

# DRIVING Competitive Advantage

Helping Clients Improve Profits  
and Achieve Pacesetter Performance

KBC provides independent consulting services and implemented solutions to improve the sustainable profitability of our clients worldwide in the process industries.

## Our Services Include:

- Process Improvement
- Linnhoff March® Energy Services
- Reliability, Availability and Maintenance (RAM)
- Planning Services
- PEL Market Services
- Profimatics™ Simulation Software
- Petrochemicals
- Training Services

## IN THE NEXT ISSUE:

KBC's Quick Response Accelerates Client's VDU Revamp Project

## FEATURE STORY

### The Profitable Way to Reduce CO<sub>2</sub> Emissions

(Abstract of paper from ERTC 2004)

by Douglas Hutton of KBC & Ulrich Bork and Wolfgang Schliep of BP Gelsenkirchen

At the BP Gelsenkirchen site in Scholven, Germany, which includes a 21,400 t/d refinery with a world scale petrochemical complex, numerous energy initiatives have ensured that individual processes are amongst the most energy efficient in Europe. However, with the approach of CO<sub>2</sub>-related emissions taxation, there is further incentive to determine whether gaps in performance exist.

#### Total Site Energy Reduction Program

The TotalSite™ approach pioneered by Linnhoff March (now part of KBC Process Technology Ltd.) is one of the most effective techniques for identifying energy optimization opportunities. BP realized that the technique would meet their specific objectives by providing:

- A comprehensive and structured investigation of the individual processes
- Analysis of the utility system, which would evaluate the savings for the site, taking into account constraints within the existing utility system and planned projects
- A strategic investment plan, or RoadMap™ that would define the compatibility and relative economics of the options open to BP

The Total Site approach has a number of steps from data gathering, through targeting and project development to the final implementation RoadMap. The flow scheme, shown right, illustrates the approach taken at Scholven.

#### Pinch Targeting

Pinch Analysis is a rigorous, structured approach that determines the minimum practical energy consumption of a process and helps to

identify the improvements that will achieve this target. Pinch targeting determined the potential for energy savings in each of the 23 units identified in the first data analysis phase. This pinpointed the 12 key processes where further detailed analysis was warranted. For these processes, detailed pinch analysis further revealed the individual items of equipment where heat was being used inefficiently.

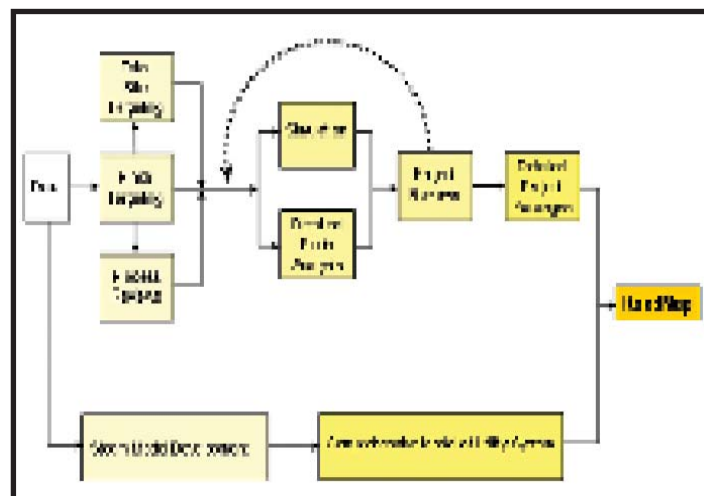
The difference between the targets and actual performance is always fully accounted for by inefficient heat transfer. Since this information is available at the level of individual heat exchangers, it is possible to identify projects that will reduce the inefficiency and save energy.

#### Total Site Targeting

Total Site targeting pulls together the individual process analyses into a picture of the overall site energy use. This helps identify opportunities for integration between processes via the utility system, such as:

- Increased steam generation

*Continued on pg 2*



## FACTOIDS

### ON GLOBAL WARMING:

- Through photosynthesis, plants take in carbon dioxide into the biosphere as organic matter and release oxygen as a by-product.
- Throughout time, oxygen gradually accumulated in the atmosphere, reaching a current value of 21% of atmospheric gases.
- Throughout time, surplus organic matter has been sequestered in the lithosphere as fossil organic materials (coal and petroleum).
- Animals uptake oxygen, burn organic matter, and release carbon dioxide as a by-product; an opposite reaction to that of plants.
- The agricultural revolution, which started about 9,000 years ago, caused a reduction in standing biomass in the biosphere and reduced the uptake of carbon dioxide, indirectly contributing to global warming.
- The concentration of carbon dioxide in the atmosphere, which was at 299 ppm in the year 1900, rose to 316 ppm in 1959, a 5.6% in the 59-year period, or at an average 0.288 ppm per year.
- Measurements of carbon dioxide since 1959 have revealed an increase to 376 ppm in 2003, a 19% increase in the recent 44-year period, or an average 1.36 ppm per year.
- Records of world temperature have been kept since 1861. The year 1998 was the warmest of record; the year 2001 was the second warmest.
- Changes in land use and land degradation such as: deforestation, overgrazing, overcultivation, desertification, and salinization - reduce the net uptake of carbon dioxide, indirectly contributing to global warming.

<http://globalwarming.sdsu.edu>

## FEATURE STORY

*Continued from pg 1*

- More effective use of available steam levels
- Potential for installing new steam headers
- Potential for low grade heat recovery

### Process Reviews

Process reviews provide a forum for generating further ideas based around the targeting results and detailed review of the process flow diagrams. The final success of the initiative was dependent on the practicality of the projects and their acceptance by the people who know the process and have to operate the modified plant. BP's feedback regarding operability and practicality was vital in filtering out unattractive projects and in modifying others to make them more attractive.

### Detailed Project Packages

In all, 77 projects meeting the criterion of less than 5 years payback were identified. These were then detailed in project packages, 25 of which formed the basis for a full cost estimation. The aim of the packages was to provide full project information so that anybody unfamiliar with the study would still be in a position to take the project to implementation.

### Steam System Simulation Model

In parallel with project identification and development, a model of the Scholven steam system was constructed using KBC ProSteam® software. The model had to accurately represent the complex-

ities of the site-wide steam supply as well as local interactions at the plant level. The main purpose of constructing the model was to accurately simulate the effects of new projects on the steam balance. The completed model could then simulate the impact of new projects on individual process steam balances. These local effects could then be evaluated on a site wide basis and the system controlled to achieve the most attractive benefits. The true value of projects could therefore be calculated in terms of fuel, power, water and steam imported by the site. Furthermore, simulation of the base case operation provided insights that could be translated into operational improvements.

### Summary

The RoadMap developed for the Scholven site detailed savings of €1.5 Million per year with a 3-year payback based purely on energy cost. By extending the payback period to 3 and 5 years, the savings increased to €3.7 Million per year.

The results justify BP's conviction that pacesetter performance could be further improved, while clearly demonstrating BP's commitment to reducing the environmental impact of plant operations. The work has now been extended to include the Gelsenkirchen Horst refinery site.

## NEWS & INNOVATION

### EVENTS

*Refining and Petrochemical Business Conference (RPBC), April 20-21, Moscow*  
Join Steve Christy, Senior Staff Consultant for PEL, who will deliver a paper entitled "Market Developments & Challenges."

A discussion on the use of Petro-SIM™ non-linear simulator model for refinery-wide optimization will be given by Simon Rogers.

A special post-conference "Delivering

Competitive Advantage" seminar will be presented by KBC on Friday April 22<sup>nd</sup> at the Marriott Grand Hotel. For more information, email Claudia Matthews at [cmatthews@kbc.com](mailto:cmatthews@kbc.com).

*ARTC 8th Annual Meeting, April 27-29, Kuala Lumpur, Malaysia*

A presentation on benchmarking and improving energy efficiency will be given by Zoran Milosevic, Senior Staff Consultant. The focus of the presentation is improving the energy efficiency of ethylene crack-

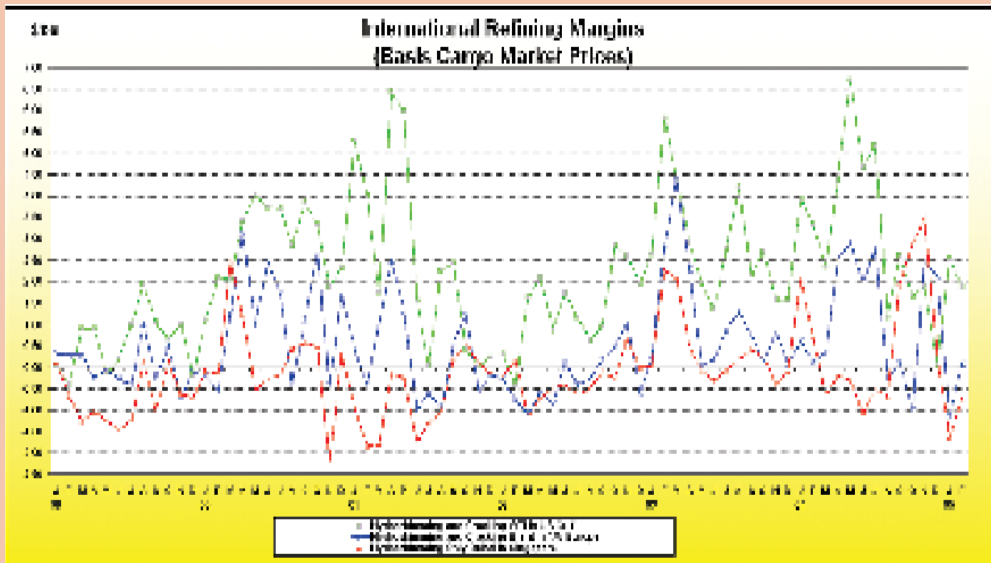
## PEL MARKET SERVICES

### Refining Margins

by Olan O'Sullivan

Refining margins have proven quite volatile since the turn of the year, particularly in northwestern Europe and Singapore. Margins in both regions averaged significantly below the breakeven point for January 2005, which indicates the strength of crude prices and the failure of product prices to match the gains in crude. However, in early February as crude prices lowered somewhat and margins improved, levels moved above breakeven on a hydroskimming and cracking basis in both Singapore and northwestern Europe. In the US, margins performed significantly better, averaging around \$2.50/bbl in January - a level not seen since September 2004. Despite gains in January, margins in February fell slightly, reflecting the increasingly bearish position of US gasoline stocks.

Product prices have entered a hiatus period between the end of the heating oil season the beginning of the gasoline season. The comfortable position of US gasoline stocks has eased anxiety in the marketplace over a possible supply crunch in the second and third quarters. However, belated cold weather has kept heating oil prices reasonably well supported.



## COMPLETED PROJECTS

### Crude Expansion Study

Americas Refinery

KBC was commissioned by an American refiner to study the site-wide impact and economic feasibility of increasing crude processing by 10 to 15%. For the purposes of the evaluation, the refinery-wide PETROfine® flow-sheet developed during a previous Profit Improvement Program® was updated to reflect current crude slate, product demands, proven unit capacities and economics. The model was further adjusted to reflect future diesel specifications and a major FCC re-vamp scheduled for mid-2005.

Four scenarios were chosen for each 5% increment of crude throughput increase, depending on the downstream disposition of marginal crude products (principally, naphtha, atmospheric residue and vacuum residue). The simulations showed a potential benefit of between \$2MM/yr and \$60MM/yr (3 to 101 c/bbl) depending on the scenario selected. Various sensitivities were identified by the combined KBC/client team during the project, and these were studied in the flowsheet to determine their relative feasibility and merit.

The study identified a preferred case, which would result in an 18 to 26% increase in crude processing, and it would require minor revamps to all three crude units, a major revamp to one vacuum unit (incorporating diesel recovery and KBC's in-house deep cut design), minor modifications to the diesel hydrotreater and a major revamp of the two coker units. The capital cost estimated for this case was approximately \$80MM, with a payback time of less than one year in the ultimate case. This scenario was significantly more financially attractive

Continued on pg 4

ers.

**NPRA - Reliability & Maintenance, May 24-27, New Orleans, USA**

Learn more about KBC's Reliability Availability and Maintenance services. For further information, contact Tamra Daniels at [tdaniels@kbc.com](mailto:tdaniels@kbc.com).

**ERTC Asset Maximization Conference (Computing & Reliability) May 23-25 2005, Budapest, Hungary**

Kevin Clarke, Vice President of Process

Consulting, will present "The Next Step in Refining Profitability - Profit Manager™," while Richard Arey, Senior Staff Consultant, will discuss "A Case Study in Defect Elimination - Reliability Improvement through a Structured Approach to Root Cause Analysis."

### COMING SOON!

Also another Petro-SIM Web Seminar planned for late April. For more information, email Claudia Matthews at [cmatthews@kbc.com](mailto:cmatthews@kbc.com).

## COMPLETED PROJECTS

than the equivalent investment in new facilities.

Innovations incorporated into this project were:

- Use of refinery-wide flowsheeting to examine changes from the crude unit, through the conversion and treatment units, to finished product blending to ensure that all impacts were considered
- Continuous involvement of the client, which was facilitated by use of web-based meeting tools and weekly teleconferences
- Leverage of KBC's pre-existing models from past programs with this client
- Use of KBC consultants, who possess a high degree of familiarity with the site to accelerate execution and keep project costs down

### Reliability/Maintenance Program

Thailand

KBC assisted Tuntex Petrochemical

Thailand, the second largest producer of PTA in Thailand, with the development and implementation of RAM (reliability, availability and maintenance) programs to help the plant achieve its performance targets.

In order to accomplish this task, KBC helped TPT implement risk-based work selection, optimized planning and scheduling activities, new asset policies and a defect elimination program.

As a result of this project, TPT improved plant on-stream time from



*Pictured (l-r): Pitchai of Tuntex Petrochemical Thailand and Dave Morgan of KBC presenting the project at ARTC Asset Maximization conference in Singapore*

93% to 94.5% and reduced maintenance costs by 10%.

### Profit Improvement Training Course

Kuwait

KBC recently lead a training course entitled *Tools and Methodology for Profit Improvement* at the Mina El Ahmadi refinery of KNPC (Kuwait National Petroleum Company).

Specific topics included: MAB Atmospheric Resid. (ARDS) Hydrotreater operating severity versus PetCoke max sulfur specs, feedstock optimization to KNPC's conversion units across the three refineries, reformer operating severity optimization and the potential of low sulfur distillate production. It was a highly interactive seminar, and discussions amongst the attendees were lively and meaningful. Feedback received from the seminar was overwhelmingly positive.



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**LEAD STORY:**  
The Profitable Way to Reduce CO<sub>2</sub> Emissions

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