

NextGen Performanceⁿ REALISED

Issue VI - 2010

National Energy Companies - The Continued Need for Optimisation

Even with contemplated expansions, optimising existing assets remains an imperative

In a world of continuing overcapacity, likely through 2015, many national oil/energy companies (NOCs) face challenges unique to their international oil company (IOC) counterparts. Many of the current capacity additions and expansions as well as contemplated projects are in emerging markets. There are three primary drivers behind this:

1. Growth in domestic demand and a desire for energy independence/security
2. Operating self-sufficiency with less reliance on IOCs and ex-patriots
3. Job creation/contribution of the local economy

While all of these are worthwhile objectives, most NOCs continue to face market challenges similar to their IOC counterparts in addition to some unique challenges. Given these factors, in many cases greater returns can be achieved by optimising existing assets than building new ones. By the time new capacity starts up, the older assets will have been optimised, thus producing the best result for the overall portfolio of assets.

Primary National Energy Company Challenges

The primary challenges include:

- Aging assets and infrastructure including reliability and maintenance concerns
- Upgrading operations to meet new global fuel specifications and eliminate unwanted fuel oil
- Need to add capacity to meet growing domestic demand and, in certain cases, to exploit export market opportunities

- Increased pressure on export markets from new refineries built in other world regions or nearby countries
- In certain cases, declining domestic crude supplies (e.g. Mexico, etc.) signalling the need for new crudes in the future and creating challenges for refining assets built to process only domestic crudes

In many instances, the NOCs also own the natural resources (crude oil and gas), the operating facilities (refineries and/or petrochemical plants) and marketing (retail) – in essence the entire supply chain. Being predominantly under government control, NOCs face unique challenges to staying competitive. These include:

- Governmental involvement in decision-making. Some country constitutions require legislative acts by lawmakers to allow investment decisions, enter into joint venture agreements, etc.
- Limitations on flexibility to change operations, such as crude oils processed and end product slates.
- Fixed domestic pricing. Often governments set retail prices and if the NOC has to import additional feeds, those feeds are priced in the international market.
- Access to funding for capital



Continued on pg. 2

The Refining Sector: How will Global Balance be Achieved?

KBC has released its first *Global Energy Perspectives*, an executive briefing discussing its views on the global refining sector over the next five years and the factors influencing returns on energy investment and economics. With global refining capacity far in excess of current demand and still more capacity under construction, a key question for the downstream energy industry over the next five years is, "How will global markets find balance between this surplus refining capacity and post-recession demand recovery?"

The dichotomy between regions is quite striking: lower demand, aging assets, and declining operating rates in Europe, North America, and Japan versus GDP growth and increased demand in China, the Middle East, and Latin America. With explicit national energy security and job creation objectives, growth markets are adding refining capacity despite an existing global glut. Like the collisional boundaries of two tectonic plates, the geographic shift in the supply-demand curve will have volatile consequences. While there are numerous factors determining the overall global balance, there are three trends KBC has identified which are particularly noteworthy.

1. Traditional rules of free market economics do not completely apply in the energy sector, yet they are not completely ignored either. Despite overcapacity, certain large-scale projects will likely progress. It is no longer solely about economic returns; decisions have also been made based on local job creation and "corporate social responsibility." Only certain national oil companies and a very few, select independent oil companies can bear the financial burden of such projects alone, irrespective of economic

Continued on pg. 3

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:

Strategic Solutions • Capital Solutions • Operating Solutions • Organisational Solutions • Environmental Solutions



NextGen Performanceⁿ

projects. Some NOCs have never gone to the international financial community for funding; others have issues with sovereign debt rating by credit agencies.

- Social and governmental goals. IOCs and other independent refiners are primarily driven by the best interest of shareholders—typically profit maximisation. A NOC's shareholder or majority shareholder is often the government, so often governmental policy and societal goals are part of their strategic plan and objectives. These goals are a driving force behind capacity expansion by NOCs, despite general overcapacity.

Facing the Challenges

So what are the implications to the typical NOC today? Often the country of the NOC is facing increasing domestic demand and remains a net importer of refined products, something the desired capacity expansions are anticipated to alleviate. The challenge for the average NOC is to obtain sufficient investment capital to finance new capacity. Most NOCs depend on international capital markets. In light of overcapacity and NOC capacity expansions that are likely to proceed independently of market conditions, some prospective refining projects in the near term are unlikely to achieve typical market-based levels. Thus, financial markets likely will be more cautious with investment decisions, resulting in potential delays or cancellations of other NOC (and IOC) projects.

Herein is the dilemma for many NOCs. Many remain net importers of refined products, yet have challenges in obtaining the required financing to complete expansions and upgrades. Accordingly, in these cases, the NOCs are challenged with addressing their



existing circuit of assets, evaluating how to gain greater throughput, increasing flexibility in processing various crude supplies, and reducing costs to be competitive with net imports. In other words, there is greater urgency to squeeze as much from the existing asset base. In certain cases, this can be a prudent interim step to be taken until capital markets become more receptive to funding additional capacity expansion.

Synergistic Optimisation is a Sensible Interim Approach

Based on KBC's experience with a number of NOCs with multiple refining assets, we recommend undertaking a circuit-wide optimisation programme, treating the assets as a single portfolio. Integration of the assets, including related petrochemical operations, terminals, storage capacity, and retail capacity – in essence the entire supply chain – will provide the greatest results. We have found a number of profit improvement levers NOCs can typically pull to achieve these overall objectives. These include:

- Traditional yield improvements and optimisation of end products produced
- Identifying opportunities for flexibility for potential changes in crude and feedstock selection
- Decreasing energy intensity
- Decreasing other resource intensity (water, hydrogen, etc.)
- Increased effective reliability through improved predictive and preventative maintenance
- Increased efficiency through an engaged workforce, including greater focus on operator skills
- Improving decision-making through real-time performance data aggregating all sources of information (whereby better decisions are made by not taking a single set of data in isolation, which may lead to an incorrect decision)
- Improving decision-making through more powerful simulation tools, not just calibrating the system once or twice a year, but on a more frequent basis, including the decision tools used in daily operating decisions
- Improving LP models using enhanced equation sets (a new method to improve yield and property accuracy)
- Reducing inventories through more effective scheduling and optimisation of tankage use
- Accelerating the development of engineering talent for greater effectiveness
- Realigning organisational structures around core work processes and streamlining for effectiveness



- Reducing existing workforce requirements or engaging existing workforce in more value-creating activities to bring labour costs in line with OECD (Organisation for Economic Co-operation and Development) counterparts

One other unique optimisation consideration is the potential to import crude oil versus refining domestic crude that is typically exported. NOCs can evaluate alternatives to sell heavy crude oil and import lighter crude oil (or the reverse) if that provides a fully vertical supply chain optimum for the *entire* NOC and not just the downstream or upstream segments. This may also provide alternatives for how best to leverage existing assets, even extending the life and usefulness of these assets - especially in situations where domestic supplies are dwindling or new discoveries are changing in composition.

The advantage of the comprehensive approach is that while each area described above may result in only incremental change, the aggregated potential of taking a number of changes can result in average increased throughput of 10- to 20-percent and likely reductions in operating costs between 10- to 25-percent. The counterbalance to this is if an organisation decides to approach each area listed above (or others) on a project-by-project basis, essentially in isolation, improvements in one area could be detrimental to others. Accordingly, while the "big bang" approach may seem overwhelming on the surface, the advantages and potential savings in terms of operating cost, incremental production, and optimisation of feedstock is compelling. Thus, the progressive NOCs are electing to take a system-wide, comprehensive approach in order to capture the greatest possible potential in the shortest amount of time. The advantage to the NOC is the ability to address increasing domestic demand while awaiting the financing or decision to advance a new capacity addition.

While many new refining projects have been announced as being under consideration, the reality is that not all will be completed. Accordingly, NOCs also need to consider optimising existing assets as a hedge against delays and against continued imports of refined products until such time as projects will become more economically viable. The end result will be a more efficient refining circuit.

KBC Announces Worldwide Release of Petro-SIM™ Version 4.0

KBC Advanced Technologies plc announces the worldwide release of Version 4 of Petro-SIM™, and the KBC SIM Suite. Version 4 is an enhanced platform for plant-wide performance optimisation, allowing users to improve operations more effectively and efficiently than ever before.

Version 4 provides a new platform for the SIM Suite, the industry's market-leading models for Fluid Catalytic Crackers, Hydrocrackers and Hydrotreaters, Catalytic Reformers and Delayed Cokers: FCC-SIM, HCR-SIM, HTR-SIM, REF-SIM, and DC-SIM. Technology enhancements have been targeted to meet the needs of today's economic climate and regulatory requirements. Key features include enhanced naphtha compositional detail, new refinery property distribution estimation, and enhanced distillation prediction.



Users of Petro-SIM can take advantage of enhanced calibration mechanisms, tighter integration of monitoring tools, and additional productivity enhancements. For an overview of enhanced features of Version 4, please visit our website:

www.kbc.com/default/Petro-SIMv4.pdf

Petro-SIM is a trademark of KBC Advanced Technologies plc and it is registered in various territories

Refining Water Management Benchmark Survey

As part of a KBC initiative to develop a benchmarking methodology for water usage in oil refineries worldwide, we invite readers with relevant backgrounds to complete our on-line Refining Water Management survey.



In return for completing this short survey, KBC will provide you with a summary of our findings from across the Refining Sector. A free 30-day trial licence of our proprietary WaterTarget software is also available upon request.

The survey should take approximately 10 minutes to complete and you can be assured that all data collected will be held securely and in full confidence. Published results will not refer to specific refineries.

You can access the survey via the link below. Thank you in advance for taking part!

http://www.survey.bris.ac.uk/kbc/water_mngmnt

The Refining Sector *Continued from pg. 1*

returns. However, third-party financing does follow free market economics and to the extent certain projects progress, others may be delayed or cancelled until rates of return are adequate to justify their investment.

2. Capacity in mature markets is clearly at risk of closure or idling. Traditionally, the view has been that the bulk of this closure would occur in the Americas. However, while no geography is immune, KBC's alternate view of the market as three vertical segments (vs. the traditional Pacific-Atlantic Basin view) illustrates key issues that would suggest European capacity is at greatest risk.
3. Much focus has been placed on India and China, and it is true that refined product demand in these geographies will drive overall growth for the next 20 years. However, less often discussed are the global impacts that Brazil, the Middle East, and Russia will also have on world oil markets. With the completion of planned projects in Brazil and the Middle East, both regions will become product powerhouses that can create significant shifts in the traditional industry dynamics. Furthermore, depending on future strategic actions, Russia has the potential to significantly influence both the European and Asian refining markets.

This 12-page executive briefing also includes likely attractive future investment opportunities and identification of some of the key associated risks. This is the first of several planned *Perspectives* pieces. To obtain a copy, visit our website at

www.kbc.com/perspectives/

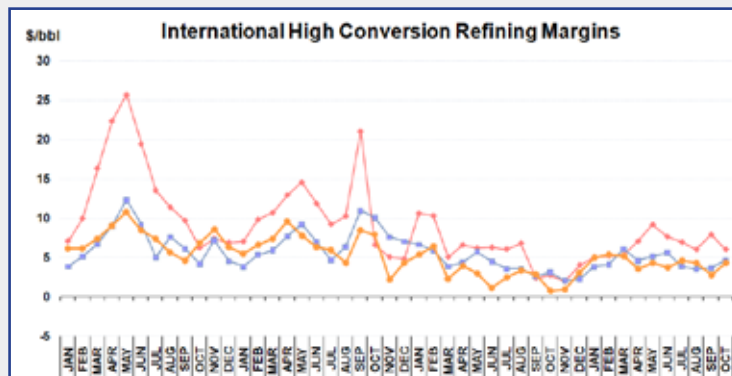
REFINING MARKET UPDATE

In October refining margins in the Main Markets sent mixed signals, increases in NW Europe and Singapore and a weakening trend in the United States. The reason US refining margins weakened was due to WTI strengthening against Brent and Dubai. The US marker crude spread versus dated Brent narrowed from minus \$2.40/bbl in September to minus \$0.50/bbl in October. The relative strengthening of WTI resulted in an apparent reduction in US Gulf margins.

- The increase in refining margins observed in NW Europe and Singapore was mainly due to two reasons. The French port strike managed to cause serious supply disruptions to both product imports as well as refinery operations. Gasoline cracks in Europe increased, contra-seasonally, by around \$2/bbl to \$8.40/bbl in NW Europe (versus light sweet Brent crude) and to \$9.25/bbl in Singapore (versus heavy sour Dubai crude). Cracks for gas oil also increased by around \$0.50/bbl in NW Europe and \$0.75/bbl in Singapore. In the US, in contrast, against a backdrop of high stocks for both products, gasoline cracks fell by almost \$2/bbl in October while heating oil slipped by \$0.50/bbl. Neither product was strong enough to compensate for the relative, month on month, strengthening of WTI relative to dated Brent.
- In Europe and Asia, there was comparatively little improvement in margins for simple refining as the advances for gasoline and heating oil were offset by weaker cracks for fuel oil. Consequently simple refining margins remained negative, constraining incremental crude runs and helping to support cracks for straight run products.

- Refining margins are expected to decrease as refineries in France resume normal operations and the backlog of product tankers delayed by strike action at the main French oil ports is reduced. At the same time refineries will be coming back up from seasonal maintenance, but this will be a balancing act between products finding their way into the markets and refiners increasing operating runs. Decreasing refining margins may be offset in the event of an early period of cold winter weather but this does not seem likely at the present time.

In November, a weaker dollar is already affecting the relative price of crude oil. In the second round of quantitative easing (QE2) in the US we expect to see the dollar depreciating more and therefore an influx of investor money into commodities, as well as a strengthening in WTI price. Thus, KBC Energy Economics expects margins to come under pressure globally.





NextGen Performance[®]

KBC Advanced Technologies, Inc.

15021 Katy Freeway
Suite 600
Houston, Texas 77094, USA
T +1 281 293 8200
+1 800 726 5914
F +1 281 616 0900

KBC Process Technology Ltd

KBC House
42-50 Hersham Road
Walton on Thames
Surrey KT12 1RZ, UK
T +44 (0) 1932 242424
F +44 (0) 1932 224214

KBC Advanced Technology Pte Ltd

435 Orchard Road #16-02/03
Wisma Atria
Singapore 238877
T +65 6735 5488
F +65 6736 4759

**LEAD STORY: National Energy Companies -
The Continued Need for Optimisation...**

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