



# Driving Excellence

Issue III - 2008

Helping Clients Achieve Operational and Capital Excellence



## Simulation and Technical Services Provision at Petroplus Coryton Refinery

by Simon Calverley (KBC), Ron Sudkamp, Martin Jones (Petroplus Coryton Refinery)

Coryton Refinery had a large sophisticated installed base of simulation tools integrated into the refinery's business tools. The simulation tools included reactor models and a commercially available process simulator, which came from different providers and were supported by two separate entities.

The refinery changed ownership and it evaluated various simulation options. One of the options was for KBC to provide a replacement for both the process simulator and the reactor models. Whichever solution the refinery chose, it needed to be able to link into existing business tools as did the existing installed base.

Shortly before the change of refinery ownership was announced, the refinery had engaged KBC for process consulting work. Further work followed from the consulting with the expectation that additional KBC services may be required going forward. KBC and the refinery set up an agreement for the provision of Technical Services to facilitate this additional work.

### Simulation

As part of the selection process for simulation, the refinery requested that KBC show the existing process simulation models could be read by and function successfully within Petro-SIM™. The KBC process simulator, Petro-SIM integrates a full suite of refinery

reactor models. Figure 1 shows an overview Petro-SIM flowsheet of a typical refinery which highlights the connection between the rigorous KBC SIM series reactor models. All files could either be read or required minor updates; the files then functioned success-

fully. Petro-SIM was consequently chosen to replace the existing commercial process simulator and the reactor models.

The existing models were replaced with Petro-SIM and KBC SIM suite reactor mod-

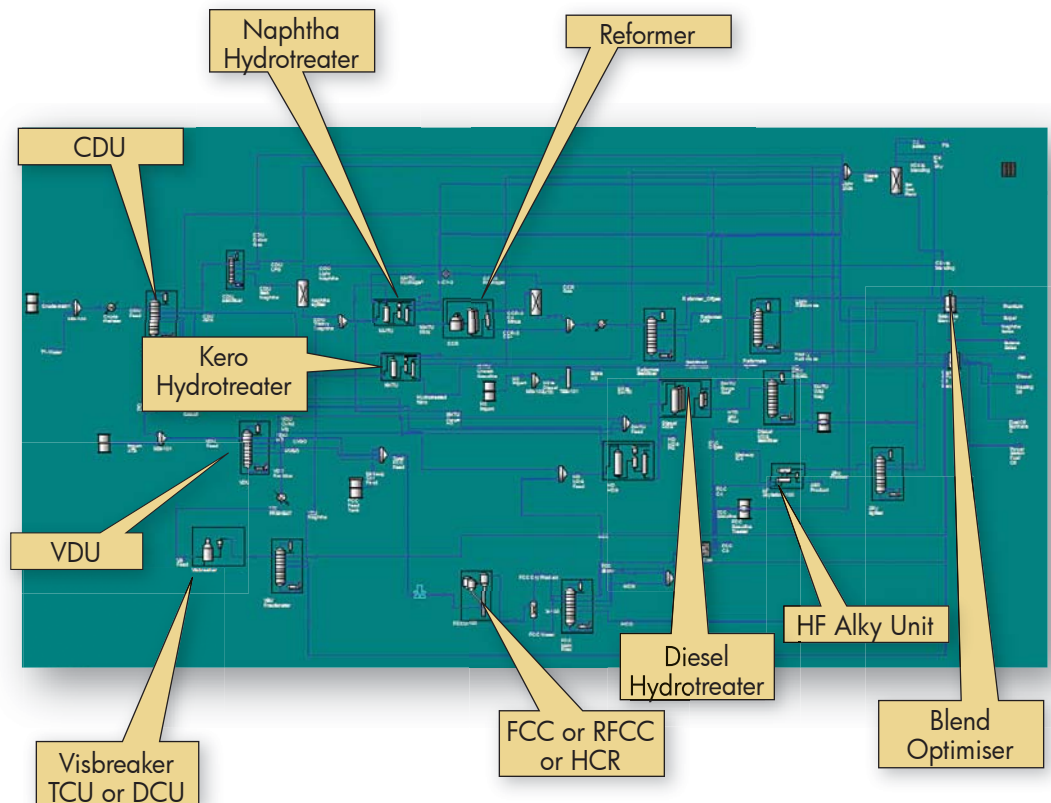


Figure 1 - Simplified Petro-SIM flowsheet

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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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els. The KBC reactor models were tuned to plant data. As part of this process KBC and refinery personnel ensured that Petro-SIM interfaced with the existing business tools. This was done in such a way that it was not necessary to update the business tools as a result of the changeover of simulation tools.

Refinery personnel were trained in the use of Petro-SIM. The trainers were experienced KBC staff who were both familiar with the software and the refinery processes (hydrotreating, FCC, etc.) on which training was being provided. A smooth transition was achieved and some key success factors were identified. Both refinery and KBC personnel were committed to the success of the replacement. The refinery staff were knowledgeable about process simulation in general and about their system in particular. The refinery staff were pragmatic, which enabled them to focus on the end requirement rather than become distracted by any minor issues that occurred. The Petro-SIM software contains the features of both commercially available process simulators and reactor models.

#### Technical Services

The Technical Services agreement has been used for follow on work related to the study in progress at the time the change of ownership was announced. Two additional work orders related to this study have been completed with a third one in progress.

Various factors have contributed to the speed and efficiency with which the additional work has been completed. KBC have good and growing knowledge of the refinery LP as a result of the initial study and follow on work. The refinery has had quick access to KBC personnel with prior knowledge of the refinery. Work orders can be generated quickly via the Technical Services Agreement; this bypasses the time consuming need for a full commercial proposal for each piece of work.

In addition to the work related to the initial study KBC has participated in an Alkylation Unit Audit at the site. KBC is currently undertaking a Strategic Energy Review (SER) with the refinery. Both of these items have been, or are currently being executed under the Technical Services Agreement.

#### Conclusion

Coryton Refinery has been a sophisticated user of simulation technology for a considerable period of time. Petro-SIM successfully replaced the existing reactor models and commercial process simulator in the refinery's business tools, as demonstrated in Figure 2.

The refinery now has a long-term solution for process simulation software with improved benefits of integrated reactor models and efficient support from one technology provider.

The Technical Services agreement allows the refinery and KBC to work together, utilising the strengths of both parties, to improve the refinery's business position.

This agreement offers a faster turnaround from an initial client request to completion of the work as a full commercial proposal is not required for each piece of work. Working this way means that items requiring relatively low total man hours become commercially feasible to execute.

#### Synergy

Synergies have been achieved by having KBC software as a key part of the refinery's business tools and using KBC as a Technical Services provider.

The Strategic Energy Review, which is currently being executed under the Technical Services agreement, has made use of the Petro-SIM simulation models installed at the refinery. A team of both KBC and refinery representatives are involved in either or both of Simulation and Technical Services. Strong professional relationships have developed and continue today. This has had a positive effect for both businesses.

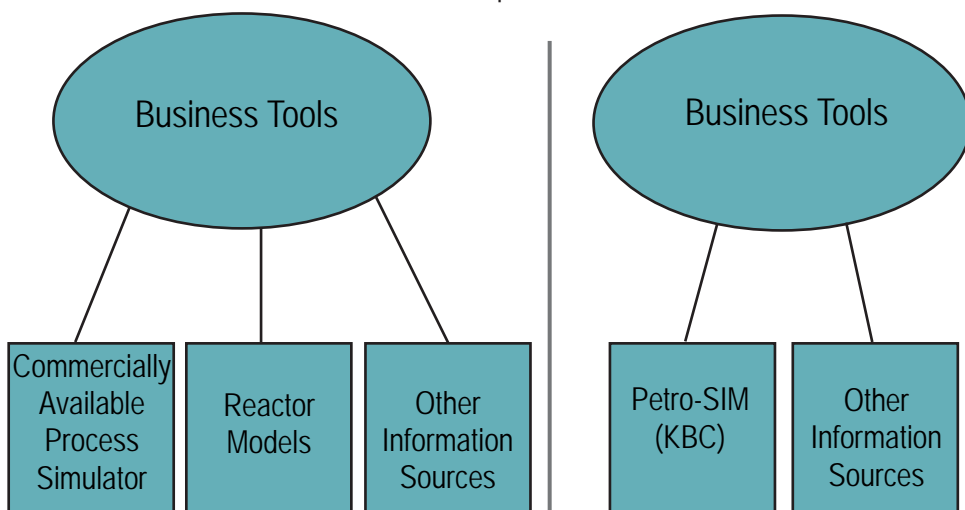


Figure 2 - Business Tool Infrastructure and Reduction in Support Sources



## KBC Driving Excellence India Symposium

15 October 2008 – Hyatt Regency Hotel, Mumbai, India

Attracting high numbers of attendees from major players in the region including Reliance Industries Ltd and Essar Oil Ltd, the recent KBC India symposium was a major success. The agenda, which focused on the current status of the industry and client experiences, was well received. Attendee interaction was prominent, and key discussion points concentrated on today's commercial environment. Popular topics included refinery/petrochemical integration, software, and market strategy.

### Additional Technical Training Seminars Scheduled!

As part of the expansion of our successful seminar business, KBC had added additional dates for the following seminars:

#### Achieving Optimum Energy Efficiency

- 28-30 January 2009 – Charlotte, North Carolina, USA

#### Improving Refinery Profitability

- 11-13 February – Chicago, Illinois, USA

Additional international dates will be announced soon.

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

## REFINING MARGINS

by Peter Stewart

Margins face pressure as high prices and economic woes dent demand.

Margins came under increasing pressure in the third quarter of 2008 after crude oil prices moved to record highs during the northern hemisphere summer. Even though US crude futures have dropped from the peak US\$147.27/bbl reached in mid-July, declining demand triggered by the high prices looks set to keep the pressure on margins moving forward.

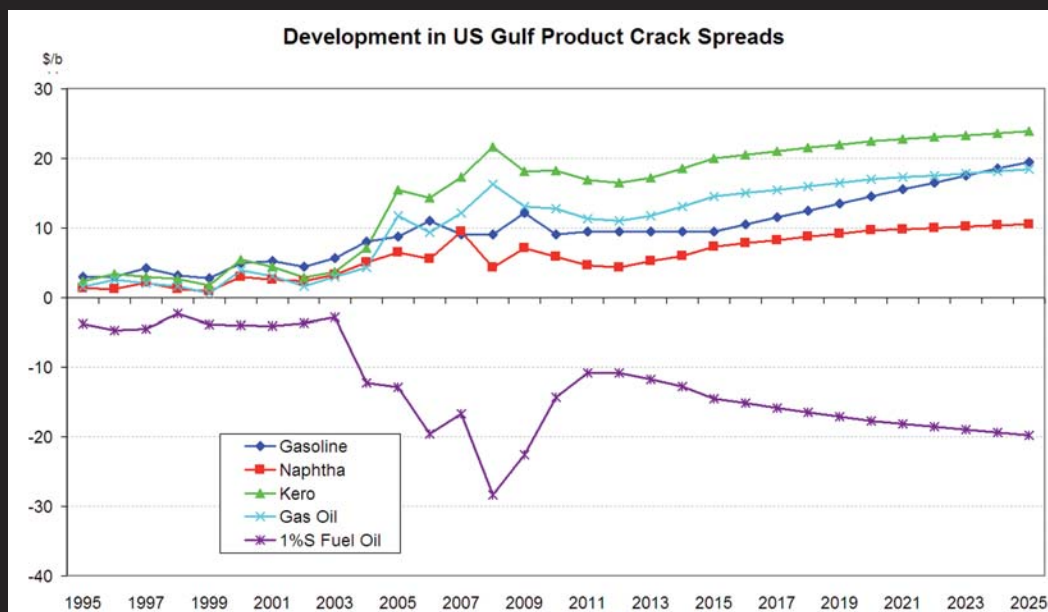
When gasoline prices, driven by soaring crude prices, rose above US\$4/gallon at the pump, it was clear that the behaviour of American motorists changed. Demand for gasoline in the US has been sharply lower this year than a year earlier, and a swift recovery looks unlikely given the country's economic woes, even though prices at the pump have fallen since crude prices dropped back below US\$100/bbl in September. Gasoline margins were negative at the peak of the driving season, causing refiners to cut runs. Despite a hurricane-led recovery in September, it looks likely that demand will stay slack into 2009. Sales of Sport Utility Vehicles have plunged, many commuters have switched toward using public transport in towns, and drivers are looking at fuel efficiencies through driving slower. It appears likely that the fallout from the mortgage crisis on personal spending in the US will be severe and protracted.

In contrast to gasoline, middle distillate margins soared to record high levels over the summer. Stockpiling by China ahead of the Olympic Games and the growing demand for diesel in Europe were the key drivers, but diesel also emerged as the fuel of choice for backup

power generation in Latin America. These demand pressures drove distillate cracks to more than US\$40/bbl, and diesel commanded a premium to gasoline even at the peak of the US driving season. More recently, a dearth of Chinese buying after the Olympic Games and fresh signs of economic slowdown have led to a slump in middle distillate margins. The prospect of substantial new refining and upgrading capacity coming on stream in Asia during the fourth quarter should prevent a recovery, even though European countries are switching to a tighter 10 ppm sulphur specification in the New Year.

Fuel oil has been dogged by falling demand from the utility sector for several years, and plentiful supplies from Russia have resulted in a widening discount to crude oil for much of 2008. After dropping to a record US\$40/bbl discount to crude, fuel oil prices recovered sharply in the third quarter due to gas shortages in the Middle East which led to strong utility demand for fuel oil for air-conditioning over the summer. As new upgrading units at refineries are brought into play from fourth quarter 2008 onward, a tighter supply of fuel oil is anticipated and this should prove supportive of fuel oil cracks moving into 2009.

This overall scenario of weaker gasoline and middle distillates and stronger fuel oil aligns with the KBC medium-term outlook for a decline in margins as new conversion capacity is built in the period 2009-2013.



## FEATURED PROJECT

### KBC Performs Independent Review of Aromatics Complex

Our client had previously contracted KBC to perform a Profit Improvement project and the work scope included a review of their aromatics production facilities. The client inquired about potential opportunities to increase the aromatics production within the facility with little to no capital investment.

KBC conducted roundtable discussions with the client to determine the bottlenecks and limits to increased aromatics production. Operating and lab data were collected for the site and a model was developed for the complex using Petro-

SIM. One particular constraint identified was a charge heater firing limit in the transalkylation unit.

The C9 aromatics stream from the heavy aromatics column was routed to storage via a cooler then fed to the unit. KBC recommended routing this stream directly to the feed surge drum to increase the feed temperature of the drum. The higher feed drum temperature resulted in a higher charge temperature to the furnace, which reduced the heater firing requirements at a fixed reactor inlet temperature, thereby debottlenecking the furnace.

The KBC team used Petro-SIM to check the bubble point pressure at the increased feed temperature and determined the liquid to be sub-cooled. Further review of

the charge pump seals and reactor effluent condenser confirmed the technical feasibility to raise the feed drum temperature.

As a result of routing this hot feed stream to the feed surge drum, the client was able to increase throughput on the unit by approximately 5% at the same heater firing rate as the base case. Yield increases in benzene, orthoxylene, and paraxylene were realised. As a result of the recommended configuration change, the client saw a benefit in aromatics production of approximately 5%, which resulted in a net economic benefit of approximately USD\$5.7 MM/year.

## EVENTS

### **NPRA Q&A and Technology Forum**

5-8 Oct – Orlando, Florida, USA

This conference addresses real problems and challenges facing refiners today with Q&A, plant automation, safety, and principles and practices sessions. Scott Sayles, KBC Principal Consultant, presented at the Gasoline Principles and Practices session. He also presided over the Q&A panel for this session.

### **KBC Petro-SIM User Conference**

8-9 Oct – KBC UK Head Offices, Walton on Thames, Surrey

It has been another successful year for the KBC Petro-SIM User Conference, with clients attending from Europe and the UK. The conference combined a series of case studies, client presentations, technology updates, training sessions, and networking opportunities to illustrate how KBC could improve your refinery profits and operations using Petro-SIM and the KBC SIM suite.

### **ANSYS Engineering Simulation Energy Conference**

11-12 Nov – Houston, Texas, USA

This conference, hosted by ANSYS, is an international event focused on engineering challenges and innovation in the energy industry. Highlights of the conference include keynote presentations, user presentations, topical workshops, discussion forums, and networking opportunities. Scott Sayles, KBC Principal Consultant, will present a joint presentation with ANSYS entitled, "Process Performance Design: An Application of CFD Techniques." In addition, Simon Rogers, KBC CIO, will present "The KBC Vision for Refinery Optimisation."

### **Downstream Asia Roundtable 2008**

25-27 Nov – Kuala Lumpur, Malaysia

John Koo, Senior Staff Consultant, ASIA will present "Reconfiguring Asian Refineries to remain Competitive."

## Upcoming Human Performance Improvement Seminars

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

- 20-22 Oct – Penang, Malaysia

### Achieving and Sustaining Operational Excellence (OpX)

- 27-29 Oct – Abu Dhabi, UAE
- 11-13 Mar – Florida, Orlando, USA

### Effective Operating Procedures (EOP)

- 5-6 Nov – San Antonio, Texas, USA

**For more information  
or to register,  
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