

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:

Fast Project Implementation Maximises Distillate Potential for European Refiner



PROFIT. ABILITY.

FEATURE STORY

Site Optimisation of PetroSA's Gas-to-Liquids Complex

by Carel Steyn, PetroSA - Mossel Bay, South Africa

The Manufacturing Division of PetroSA operates a Gas-to-Liquids (GTL) plant to convert natural gas to liquid products and includes a 40,000 bpsd refinery for the upgrade of the synthetic liquids together with a condensate stream to on-specification fuels and related products.

For over 12 years, the primary feedstock to the Manufacturing plant had been sourced from the local gas and condensate fields at a relatively low cost; however, limited life spans prompted studies on these reservoirs to identify a suitable long-term third-party-supplied feedstock. Understanding that the cost of a long-term feedstock would have a negative impact on the profitability of the Manufacturing Division, a Site Optimisation Project (SOP) was launched to improve the overall profitability of the organisation. The SOP was initiated by identifying the need for improvement in the areas of plant Reliability, Availability and Maintenance (RAM) and optimisation of product yield and energy efficiency, executed as a Profit Improvement Program (PIP).

KBC Process Technology Ltd. was appointed to assist PetroSA by providing independent advice and world-class improvement methodologies. The SOP would focus on non- and/or

low-investment opportunities to deliver sustainable profit improvements.

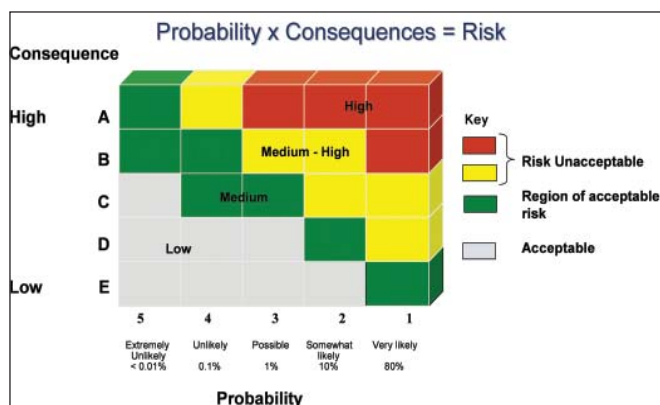
Reliability, Availability and Maintenance (RAM) Implementation

The RAM implementation began by studying current maintenance and reliability work practices and measuring performance levels against industry standards. Potential improvement opportunities were quantified, and a multi-year Asset Management Improvement Strategy was developed, setting high-level strategic objectives for cost and mechanical availability in line with corporate targets.

Supporting change management, a cross-functional team of experienced personnel from the Reliability, Maintenance, Production and Process departments was formed to manage the entire program.

Since risk management was at the heart of the overall program, a site risk matrix was developed using industry standards and calibrated to reflect PetroSA's business objectives in the areas of Health, Safety & Environment, economics, and other business drivers. A typical risk matrix of consequence versus probability is shown in Figure 1.

Figure 1



Routine Maintenance Improvements

Once the risk matrix was in place, prioritisation of routine maintenance commenced with all break-down and ad-hoc maintenance work requests screened on a daily basis.

The next area of focus was planning and scheduling. The aim was to ensure that all work be adequately planned with spares available before scheduled for execution.

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FEATURE STORY

Continued from pg 1

Various Performance Indicators (PIs) were developed, and they are tracked on weekly/monthly frequencies. Some of the key PIs are:

- Percentage Schedule Breakers
- Schedule Compliance
- Backlog

Reliability Improvements

Two approaches were taken in reliability improvements. The proactive approach involves a structured, systematic means to developing and optimising asset care through the application of Asset Policies. These policies were developed by a cross-functional team, and the risk matrix was used to evaluate degradation/failure mechanisms before defining appropriate mitigating actions. Inherent within asset policies are the principles of reliability-centered maintenance and risk-based inspection. The reactive approach involved the use of defect elimination, a rigorous process where high risk/cost incidents were identified and investigated by dedicated lead investigators. Causal factors were identified both to solve current problems and allow future evaluation and identification of systemic defects.

Shutdown/Turnaround Improvements

Since planned shutdowns and turnarounds typically represent the single largest loss of unit availability and significant maintenance costs, the focus was to ensure optimum definition of the work scope. This was achieved through application of the risk matrix. Tight procedures were employed to manage scope growth, typically 9 - 12 months prior to shutdown. Independent external resources were used to facilitate the work selection process as well as review of critical paths.

Profit Improvement Program (PIP)

The focus of this part of project involved evaluation and benchmarking of current production operations, then identifying and implementing opportunities to improve product yields and energy efficiency. A cross-functional team of operating personnel, process engineers, marketing, engineering, and planning were involved to provide an in-depth understanding of all issues that affect production economics.

These discussion sessions provided a fo-

rum to develop improvement ideas, with the additional benefit of skills transfer. Improvement ideas were then evaluated by means of a simulation model, specifically created for the study. Detailed investigations were possible with this more rigorous model than the PIMS model used for planning.

Each opportunity was rated to define the level of investment required and a degree of confidence was allocated to each idea. This classification was used to prioritise implementation activities.

Typical Improvement Opportunities

The importance of feedstock quality and quantity was a specific area of focus during the study, and several opportunities identified a need to increase feedstock throughput. This increase could be accomplished by the removal of perceived constraints, identification of alternative process routes, or updating and improving planning tools and parameters.

A thorough understanding of the Fischer Tropsch technology, combined with a thorough simulation of the process, identified further potential enhancements in the key "Synthol" units. Results indicated that it would be possible to improve both selectivity and product yield.

In the refinery, a number of alternative routings for process streams were proposed to provide flexibility, maximise octane components and fully utilise the unique properties of the Fischer Tropsch-derived products.

Since the gas-to-liquids process is energy intensive, the optimisation of utilities was a key step to unlock value. Modelling of the steam system made it possible to continuously monitor, evaluate and optimise operations.

Implementation

For each opportunity, a key performance indicator (KPI) was identified and presented on a monthly basis to compare and evaluate the overall economic progress. More than half of the anticipated benefit of 20 c/bbl was achieved at an early stage in the project.

The systematic methodology, detailed

simulation modelling and wide role-player involvement was a successful approach to harness significant benefits in a facility that has been in stable operation for a number of years. The results of the program will be the basis for continuous optimisation at PetroSA in future years.

Conclusions

A number of key learning points have been identified:

- The success of such a project is dependant on the effectiveness of the change management process; general communication related to the project should be a high priority from the beginning.
- The benefits of an exercise of this nature can be maximised if it is not approached as a short-term project, but, rather as the initiation of a culture of continuous improvement.
- The assistance of external specialists can add substantial value by enhancing specific skills within the Manufacturing organisation through skills transfer and maintained project momentum.
- Significantly more progress is made where dedicated resources were available for the implementation process.

UPCOMING EVENTS

IQPC Shutdowns and Turnarounds Conf

5 - 6 Dec 2005,
InterContinental Hotel – Dubai
Dubai, UAE

KBC's RAM team will be present at the table-top exhibit, and KBC will provide a subject-matter expert for the panel discussion.

Shutdowns & Turnarounds Conf

7 - 8 Dec 2005,
Millennium Hotel,
London, UK

KBC's Vice President of RAM, Stephen Wright, will present a paper on "Minimising Turnaround Spend by Effective Risk Management of the Work Scope."

Operational Excellence in the Middle East

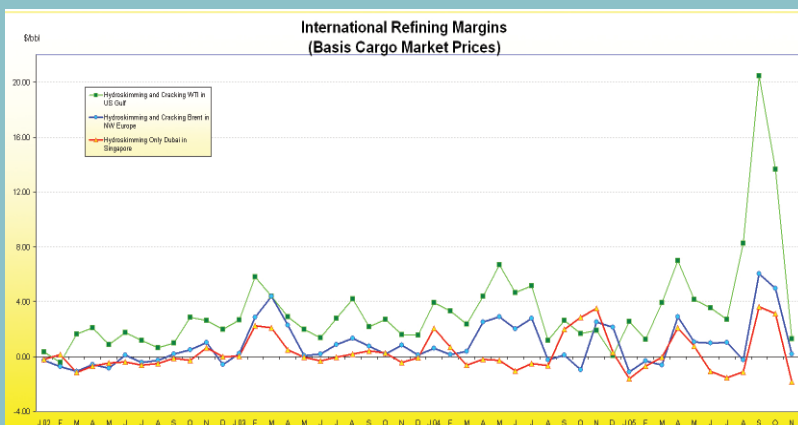
15 Jan 2006,
The Ritz-Carlton Hotel & Spa
Bahrain

PEL MARKET SERVICES

Refining Margins

by Olan O'Sullivan

The impact from Hurricanes Katrina and Rita significantly affected margins during September and October, thrusting them to record levels in the US Gulf (above US\$20/bbl). Gasoline and middle distillate prices hit record highs as the market became fearful of supply shortages, especially with the imminent Northern Hemisphere winter. Physical crack spreads for gasoline and diesel hit extraordinary heights of above \$50/bbl, yielding huge returns for refiners capable of producing PADD III, especially those on the US East Coast. The massive shock from the hurricanes on the US refining system provided support to other regional markets, and Europe and Singapore received coordinate support, with NWE margins averaging \$6/bbl and \$5/bbl respectively for September and October. Similarly, in the Far East, margins on a simple hydroskimming basis averaged over \$3/bbl for the two months. However, by mid-October, prices began to waiver, particularly for gasoline. This was due to strategic releases of crude and products by the IEA, relaxed quality specifications for US gasoline and diesel, weakened demand due to high prices, mild weather, and a refining system running flat out, relieved some of the anxiety in the market. The tightness of the freight market ensured surplus product remained region-bound, such as the build up of kerosene stocks in Asia. Reduced demand from the key regional importer, Indonesia, forced Japanese and South Korean refiners to cut runs by the end of November. Weather generally proves to be a key driver in the fourth quarter. The benign start to the Northern Hemisphere winter, with heating degree days down by 20-30% in most regions, allowed the refining system to switch back to distillate production after an extended gasoline season. Margins thus fell back quite dramatically in the US by over \$12/bbl on a monthly average basis.



KBC is hosting this seminar for key executives from major refining and petrochemical companies in the Middle East region. The seminar format will be conducive to open and constructive dialogue about the status and experiences of the industry, while focusing key issues such as:

- Profit Improvement - KNPC
- Optimisation Software - Saudi Aramco
- Technical Services - KNPC
- Smart Design Investments - Repsol YPF
- Asset Management - BAPCO

Lunch and post-seminar reception included. Please visit www.kbcat.com/seminars/MEseminar.asp to register.

International Downstream Technology & Catalyst Conf
15-16 Feb 2006,
Royal Garden Hotel,

London, UK

KBC has executed over 120 Profit Improvement Programs at refinery and petrochemical sites worldwide generating significant benefits for clients. Kevin Clarke, KBC's VP Process Consulting, will present the evolution of this methodology into a Continuous Improvement Program.

Production Optimization for Process Plants

The Regent Hotel
Kuala Lumpur, Malaysia

Discover how industry leaders have developed and executed manufacturing strategies to ensure maximum gain and guarantee optimal plant productivity.

KBC will present a paper on "Aromatics Optimisation."

COMPLETED PROJECTS

Refinery Optimisation and Profit Improvement Program (Phase 1)

Serbia

Following a public tender, KBC was awarded the contract in direct competition to provide refinery optimisation and a methodology for the calculation of production costs by product.

KBC was selected as the winning bidder based on references, the level of anticipated benefits and price.

Program objectives:

- Improvement in refinery margin through non-investment, minor investment opportunities and investment projects
- Initiation of a comprehensive profit improvement program
- Calculation of production cost per product

It is anticipated that this initial program would identify benefits of about US\$4 million/year, with a project duration of four months.

KBC offers Petro-SIM™, our optimisation software package, including support, profit improvement implementation services, and training as options.

NIS stated that they are prepared to embark upon Phase 2 of the program, following completion of Phase 1. Phase 2 is expected to generate benefits of 50 c/bbl, the equivalent to roughly \$14 million/year (based on 4 million ton/year capacity of two refineries).

NIS expects that KBC's program will significantly increase the asset value of their two refineries as they prepare for privatisation.

Maximising Gasoline Production Middle East

Background

Our client imports a significant amount of gasoline to meet a deficit in the domestic market. KBC was asked to undertake a study to identify and help maximise gasoline pro-

Continued on pg 4

RECENTLY COMPLETED PROJECTS

Continued from pg 3

duction, preferably without investments. Among the many sites owned by the client, a particular refinery, located in the Persian Gulf, was chosen as the first site for identification and implementation of a gasoline maximisation strategy.

The refinery process units consist of a 30 kbb/d CDU and 6.3 kbb/d reformer unit. Through preliminary discussions with the client, KBC had estimated the potential to increase gasoline production by some 10%. However, since that time, the refinery had begun processing lighter crude diet, which added constraints in the CDU overhead system.

Methodology and Implementation

KBC commenced the study in May 2005 with a site visit to collect data and discuss the refinery operations, the operational strategy and the major constraints. Following discussion with the refinery management and staff, the main objective of the study was to maximise incremental

naphtha feed stock in the CDU for the reformer unit which had spare capacity.

Through June 2005, KBC developed a refinery flowsheet using KBC's proprietary Petro-SIM™ flowsheet software.

Various non-investment and investment options to maximise naphtha production were identified and evaluated using Petro-SIM; the impact on the reformer operation was also studied. The most favourable economic non-investment option was selected to demonstrate the strategy recommended via a test run. This involved overcoming CDU overhead cooling constraints by optimising stripping steam rates in the side strippers and changing the naphtha/kero cut point to maximise naphtha production. KBC staff visited the site to discuss the proposed strategy and supervise the test run. A stepwise test run procedure was developed by KBC, and then carried out successfully during a peak summer period when the CDU overheads system was

operating with maximum constraints.

Results

An increase in the naphtha production of over 15% was demonstrated. Operating guidelines were prepared by KBC staff and passed on to the refinery operation staff in order to sustain the operation.

Since the successful demonstration test run, the refinery has sustained an increase in naphtha production of around 14%, exceeding the 10% initial anticipation.

The success of the project was largely due to the close cooperation and rapport between the KBC team and refinery staff, and the excellent support from management of the refinery for the execution and implementation of the project.



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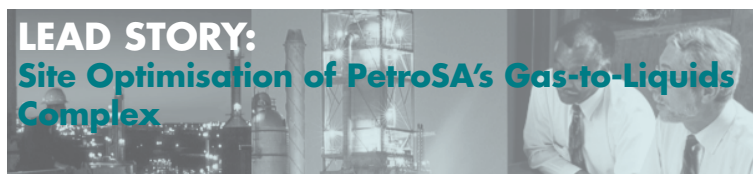
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LEAD STORY:
**Site Optimisation of PetroSA's Gas-to-Liquids
Complex**



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