



# The AI-First Refiner

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Swings in feedstock costs, rapid demand changes, and geopolitical shifts have long depressed margins in refining. But the impact of volatility has been magnified by fragmented planning and decision making.

AI changes this. By coordinating decisions across the system, it allows refiners to respond holistically to unexpected events, from tanker delays to short-term market opportunities, retaining value previously lost.

We project that by 2030 a midsized refiner that is using AI across planning, operations, trading, and maintenance will enhance EBIT per barrel by \$0.5 to \$1.2—a powerful competitive advantage.

This rewriting of industry economics cannot come from isolated use cases. It is created by redesigning core workflows end-to-end, ensuring decisions are continuously optimized across the

system. Achieving this requires the CEO to take the lead, rewiring the refinery's operations, with AI embedded at the core of day-to-day decision making.

## How AI Is Generating Value Today

AI leaders are already demonstrating results.

**Optimizing operations in real time.** A large refiner in Latin America struggled with slow and disconnected responses to swings in feedstocks or utilities. BCG helped the company build real-time refinery optimization powered by AI agents. The agents scan plant data, operating metrics, and historical knowledge 24/7 to detect issues early, fine-tune tradeoffs, and guide the control room with a single clear display. The refiner has already generated savings of over \$80 million.

**Better scheduling to boost margins.** A global refiner was losing margin owing to weak scheduling based on manual and spreadsheet processes to plan across units, tanks, and logistics. This system was replaced by an AI scheduler running a digital twin modeling the entire refinery—supply, operations (including blending), and inventory management. The refiner can now re-optimize routing, blending, inventory, and dispatch within minutes of any disruption, minimizing margin leakage. Throughput and yield have improved, demurrage has been minimized, and margins have lifted by \$0.15 to \$0.30/barrel.

**Capturing more real value from trading.** A US refiner was not optimizing trading performance. Trader knowledge was not codified, driving inconsistency; execution was too focused on minimizing short-term costs to meet volume commitments. The traders are now guided by AI that forecasts market structure and recommends best trades across various instruments based on inventory, market prices, shipping rates, pipeline flows, and even weather (which affects demand for some products). The first-year potential margin increase is \$80 million, and performance will increase as the system learns from executed trades.

## Rewriting the Economics of Refining

A top-down AI strategy creates impact across the full refining value chain.

Operations is the biggest and most obvious opportunity. AI optimization increases yield, minimizes spec giveaway, reduces energy use, and maximizes throughput within safe operating limits. The EBIT improvement can be \$0.1 to \$0.5 per barrel.

But the AI-first refiner will drive improvements in other areas that collectively match or exceed this. Logistics and trading can benefit from higher tank and terminal throughput, lower distribution costs, and improved inventory management, reducing working capital and adding up to \$0.3 a barrel.

An end-to-end redesign of planning and scheduling also generates significant value. AI excels at complex blending decisions and product allocation between units, and can adjust within minutes to the volatility of real-world events, maximizing netback. This can generate another \$0.3 in EBIT per barrel.

## Becoming an AI-First Refiner

To capture the full value from AI:

- **Pursue a multiyear, strategic ambition.** The CEO and the C-suite, including refinery, general management, and functional leaders, must be actively engaged. A chief AI/data officer may be needed.
- **Reshape and invent for P&L impact.** Margin improvement and other similar measures are the yardstick for success, not tool deployment. Value tracking helps speed wider deployment.
- **Build the AI-first operating model.** Mature and responsible guardrails and governance are essential. Implementation should be a partnership between IT and the business.
- **Secure and enable the necessary talent.** There is no need for large internal teams, but the organization needs a small number of AI-capable leaders and broad workforce enablement.
- **Use fit-for-purpose technology and data.** An enterprise AI platform is the backbone of AI success. Templates and enterprise-wide data models accelerate rollout.

The strategic challenges around refining will not go away; the industry is fundamentally exposed to geopolitical instability. Some refiners may accept this fate. Industry leaders, however, will not. They are already using an AI-first approach not only to survive amid volatility but also to prosper.

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