silico

The Future of the Chemicals Industry

USING AI-BASED SIMULATION TO NAVIGATE VOLATILITY IN OIL AND GAS MARKETS

“Foresight is not about predicting the future, it’s about minimizing surprise.”

- Karl Schroeder

Executive Summary

Chemicals companies rely heavily on fossil fuels. Oil and gas serve as key raw materials for crucial chemical compounds, while the industry also consumes significant amounts of energy and freight (closely correlated to fuel prices).

This close-knit relationship means price volatility in oil and gas markets inevitably has a significant impact on chemicals companies. Current market conditions therefore represent a challenge. While the war in Ukraine has already caused prices to spike, significant uncertainty remains over the future direction of markets.

The only way for organisations to manage such an environment is to prepare themselves for every eventuality. Being able to rapidly and accurately simulate scenarios and respond to changing conditions is therefore of crucial importance to business success.

This e-book will highlight:

- The ongoing importance of oil and gas markets
- The impact of current market volatility
- The importance of foresight to guide business operations
- The need for agile technology and operations

Chemicals and fossil fuels: a tight coupling

The link between the chemicals industry and fossil fuels is not as old as one might expect. Just under 100 years ago, in 1925, less than 0.1% of all organic chemicals manufactured in the US were derived from petroleum. Twenty years later that figure had risen to 28%[1]. Fast forward to the present day and "feedstock accounts for half of the chemical sector's energy inputs, of which oil and gas account for more than 90%," according to IEA analysis.

Chemicals derived from oil and gas are now the basis for thousands of products - from textiles and sporting goods, pesticides and fertilisers, lubricants and paints, cosmetics and beauty products, personal care and cleaning products, through to medicines and medical devices. Even though environmental concerns have started to curtail use of plastics and fossil fuels in some areas, overall demand is expected to stay robust - driven by emerging markets, where per capita consumption of plastics is up to 20 times lower and fertilisers up to 10 times lower than developed markets. In fact, the IEA predicts that "petrochemicals are set to account for over a third of the growth in oil demand to 2030, and nearly half to 2050."

[1] Chemical and Engineering News

"Chemical companies need to develop the organizational agility to prepare for impending shocks and take rapid action when they occur, to capture value and minimize threats.."

- McKinsey, Oil Price Shocks and the Chemical Industry

The spectre of price volatility

The price of fossil fuels has proven to volatile and unpredictable. Although oil topped $100 per barrel for much of 2011-2014 and saw a choppy descent for the remainder of the decade, nothing could have prepared us for the last couple of years.

In a truly bizarre scenario, on April 20, 2020, WTI crude futures plunged into negative territory as markets digested the impact of Covid. Less than two years later, prices were back approaching all-time highs, with WTI crude over $121 by the 7th of March 2022. Some of that rise happened more gradually as lockdowns eased, but as tensions in Ukraine escalated into full-blown war, the price of crude oil almost doubled in a three-month period, with natural gas rising even more steeply.

This volatility is exacerbated by the importance of raw materials costs to margins. McKinsey estimates that purchasing expenses for commodity chemicals manufacturers amount to 50-80 percent of revenues, with the range at 20-60 percent for speciality chemicals[2].

[2] McKinsey, Pursuing purchasing excellence in chemicals

"Chemical companies need not necessarily fear oil-price volatility; in fact, the best ones will savour the opportunities it presents. With disciplined investment in organizational capabilities and agility, producers can effectively plan for, respond to, and benefit from oil-price shocks."

- McKinsey, Oil Price Shocks and the Chemical Industry

The importance of foresight

Predicting the future is difficult at the best of times, but never more so given current levels of uncertainty. Some analysts foresee oil prices rising above $200 per barrel as the impact of sanctions and boycotts of Russian oil take hold. But the possibility that an earlier than expected diplomatic resolution causes prices to fall cannot be discounted.

This uncertainty not only has the potential to impact margins, it can ultimately make or break certain business operations. Given that there are multiple means to arrive at the same chemical compounds, the relative price of one raw material over another can render a production technique economically unviable under certain scenarios.

With the industry so fundamentally reliant on raw materials that are exhibiting particularly high levels of price volatility, companies need the means to model and forecast different scenarios. But traditional forecasting methods are simply not fit for purpose – too cumbersome and rooted in retrospective analysis.

"People don't steer their cars solely on the basis of what they see in the rear-view mirror, yet that is essentially how most business leaders steer their companies… companies need an approach to financial steering that permits rapid and effective course corrections in anticipation of future developments."

- Boston Consulting Group, The Power of Algorithmic Forecasting

Preparing for every eventuality

The paradox of most forecasting models is that they are inherently retrospective. Their interpretation of the future is an extrapolation of the past. When things move in a predictable fashion, this issue is not so evident. But when conditions become particularly volatile and uncertain, then this shortcoming becomes very pronounced.

An ideal solution to this challenge is to construct a digital twin of an enterprise that models key variables, such as inputs, processes, and outputs. Such a model would be able to highlight risks, dependencies, and sensitivities, by positing different scenarios and outcomes.

However, scenario-based analysis has traditionally proved to be very time-consuming and cumbersome. Companies would either be burdened by a complex sprawl of interlinked spreadsheets (posing operational risks), or a hard-coded solution that was very slow to update in response to rapidly evolving market conditions.

The answer therefore lies in combining the best of human and artificial intelligence – a platform that allows experts to easily model and posit different scenarios, with artificial intelligence used to crunch the numbers, playing out all conceivable combinations of scenarios and outcomes. Such an approach provides both agility of operations and accuracy of insights, helping organisations be prepared for every eventuality.

At Silico we believe in the power of foresight to make better decisions – offering businesses the chance to look around corners to explore the impact of different outcomes for their future. This can be achieved quickly, cost-effectively and risk-free. Silico is the only platform that coordinates data and human knowledge to build powerful simulations of your business. Silico simulations give decision makers the ability to try out decisions in Silico before they are made in the real world.

Headquarters

160 Kemp House,
City Road, London
EC1V 2NX, UK

LinkedIn
https://www.linkedin.com/company/sheetless/

Email
sales@silicoai.com

silico

Making better decisions