

NextGen Performance[™] REALISED

Issue V - 2010

Strategies to Hedge against Market Uncertainty:

The role of petrochemicals to increase long-term economic sustainability

Petrochemicals: The Darling of the Energy Sector?

Given significant uncertainty in the energy markets, many refining clients are examining strategies to ensure long-term economic viability and global competitiveness. For certain asset owners, a leading strategy when evaluating their end product portfolio is to consider petrochemical investment and expansion.

This is based on a view that petrochemicals will rebound more quickly and have a more predictable future than will the refining sector. Historically, petrochemicals have been attractive because the sector's growth rate usually exceeds GDP growth. Petrochemical demand has been characterised as a "lifestyle" choice that often parallels and exceeds GDP, while fuel demand from traditional refineries typically lags GDP growth. The latter has historically been because, for many consumers, incremental transportation fuel demand is discretionary (offset by public transportation, less personal travel, fuel efficiency, etc.). However, in recent times, transport fuel demand

	Regional Demand Growth: Oil & Basic Petrochemicals	
	Oil	EPBTX
World	1.4%	3.8%
Total Asia	2.6%	4.3%
China	4.7%	6.6%
Europe	-0.2%	1.5%
North America	-0.2%	1.8%
Latin America	1.3%	5.5%

growth has also come under pressure as (1) increased emphasis is placed on substitution of petroleum fuel with biofuels and (2) increased regulatory pressure on greater fuel efficiency. Given this background, is the petrochemical sector more worthy of a greater investment focus than traditional fuel refineries? Do petrochemicals offer a better end product focus over the longer term horizon than traditional refined products?

The answer to these questions is: "It depends." Historic returns from petrochemicals have on average been higher than those from refining, but have and will continue to be more cyclical.

One of the key decision-factors in terms of a contemplated petrochemical strategy is geographical location. Is the location being considered for petrochemical investment near my existing facilities? Where is it in relation to the demand for the petrochemical products? Another key decision-factor is petrochemical feedstock availability and price. Where and how one

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An Inter-disciplinary Approach to Value Improvement

A challenge of many improvement initiatives is that by focussing on only one aspect or dimension, improvements can be made at the detriment of other processes or areas, thus actually resulting in no overall net savings or, worse, an increase in cost in others affected by the implemented improvement. Accordingly, the most effective way to evaluate improvement alternatives is through an inter-disciplinary approach which would take a much broader view of facility operations.

As an example, a global refiner recently undertook a pilot program at one of its key facilities. The focus was on both organisational efficiency and margin enhancement efforts simultaneously. Accordingly, aspects of this particular value improvement effort include:

- An assessment of organisational structure
- An assessment of work processes and practises
- A study of yield and energy, including simulation modelling
- A concurrent assessment of mechanical, equipment, and operator practises

Thus, what is unique about this approach is that it includes human, mechanical, and technical components being evaluated in connection with each other, with the intention of optimising the entire operation. For example, a traditional yield and energy study might identify opportunities for improvement where, if implemented, might result in significant savings. However, it is altogether possible that certain operator practises might negate or minimise the value realised from the improvement, albeit likely not deliberately. An integrated approach can also identify or validate the most important key performance indicators, or recalibrate these metrics in order to better

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In this photo: On 17th August 2010 George Bright and senior executives from KBC Asia met with Sinopec SVP Mr. Zhang Jianhua, VP Mr. Ling Yiquan and members of Sinopec Foreign Relations team to discuss next steps in the development of the relationship between KBC and Sinopec.

In the current marketplace, navigating the challenges facing businesses today can be difficult. We collaborate with clients to create unique solutions to provide results now that will move them closer to NextGen Performance in the future. We offer:

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invests is influenced by the availability of crude oils and natural gas liquids (including ethane and propane). A third factor with feedstock selection is technology advancement. Several global manufacturers have also been actively widening their feed window and flexibility by developing unique pyrolysis and feed separation technologies, combined with advanced feed management and process modelling practices. These go hand in hand with facilities integration.

Strategic Considerations

The location of existing refining and petrochemical facilities should be considered as part of a petrochemical investment decision. Some strategic choices clients are considering include greater refinery petrochemical integration or RPI (See also NextGen Performance Realised, 2010, Issue IV). This can be approached in two ways: integration of assets already under common ownership, a traditional approach, or actually creating integration between assets owned by two or more parties. While the latter is more difficult to achieve and can potentially involve the use of a joint venture or special purpose entity, the combination can actually result in superior flexibility for all of the individual participants. This can be achieved by considering all possible combination of assets "outside the fence" without having to actually own or acquire those assets. Thus greater total, and hence individual, returns for all parties can be achieved by attaining even greater leverage from existing assets.

Supply-side efficiencies are only half of the equation. Demand is the other. What is the current regional demand balance for petrochemicals and what are the future projections? Are there attractive efficiencies available by investing close to buyers?



Another alternative some are considering, especially given significantly reduced refinery operating rates (most notably in OECD countries), is shifting 100-percent of a given refinery's output to petrochemical feedstock production. While this may sound like a new idea, it is actually the energy sector coming full circle after 30+ years from when this idea had been previously considered. One notable example was the construction in the late 1970s of a petrochemical refinery by Dow at their Freeport, Texas facility. This refinery was built with the intent of producing only petrochemical feedstocks, but it operated for less than a year before being idled due to changing market conditions. So the question today is: "Are market conditions significantly different today than at this same point in the last cycle?"

Which Strategy Makes the Most Sense?

While the answer to that question varies by asset owner, on a general basis, it is greatly influenced by an asset's feedstock availability. In particular, what is the availability of crude oil supply, natural gas liquids, and naphtha. What are the relative regional price projections of these feedstocks. For example, in the United States, from 1980's – 2000, the country's petrochemical sector had a significant global competitive advantage due to the low cost of natural gas (and natural gas liquids). As natural gas prices began to increase during the early 2000's, this competitive advantage was eroded resulting in companies taking another look at greater RPI. With the collapse of natural gas prices during the past few years, the focus is upon modifying operations to maximise gas cracking rather than further RPI.

Contrast this situation to the Middle East where previous significant natural gas availability has now in some countries been overcommitted to support power

production, desalinisation, and other manufacturing. The big increase in regional petrochemical production has been on ethane-based feedstock, which has greatly expanded the global supply of primary and secondary petrochemicals. The resulting lightening of the average global feed slate has also had a impact upon ethylene co-product balances, particularly propylene (See also NextGen Performance Realised, 2010, Issue I). Now several major integrated refinery-petrochemical projects are being developed across the region, attempting to realise a global competitive advantage through scale and efficient integration in addition to some advantaged feed and fuel values.

In Europe, naphtha has always been the primary feedstock source for petrochemicals, but there are only a few site where effective RPI is practised. The increased supply of natural gas from Russia into Europe has resulted in lower power costs, but not an increased and stable availability of natural gas liquids for cracking.

In China, naphtha is also the key feedstock source for basic petrochemical production. Some of the large new refinery-petrochemical complexes have greater potential for increased profitability through enhanced integration. China has vast resources of coal and crude oil, but not yet natural gas to the level to support a light feedstock-based industry. In some instances (fertilizer and PVC), substantial developments are being based on coal.

In India, many projects are designed and built with extensive integration between refining and petrochemical operations. For example, Reliance Industries' Hazira ethylene cracker was designed to be



flexible in using a wide range of feedstocks from light gases to naphtha to heavier refinery streams. Reliance's original Jamnagar development remains a global benchmark for designing in the benefits of integration across large-scale refining, petrochemicals, and power generation. Plants have also been operating for over a decade in the region based on natural gas liquids, such as GAIL's complex in Pata, Uttar Pradesh. The firm's latest addition processes a mix of gas liquids and naphtha.

Singapore is a unique story, playing a key role in the growth of Asia-Pacific's petrochemical industry and reflecting integration and economies of scale of a different kind. By



early 2011, it is projected there will be four million tons per annum of ethylene produced from the PCS, Shell Bukom, and ExxonMobil integrated complexes, all located in an integrated hub on Jurong Island. Central to the industry cluster concept is the sharing of common facilities and services, including marine facilities, warehousing, waste treatment, fire fighting, medical and emergency response, and a common service corridor and infrastructure such as roads and drains. This creates significant economies of scale through a self-contained complex.

In Brazil, the industry to date has been based on domestically sourced or imported liquid feedstocks and natural gas liquids provided by the national oil company, Petrobras. With Petrobras now a part owner of Braskem, tighter integration between their refineries and the petrochemical operations should increase the overall value of operations as feed and product flexibility are optimised.

Accordingly, the desirability to increase RPI as a business strategy is highly dependent upon geographical location and a number of variables which need to be carefully considered. It is not a panacea or quick fix for declining refining margins. Sound investment analysis and due diligence are required.

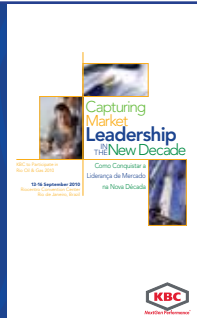
KBC has worked closely with clients across the globe to evaluate crude oil and feedstock supplies, product market demand, and refinery-petrochemical integration scenarios. The company has the breadth of knowledge, tools, capabilities to work such issues from opportunity development to implementation and benefits tracking.

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monitor leading indicators on a real-time basis, thus improving decision-making and enabling a more rapid response to unfavourable conditions within a facility. In addition, the organisational dimension is important because it cuts across the traditional departmental boundaries which exist in an operation. The net result is greater realisation of net economic benefits by addressing value improvement opportunities on an inter-disciplinary basis.

NextGen Performance is best achieved when taking innovative, creative, and inter-disciplinary approaches to value improvement initiatives. Without these key linkages and interfaces, efforts could easily be sub-optimised by not considering the unintended consequences of an improvement identified in isolation.

KBC has been involved with clients on performance and value improvement programmes and initiatives for more than 30 years. The company specialises in inter-disciplinary approaches.



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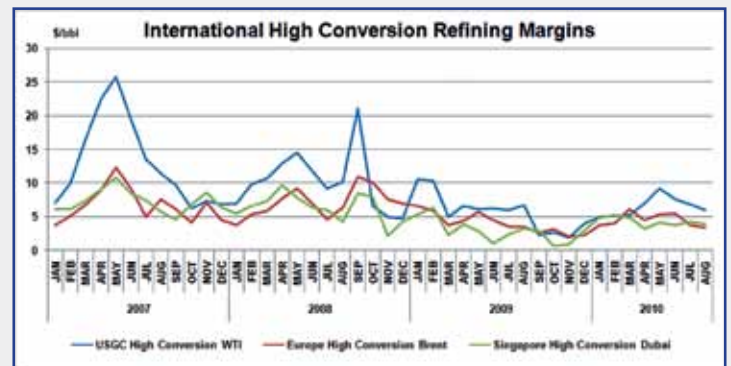


REFINING MARKET UPDATE

- Refinery margins slipped in August in all three main global refining centres and for both high conversion and simple operations. High conversion margins fell by around \$1/bbl in the US Gulf, \$0.50/bbl in NW Europe, and \$0.25/bbl at Singapore. In NW Europe the high conversion margin of \$3.25/bbl, against Dated Brent, was the lowest level since December 2009.
- The relative strength of dated Brent was due to summer North Sea maintenance at some of the fields that comprise the price quotation. With most crudes refined in Europe priced relative to dated Brent the strength in the regional benchmark crude is working against the interest of European refiners in their quest for higher levels of utilisation.
- The fallback in margins was due to the weakness in gasoline prices, especially in the US Gulf where cracks slipped by almost \$3/bbl in August, compared to corresponding falls of around \$1.25/bbl in NW Europe and Singapore.
- In contrast, cracks for gas/diesel oil were stable in NW Europe but increased by around \$1/bbl in both the US Gulf and Singapore because of lower demand.
- Slightly weaker margins for simple refining operations reflected a relative weakness in fuel oil cracks.
- KBC expects some support to come from discretionary cuts in refining utilisation especially for simple refineries, due to poor economics. Already a sizeable portion of European refining capacity is scheduled

to be down for seasonal maintenance before the peak winter season. With the end of maintenance in the North Sea it is also expected that regional crude benchmarks will fall back closer to the historical norm therefore making comparative refining economics better for Europe.

- Record high levels of stocks today in both gasoline and distillates are making the outlook for US GC refiners somewhat bleak. However, with record high crude stocks also for the time of year, the US crude benchmark is expected to remain relatively weak and continue to obscure the true effect of lower margins for processing other international crudes in the US Gulf. Meanwhile, US Gulf refiners will continue to look at export markets to sustain higher levels of utilisation and obtain some benefit from diesel arbitrage opportunities into Europe and Latin America. For the past few months the diesel arbitrage to both Europe and Latin America made USGC refining operations profitable.





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LEAD STORY: Strategies to Hedge against Market Uncertainty...

Where do You Want to be on the Performance Curve?

Your Company + KBC Produces NextGen Performance[®]

We collaborate with our clients to create unique solutions to their specific challenges. Some of these challenges may include:

Strategic Challenges

- Creating Effective Business Strategy/Decisions
- Increasing Return on Investments
- Enhancing Returns on Acquisitions/Divestitures
- Reducing Strategic/Capital/Market/Investment Risk
- Enhancing Yields
- Creating Effective Response to Crude/Feedstock/Product Markets
- Improving Financial Performance

Capital Challenges

- Increasing Return on Capital Investment
- Rationalising/Optimising Environmental Compliance Capital Expenditures
- Reducing Capital Risk

Operating Challenges

- Improving Yield
- Reducing Maintenance Costs
- Implementing/Improving Behaviour-based Reliability
- Improving Supply Chain Performance
- Increasing Availability
- Improving Safety Performance
- Managing Operational Risk

Organisational Challenges

- Increasing Organisational Effectiveness
- Improving Employee Competency/Capability
- Enhancing Employee Support Systems
- Improving Shift Team Function

Environmental Challenges

- Reducing Emissions
- Reducing/Managing Environmental Liabilities
- Rationalising Compliance Expenditures
- Ensuring Compliance
- Improving Energy Efficiency