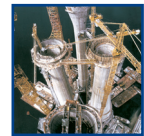


Ecopetrol to exceed refinery performance targets



Ecopetrol SA, the Colombian state-owned oil company, is the fourth largest oil company in Latin America. In 2000, the organisation identified several business challenges. Competitiveness in the South American refining industry was increasing and industry deregulation was about to allow private refiners into Colombia. The company also had to contend with wider industry trends such as new environmental regulations, increased use of sour and heavier crudes, and a growing demand for diesel.

Ecopetrol was determined to improve performance and deal with these issues by making a step change in the way it operated. In November 2000, the company teamed up with Shell Global Solutions to undertake an ambitious six-year refinery performance-improvement programme with a tough target – to average implemented benefits of \$100 million per year (\$1/bbl feed) by the end of the six-year contract. This target was later revised to \$145 million per year following early successes.

The programme aims to increase efficiency, safety and profitability at Ecopetrol's refineries in Barrancabermeja and Cartagena through implementation of industry best practices and technology transfer.

Initiatives

Although the programme was to be embarked on as a single, concerted exercise, it was broken down into modules. In the hydrocarbon-management module, all the value-adding activities that related to refining, supply and distribution were considered, and a range of improvements was devised. These included upgrading low-value fuel oil to high-value diesel; using catalytic cracking catalysts that were better suited to the product slate; and improving recovery efficiency in distillation operations. In addition, a review of the lubricant oil plant identified process and hardware changes that could dramatically increase the production of high-value wax and provide a \$20-million per year benefit.

Gasoil recovery has now increased by nearly 6,200 bbl/d, which is worth some \$9 million per year. Improvements in gasoline quality have enabled Ecopetrol to export gasoline and generate foreign earnings for the first time.

Safety improvements have been made, as evidenced by the reduced accident injury frequency (Figure 1). The organisation's environmental performance has also been boosted by the development of process solutions that have helped to eliminate continuous flaring, which is saving \$12 million per year.

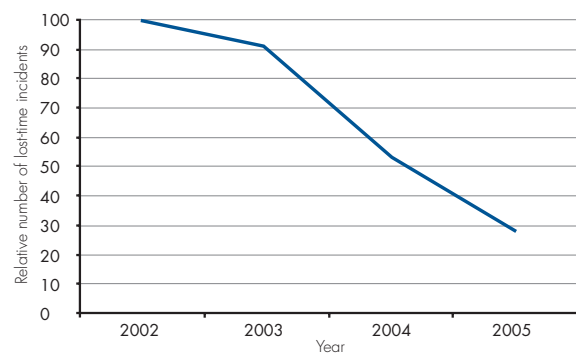


Figure 1: Relative to 2002, the number of lost-time incidents is steadily reducing.



State-of-the-art preventive-maintenance planning methodologies are helping Ecopetrol to achieve the desired plant availability for optimal effort. Risk information has been integrated into the maintenance decision-making process through Shell Global Solutions' risk and reliability management system. This includes reliability-centred maintenance and risk-based inspection, which help to optimise run lengths between shutdowns and reduce equipment intervention levels.

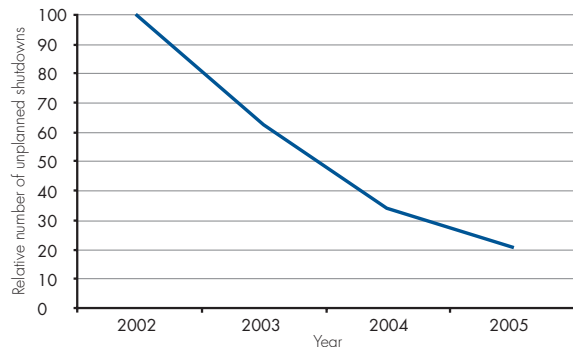


Figure 2: Since 2002, there have been fewer unplanned shutdowns, year on year

For example, investigations revealed that the pump alignment and lubrication procedures were not being followed strictly enough. The small improvements that have been made are helping to improve plant reliability dramatically (Figure 2).

Energy and loss investigations uncovered major benefits; for example, up to \$3 million per year has been saved by optimising the operation of the fired equipment and enhancing its efficiency.

Facilities management solutions have also been implemented, including the introduction of best practices for contractor and project management, and organisational effectiveness solutions.

The client's verdict

"The first year of the programme targeted a series of small improvements that could be executed rapidly," says Federico Maya Molina, Ecopetrol vice president of refining. "During years two to four, the potential major improvements were targeted and the projects to achieve these were implemented. The focus in the final two years will be on finalising the larger projects and sustainability, i.e., helping the implemented projects to continue to deliver value."

Federico Maya Molina continues, "Shell Global Solutions' on-the-ground support has been a key factor in project implementation. This support extends throughout the organisation, and relationships have been established between the consultants and Ecopetrol's managers and executives at all levels and in all business functions."

Business benefits

The programme realised annual benefits of \$55 million in 2003, \$90 million in 2004 and \$108 million in 2005 (Figure 3). The project is considered to be on track to reach the \$145 million per year bottom-line benefits that have been targeted for 2006.

Ecopetrol initiated the business-improvement project because it was keen to transform its business, secure long-term viability and fend off foreign competition. The expectations are that, by implementing operational changes and introducing new working practices, both refineries will achieve second-quartile Solomon benchmarking performance in 2006. Ecopetrol is keen to enhance its performance further with a drive to achieve first-quartile performance by 2010 among the Latin American refineries.

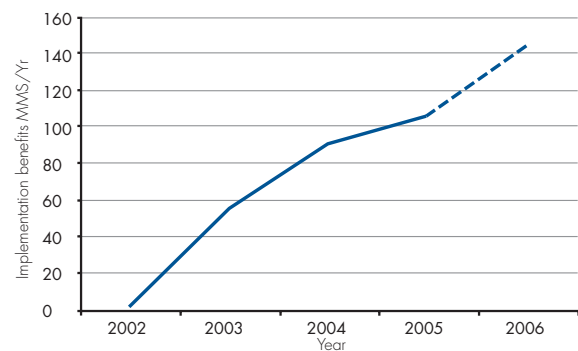


Figure 3: The annual benefits being realised through the business-improvement programme are exceeding targets.

Please contact Shell Global Solutions for further information:

E-mail us at: shellglobalsolutions@shell.com

Or visit our website at: www.shell.com/globalsolutions

Shell Global Solutions is a network of independent technology companies in the Shell Group. In this case study, the expression 'Shell Global Solutions' is sometimes used for convenience where reference is made to these companies in general, or where no useful purpose is served by identifying a particular company. The information contained in this material is intended to be general in nature and must not be relied on as specific advice in connection with any decisions you may make. Shell Global Solutions is not liable for any action you may take as a result of you relying on such material or for any loss or damage suffered by you as a result of you taking this action. Furthermore, these materials do not in any way constitute an offer to provide specific services. Some services may not be available in certain countries or political subdivisions thereof.

All quotations in this document have been reproduced with the kind permission of our clients.

Copyright © 2006 Shell Global Solutions International BV. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical including by photocopy, recording or information storage and retrieval system, without permission in writing from Shell Global Solutions International BV.

GS24850806-En

VMS The Hague_H6109