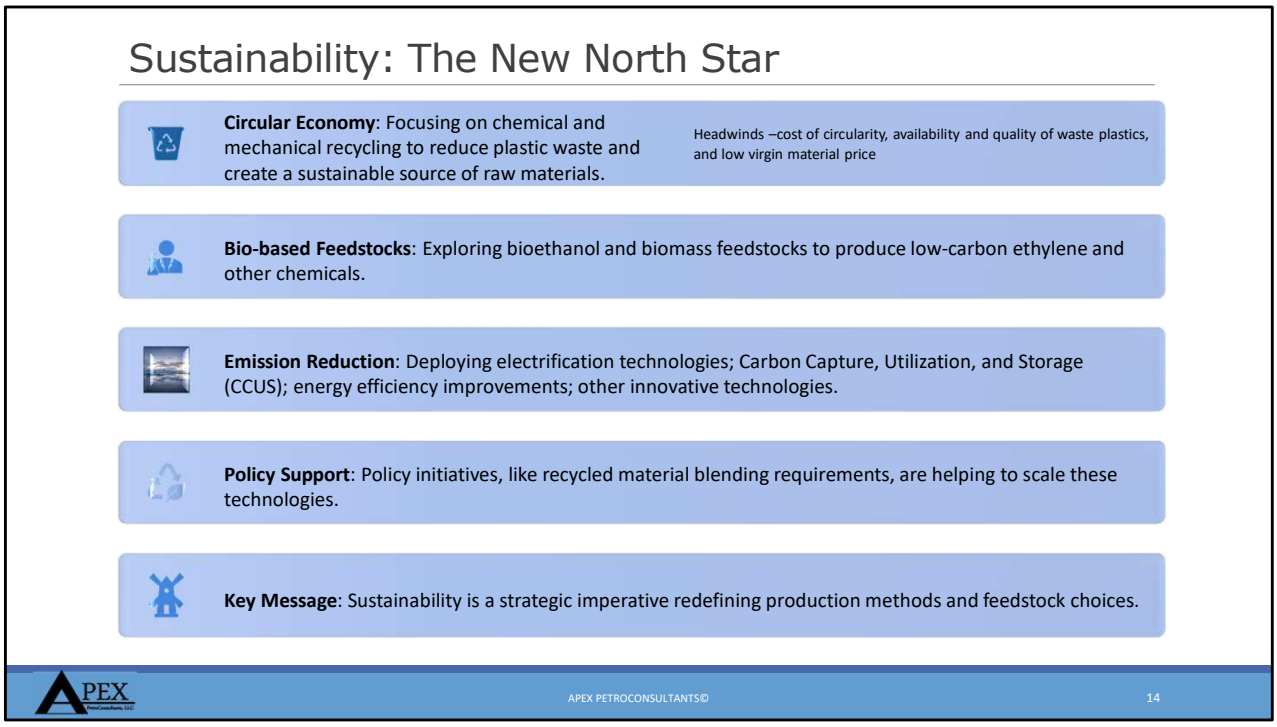
The production cost of light olefins is highly dependent on energy prices. Geopolitical conflicts in key regions can introduce significant volatility, impacting everything from crude oil to natural gas. For instance, the US is projecting higher natural gas prices in the coming years due to increased exports, which directly affects the cost of producing ethane-based ethylene. On the other hand, the broader oil market is expected to be oversupplied in 2025, which could exert downward pressure on prices. This uncertainty makes long-term investment decisions more complex and drives capital towards cleaner, less volatile energy sources.



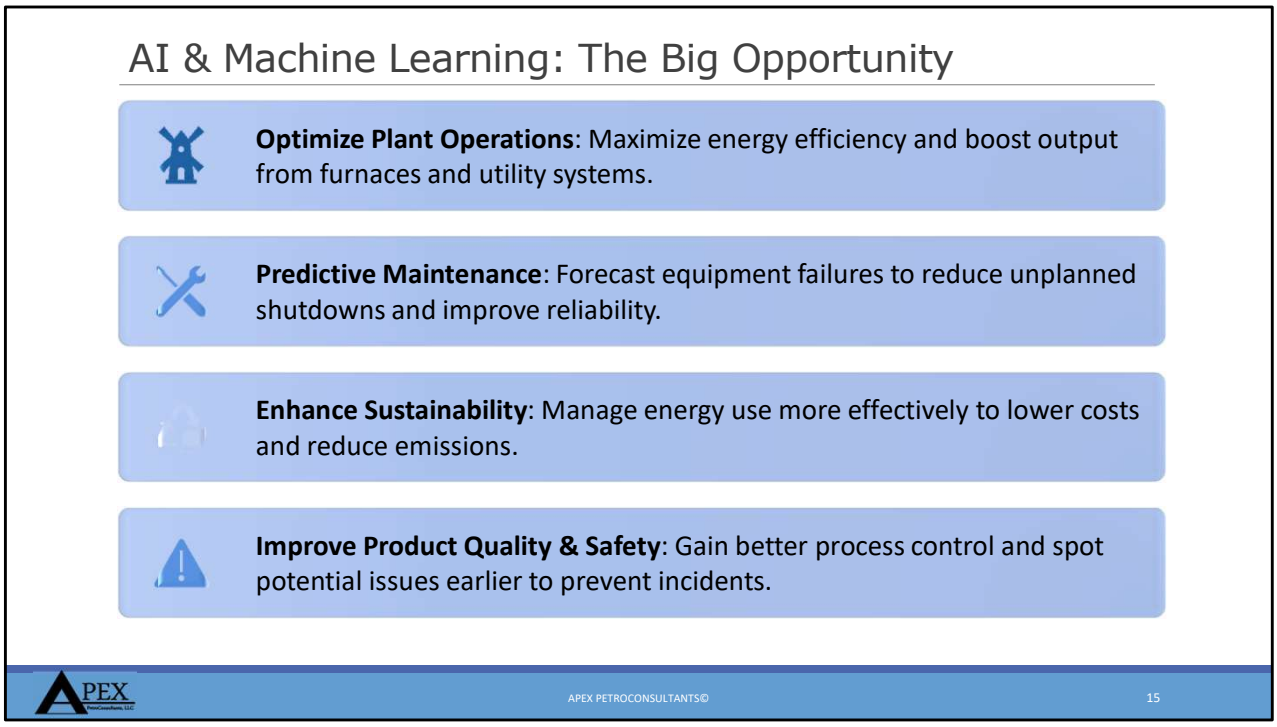
The economic outlook presents both opportunities and challenges. On one hand, the long-term growth of the petrochemical market is undeniable. On the other hand, demand for these products is directly tied to the health of the broader economy. If consumer confidence falters or we see an economic slowdown, it can quickly lead to inventory challenges for products like polypropylene and butadiene. An interesting shift is that as more cars become electric, the petrochemical industry is becoming a more stable source of oil demand, which provides a long-term buffer against some of the volatility we see in the energy markets.



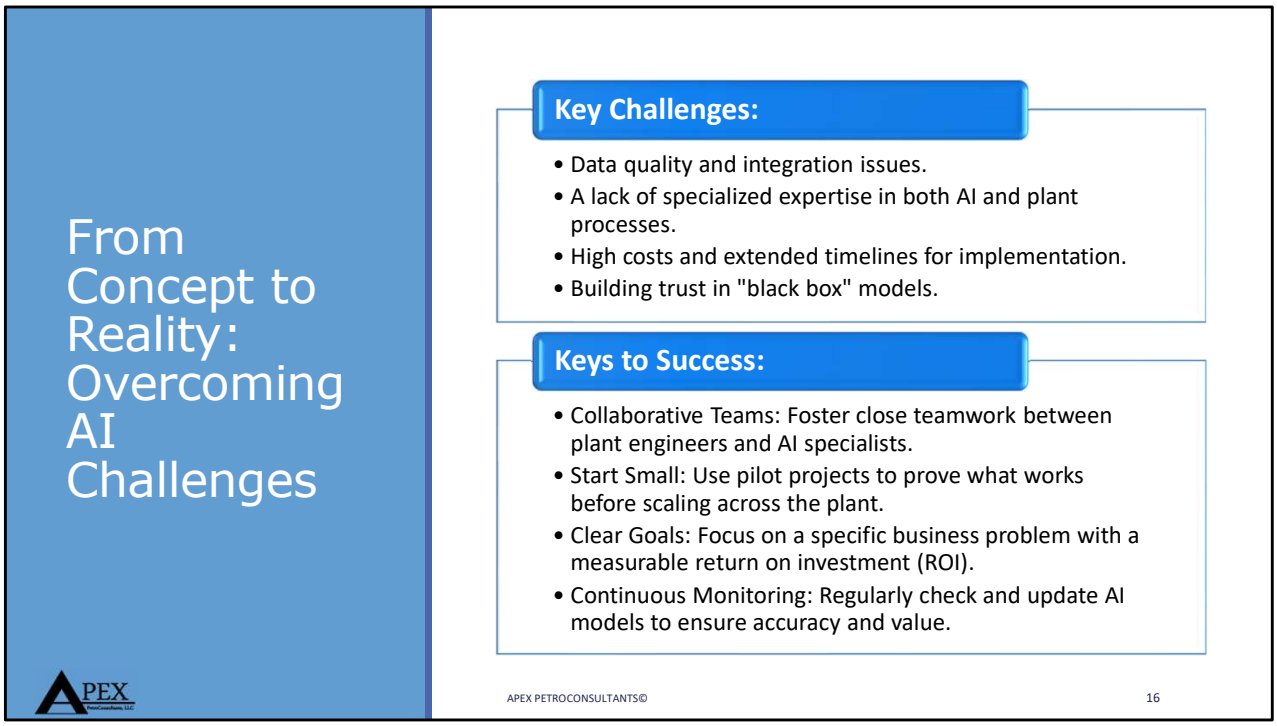
The supply chain is a major source of vulnerability in today's environment. We're seeing persistent logistical bottlenecks, from port congestion to carrier instability, that are delaying shipments and increasing costs. The traditional "Just-in-Time" inventory model, which was designed for efficiency, is proving to be fragile in this unpredictable climate. The industry's response is a strategic pivot towards resilience. This includes diversifying suppliers, regionalizing production to shorten supply chains, and leveraging technology like AI to get real-time visibility and predictive insights, so companies can proactively manage risks.



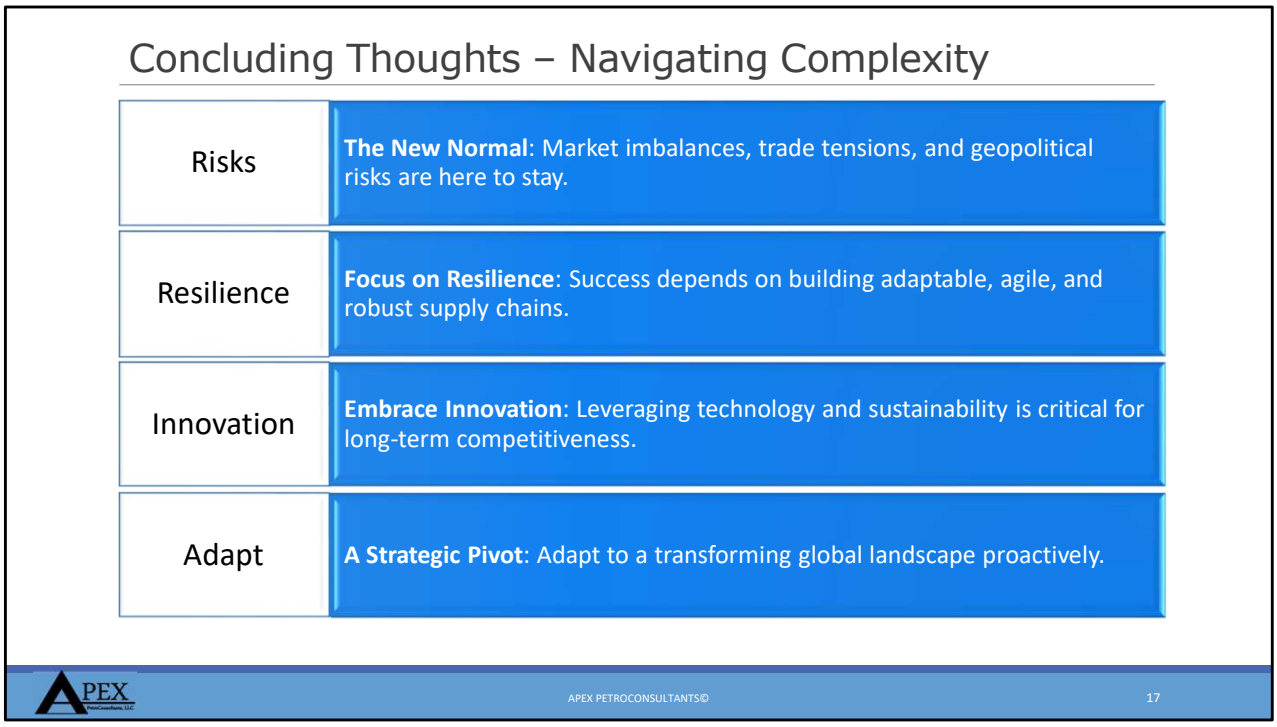
Sustainability is rapidly transforming the light olefins sector. We're witnessing a significant shift towards bio-based feedstocks, with companies exploring a range of options, from bioethanol to agricultural waste, to produce low-carbon versions of these chemicals. The circular economy is also gaining significant momentum, with a primary focus on chemical recycling to handle plastic waste and create a new, sustainable source of raw materials. Lately, there has been a pullback from chemical recycling projects due to the high costs, limited availability, and poor quality of recycled feed. Light olefins production processes are energy intensive; transitioning these from fossil fuels to low-emission approaches is a strategic imperative. Importantly, these efforts are being supported by policy, which is helping to make these new technologies more economically viable. Even the policy support is facing uncertainty in the current environment.



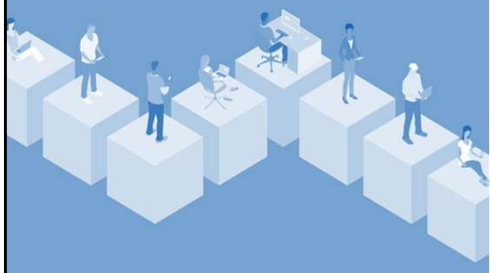
Let's take a closer look at one of the most transformative technologies: Artificial Intelligence and Machine Learning. AI is no longer a futuristic concept; it's a practical tool for petrochemical plants. It's driven by three main factors: fierce global competition, the push for Net Zero targets, and the vast amount of data being generated by modern plants. AI can help with everything from optimizing energy-intensive furnace operations and improving plant output to predicting when equipment might fail. These aren't just incremental changes; they can deliver significant cost savings, improve operational reliability, and help companies meet their critical sustainability goals.



While the potential of AI is immense, its adoption isn't without hurdles. Companies often face challenges with data quality, as AI needs clean, well-organized data to be effective. There is also a fundamental skills gap—it's rare to find people who are experts in both AI and the complex chemical processes of a plant. And, of course, there are concerns about cost, time, and trust in how these models make decisions. However, these challenges are surmountable. The key is to start with clear, measurable goals, run small-scale pilot projects to prove the value, and build collaborative teams where plant engineers and AI specialists work together. This strategic approach is what sets the most successful companies up for long-term success.



To conclude, the light olefins industry is at a critical crossroads. The era of predictable, linear growth is over. The new normal is one of constant flux, defined by market imbalances, protectionist policies, and geopolitical risks. The key to success will be a strategic pivot from a focus on efficiency alone to one that prioritizes resilience. This means building a business that is not just lean, but also agile and robust enough to handle continuous disruption. Ultimately, the future of this indispensable industry belongs to those who can leverage innovation and proactively adapt to this new global landscape.



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- Sustainable Change
- Successful Projects
- Technology Decisions
- Project assurance
- Team Skills
- Proven Expertise

Sanjeev Kapur – Principal Consultant

- 45 years of industry experience
- Leading industry expert - petrochemical industry, particularly Ethylene & related technologies, and integration of refineries and petrochemicals.

Build Smarter. Operate Better. Perform Stronger.
Independent expertise for the light olefins industry.

Q&A

Thanks

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