



CASE STUDY

Waste water treatment, oil dehydration and corrosion inhibition in the Columbian oil sector

1. Background information

The chemicals used in the petroleum industry for oil dehydration, water treatment and corrosion inhibition represent an important part of a company’s operational costs and can cause adverse effects to the environment. Proper monitoring is essential to avoid negative environmental impact and accidents caused by these processes.

The parameters usually measured to determine the efficiency of the above mentioned processes are 1) water content in crude oil - if it is too high, customers may not accept the oil; 2) oil content and 3) suspended solids in waste water - if either of the latter ones is too high, environmental authorities may impose fines or may even close the oil field.

2. Introduction

The largest Columbian oil company, Ecopetrol, was looking for new strategies not only to lower costs but also to consider the total economic balance of its crude oil drilling and water treatment operations. Acknowledging the potential environmental and economic benefits of implementing best practices in the chemical processes, they identified the Chemical Leasing business model as the most suitable strategy.

A Chemical Leasing project was developed together with Nalco, one of Ecopetrol’s suppliers. Nalco is one of the world leaders in the area of water treatment and related processes, providing services, chemicals and equipment to this branch of industry.

3. Key changes and results:

The Chemical Leasing business model was applied to the following processes:

- Oil dehydration - a process by which the water/oil emulsion gets separated
- Water purification - this process consists of eliminating the oil and solid contents from the water
- Corrosion inhibition - crude oil contains water, so it is necessary to prevent corrosion in the facilities that come in contact with it

The model was implemented in 2009 and is still operational. As shown in Figure 1, the results have been a substantial increase in the production and treatment of oil and the treatment of water with only a minor increase in the quantity of chemicals used and solid waste produced.

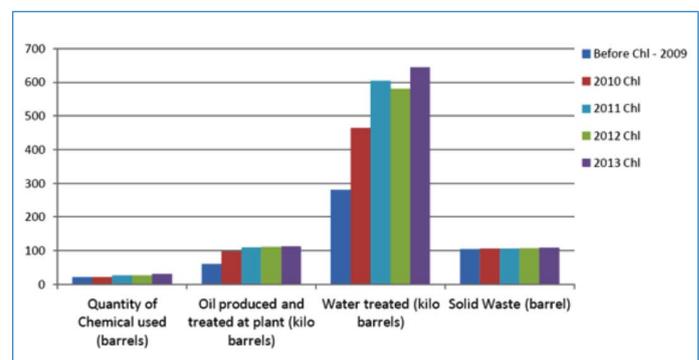


Figure 1: Results of Chemical Leasing implementation since 2010

3.1 Unit of payment applied

Before Chemical Leasing:	US\$ per gallons or kilos of chemical purchased
After Chemical Leasing:	US\$ per kilo barrels of oil with a specified quality

3.2 Technical measures tested and implemented

The application of chemicals was optimized through improved measurement techniques, constant evaluation of dosage and points of application.

The evaluation was done by using laboratory equipment purchased by the chemical supplier, enabling Nalco to simulate the operating conditions of the equipment in the field. Dosage controlling equipment was purchased and installed in the field in order to better control the dilution and saturation of products injected into the fluids.

3.3 Results achieved

Before Chemical Leasing	After Chemical Leasing (2010 onwards)
<ul style="list-style-type: none"> • Operations with a high consumption of chemicals • Low efficiency and higher potential risks at the oil fields • High storage and transportation costs of chemicals • Limited incentives for reduction of chemicals consumption for the supplier 	<p>Environmental benefits:</p> <ul style="list-style-type: none"> • Reduction in chemicals consumption and less residues in the stabilization pools and treated water • Reduction of the environmental impact of treated water due to less content of oil <p>Economic benefits:</p> <ul style="list-style-type: none"> • Decrease of oil and grease used in the cooling towers • Cost savings due to the recovery of oil in the stabilization pools and lower costs for maintenance of the pools and cooling towers • Reduction of costs of the treatment process by almost 20% • Reduction of drums used for the transportation and storage of the chemicals from 4,900 to 3,500 pieces • Total savings for oil company - 1.8 million US\$ • Savings for the chemical supplier – 165,000 US\$ • Long-term commercial relationship encouraging continuous process improvement <p>Social benefits:</p> <ul style="list-style-type: none"> • Creation of jobs (in laboratories) • Risk reduction and better working conditions