



# Driving Excellence

Issue II - 2008

Helping Clients Achieve Operational and Capital Excellence



## KBC and SINOPEC Successfully Implement Profit Improvement Project

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China Petroleum and Chemical Corporation (SINOPEC) engaged KBC to improve the refinery performance and profitability of the Yansan Refinery using the KBC Profit Improvement Methodology for a US\$11.4 MM, 42 month project. Both refineries are major, important, complex full-conversion refineries in SINOPEC.

KBC consultants customised the program to satisfy SINOPEC's need to improve Yansan refinery performance. The program was built to include:

- Yield Improvements
  - 11 c/bbl implemented opportunities by Sept 2006
  - 22 c/bbl implemented opportunities by Feb 2008
  - 39 c/bbl implemented opportunities by Dec 2008
  - 39 c/bbl sustained implementation by Jun 2009
  - US\$30 MM cumulative profit (actual prices)
- Energy Reduction
- Improve Reliability, Availability, and Maintenance
- LP Improvement
- Building state-of-the-art models for the individual units, steam utility system, and a full refinery flowsheet

The study included all the refining units (including lubes/waxes, aromatics), the utility system (including the power plant), storage and product blending.

This study was divided into 3 phases :

Phase 1: (Jan-Feb 2006) Optimisation and performance improvement of the existing refinery

Phase 2: (Mar-Aug 2006) New refinery start-up

Phase 3: (Sept 2007-Jun 2009) Optimisation and performance improvement of the revamped refinery.

This paper discusses the experiences and results only from the Yield Improvement part from Phase 1 for Yansan refinery.

### The Project Timeline and Methodology

KBC kicked-off the project in December 2005 on-site:

- Collecting monthly average data (summer/winter operation) for establishing a base refinery operation
- Collecting test run data for calibrating the individual unit models

Following data collection, KBC specialists conducted an intensive 1-month site visit

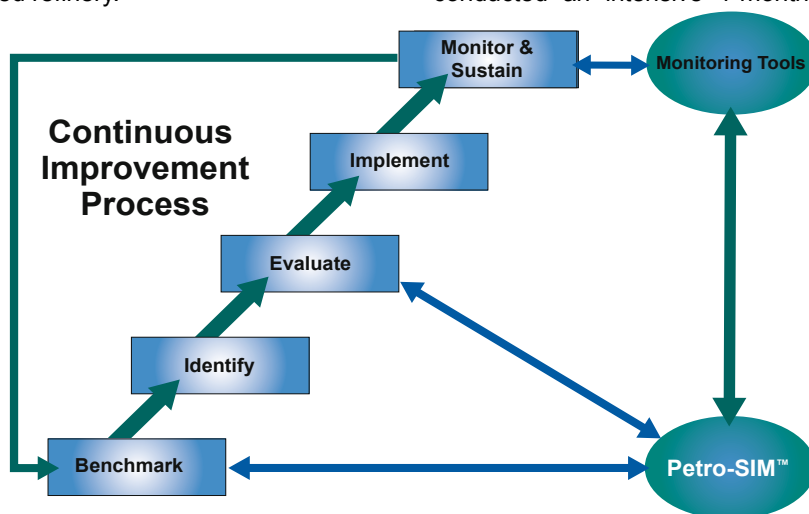


Figure 1 - KBC Methodology Diagram

Continued on pg 2

KBC offers a comprehensive range of consulting, implementation, and training solutions to provide sustainable competitive advantage to our process industry clients worldwide.

### OUR SERVICES INCLUDE: CapX - Capital Excellence

- Market Analysis & Forecasting
- Business Strategy Review
- Merger, Acquisition, & Integration Studies
- Feasibility Studies
- Capital Project Support

### OpX - Operational Excellence

- Operational Planning
- Process Optimisation
- Energy
- HSE
- Reliability, Availability, & Maintenance
- Human Performance Improvement
- Software Solutions

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with refinery personnel to get an in-depth understanding of the unit in January 2006.

This information was used to develop customised individual process models for all the major process units using the KBC SIM suite. These calibrated models were then put onto the Petro-SIM™ platform to develop a refinery-wide flowsheet. All models and refinery-wide model were discussed with the refinery, modified, and finalised. This final model became the basis for all opportunity evaluations. The combination of the linked models and the use of final prices made the economic evaluations extremely accurate and useful for downstream operators to understand the impact of opportunities implemented in the upstream units.

The implementation of opportunities was done using the KBC methodology diagram outlined in Figure 1.

### Results

Identified and implemented opportunities KBC tracked using the KBC Tracker. After one year, 63 opportunities were identified and 18 opportunities were fully implemented. The monthly progress is shown in Figure 2. These opportunities amounted to 136.2 c/bbl (US\$80.3MM/yr) of identified benefits and 38.1 c/bbl (US\$22.5MM/yr) of implemented benefits.

	Identified	Implemented (Best Month)
c/bbl	136.2	38.1
MMS\$/yr	80.3	22.5

The tracker also shows the monthly progress using a fixed set of prices (project based prices). The first target of 11 c/bbl in Sept 2006 was easily met, and the project is on-schedule to exceed the next target of 22 c/bbl.

### Summary

Phase 1 of the study and Phase 2 involving the refinery turnaround and the start-up of the new refinery have both been completed successfully. Phase 3 of the study involving the optimisation of the new and the existing refinery started on-schedule in September 2007 and continues today.

The highlights of the Phase 1 study are as follows :

- All targets have been successfully met
  - 11 c/bbl in September 2006
  - 22 c/bbl in Feb 2008 and 39 c/bbl for Dec 2008 on schedule
  - US\$30 MM cumulative target on schedule for June 2009
  - All software models were delivered on schedule
  - All software training and technology transfer was completed on schedule.

- 38.1c/bbl of implemented opportunities
- US\$9MM cumulative benefit till Jan 2007

The major benefits from the program thus far:

- Increase in both, production and recovery of high value aromatics such as Xylene and Toluene (higher CCR severity and increased recovery in the aromatic extraction unit)
- Increase in light ethylene cracker feedstock feed (increase CCR feed endpoint)
- Fuel Oil Reduction (deepcut at VDU and increase PDA lift)
- Increase in lube oil/wax production
- Increase in Jinbiao gasoline (increase FCC Naphtha to State Gasoline)
- Lower energy consumption through process optimisation and better power plant/refinery integration.

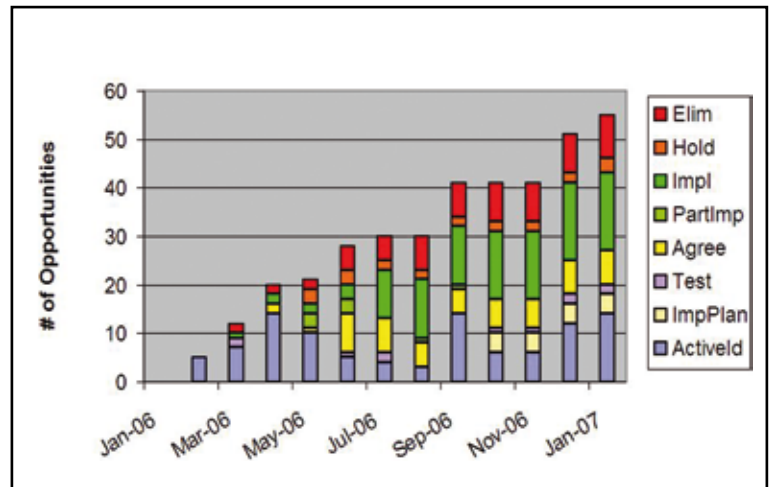


Figure 2 - Monthly Progress

## Upcoming Human Performance Improvement Seminars

### Training Skills for Process Plant Trainers (TSPPT)

- 13-15 Aug – Houston, Texas, USA
- 20-22 Oct – Penang, Malaysia

### Achieving and Sustaining Operational Excellence (OpX)

- 21-23 July – Bangkok, Thailand
- 8-10 Sept – Tokyo, Japan
- 24-26 Sept – Denver, Colorado, USA
- 27-29 Oct – Abu Dhabi, UAE

### Supervising for Operational Effectiveness (SOE)

- 10-12 Sept – Houston, Texas, USA

### Improving and Sustaining Plant Operator Performance (ISPOP)

- 1-3 Oct – Houston, Texas, USA

For more information or to register, visit [www.kbcat.com](http://www.kbcat.com)

## FEATURED PROJECT Strategic Energy Study on North American Petrochemical Plant

Our client had initiated a corporate Energy Management Program. Following a pilot study by another vendor, KBC was selected through competitive bidding process to complete this study.

The site chosen for KBC is the client's largest energy consumer. Achieving savings at this site was critical to the client's overall corporate goal. The client liked the KBC structured Strategic Energy Review (SER) approach, and they commented on our ability to "talk" energy with the site staff. The energy balance of the site



was constrained due to contracts for steam and power, and the customer was looking for solutions to solve that issue.

KBC performed a full SER for the entire plant employing Gap analysis, benchmarking, steam and fuel system modelling, furnace efficiency analysis, pinch analysis, and heat and power cycle efficiency improvement strategies. The assessment also included process reviews, operations reviews, and plant walk-throughs. Detailed Petro-SIM models were developed for key components of the project analyses and heat and material balance development for the site.

The energy efficiency measures identified resulted in an estimated saving of US\$44 MM/yr with a payback of ~2 years. Major areas of opportunity included power cycle efficiency improvements (70%), cracker furnace energy savings (20%) and heat integration savings (10%). KBC developed an investment roadmap comprising of 9 key steps sequenced to fit future plant turnaround schedules.

## REFINING MARGINS

by Peter Stewart

Refining margins face pressure as high crude prices dent demand growth.

Continued strength in global crude prices has started to put downward pressure on refining margins, amid growing signs that high prices are taking their toll on oil demand growth in the west.

Crude prices have been spurred higher by supply disruptions, political tensions and the weak dollar, which has encouraged financial flows into the commodities markets and pushed crude futures to record highs. With crude prices entrenched above US\$100/bbl, and the economic slowdown in the west in the wake of the "credit crunch" limiting personal spending, there are growing signs that demand growth for oil products is slowing.

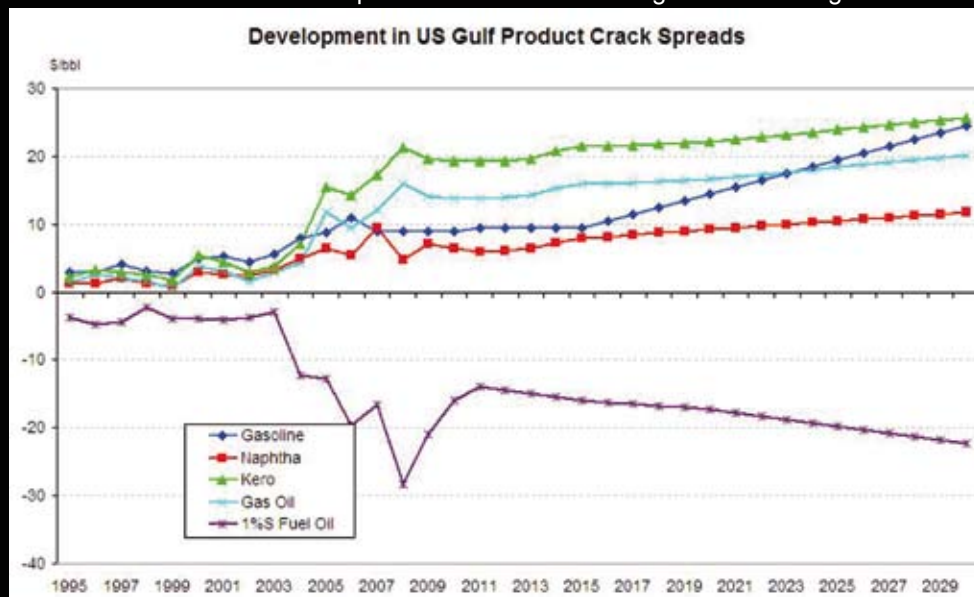
Refiners kept runs at low levels throughout first quarter 2008 due to poor margins and, although this pattern is not uncommon during the spring lull following the winter heating season, the recovery as refiners gear up to meet summer gasoline demand has been slow this year. Although gasoline cracks have started to strengthen ahead of the peak driving season, in line with our forecasts, we continue to project that margins will not benefit as much as they did last year from the summer driving season in the northern hemisphere. The use of ethanol to boost octane in the US is also taking some of the steam out of the performance of gasoline this year.

The bottom of the barrel also remains weak, and fuel oil cracks have dropped to as much as US\$40/bbl negative in some markets. Competition from gas in the US, plentiful supplies of Russian fuel oil into Asia and slack Chinese demand remain the key drivers, but, with gas consumption rising in the Middle East,

we should see the glut start to diminish in the coming months. An improvement is likely by the end of the year, as new upgrading capacity in India gathers momentum.

This additional capacity should also begin to dampen the strength of middle distillates, which hit record high levels on an outright and crack basis in recent months. Demand for ultra low sulphur diesel has been growing rapidly in Europe, and this product has followed jet fuel above the US\$1,000/mt barrier, opening a regular arbitrage for US diesel into Europe. The appetite for transport fuels in the rapidly growing economies outside the EU has also been strong; however, heating oil remained firm despite the end of the northern hemisphere winter as these grades can be used in transportation outside the EU where more relaxed sulphur limits exist. This has perpetuated an inversion in the usual relationship between gasoline and diesel in the US, although we believe that the very high premiums for diesel above gasoline seen through much of Q2 will begin to narrow.

Although margins have come under pressure because of slowing demand, it is worth remarking that the slowdown has mainly been felt in the economies of the west, which have been worst affected by the credit crunch. The fact that crude oil prices remain well above US\$100/bbl also reflects a background of continued strong demand growth in the eastern hemisphere. Although this demand growth has been encouraged by subsidies, high inflation and the political sensitivity of rising food prices suggest it is unlikely that these will be scrapped soon despite the economic strain on government budgets.



## Sign Up Now for Technical Training!

The new KBC technical seminars are filling up fast. These technical seminars advise clients on how and why they make changes to their existing facility, and present industry "Best Practice" tools and methodologies for making improvements to current operations.

We are taking registrations for the following courses:  
Achieving Optimum Energy Efficiency  
 • 17-19 Sept – Charlotte, North Carolina USA

Improving Refinery Profitability  
 • 22-24 Oct – Chicago, Illinois, USA

Reliability Improvement Process  
 • 12-14 Nov – Houston, Texas, USA

Please visit our website at [www.kbc.com/?id=177](http://www.kbc.com/?id=177) for more information.



## Does Your Facility Need Assistance with an Alternative Fuels and/or Feedstocks Strategy?

In response to client requests, KBC has used our proven in-depth expertise in conventional oil refining to add to our service offerings. We have developed expertise in various areas of Alternative Fuels and Feedstocks to meet your needs.

The KBC team possesses experience in Biofuels, GNG/LPG, F-T Diesel (from xTL), and Hydrogen. We have also worked with clients to employ alternative feedstocks, such as vegetable and animal oils processed in existing refineries and alternative blendstocks (Biofuels, F-T Diesel, ETBE, Butanol, DME, Methanol). For more information on how the traditional KBC OpX and CapX services are being applied in this area, please visit [www.kbc.com/?id=183](http://www.kbc.com/?id=183).

## EVENTS

### KBC Driving Excellence Seminars

25 May – Manama, Bahrain and 2 Jun – Copenhagen, Denmark

It has been another successful year for the KBC Driving Excellence Seminar, with two held to date in Europe and the Middle East. Focused around current industry issues and challenges the seminars have attracted major players from Saudi Arabia and Denmark.

### 19<sup>th</sup> World Petroleum Congress and Exhibition

29 Jun-3 Jul – Madrid, Spain

KBC attended the 19th WPC where governments and oil companies, IOCs and NOCs, industry and stakeholders from around the globe came together to set out the way forward for the petroleum sector. Zoran Milosevic, KBC Senior Staff Consultant, presented "Improving Refinery Energy Efficiency Today." In addition Pablo Jimenez-Asenjo, KBC Software Support Manager, and Dr. Antonio López-Rodríguez, Repsol YPF presented "Rigorous Refinery-wide Optimisation: A Case Study for Petronor." KBC also supported the event as an exhibitor.

### RPBC - 5<sup>th</sup> Russia/CIS Refining and Petrochemicals Business Conference and Exhibition

22 Sept – Moscow, Russia

Peter Stewart, KBC Principal Consultant, EMEA will present "Shifting Patterns of Product Demand and the Implications for Russian Refinery Investment."

### RPTC - 7<sup>th</sup> Russia/CIS Refining and Gas Technology Conference and Exhibition

23-24 Sept – Moscow, Russia

John Philpot, KBC Petrochemical Business Line Leader, will present "Opportunities and Challenges for the Russian Petrochemical Industry."

### RRTC - 8<sup>th</sup> Russia/CIS Refining Technology Conference and Exhibition

25-26 Sept – Moscow, Russia

Alan McCartney, Principal Consultant, EMEA will present "Conceptual Design and Feasibility Study for a New Refinery."

### 16<sup>th</sup> Asia Petrochemical Summit 2008

9-10 Oct – Bangkok, Thailand

Steven Kantorowicz, KBC Vice President, Petrochemicals-Asia will present "Innovations in Cracker Technology for Process Optimisation."

### 4<sup>th</sup> Asia Refining 2008

16-17 Oct – Singapore, ASIA

KBC will present "Overcoming Issues with High Acid Crude Processing in Current Refineries."

## EMEA Representative Seminar Held in Walton on Thames

In June 2008, KBC held a seminar for KBC Representatives in the Europe/Middle East/Africa (EMEA) region at our corporate headquarters in Walton on Thames. The seminar provided a forum for KBC regional personnel and representatives to share Best Practices, discuss on-going business, and network with both new and familiar faces.



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### DRIVING EXCELLENCE

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**LEAD STORY: KBC and SINOPEC Successfully Implement Profit Improvement Project**

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