

IAMC Toolkit

Innovative Approaches for the Sound Management
of Chemicals and Chemical Waste

CASE STUDY

*Application of nonyl phenol in the
formulation of cleaning products and its
substitution by ethoxylated alcohols*

1. Background information

Hazardous substances such as nonyl phenol are widely used in the formulation of cleaning products. The use of nonyl phenol in cleaning products poses risks for workers, costumers and the environment at various life cycle stages, starting from the production to the use of products and the final disposal at the end of their life cycle.

2. Introduction

Central Química is a small manufacturer of cleaning products, with 34 employees in total. The company has more than 25 years of experience within the manufacturing of specialized chemical products for metal treatment, aircraft and vehicles cleaning as well as products for cleaning of households and institutions (e.g. schools, hospitals, etc.). Central Química markets around 80% of its cleaning products for domestic use under different trade marks of the Business Group Exito (e.g. Carulla, Surtimax and Exito), Disconfites (Zeus) and the own mark (Central Química).

In an effort to make their cleaning products more sustainable and safe, the company joined the UNIDO IAMC project in 2015.

3. Project start

With the support of the CNPML, the core innovation team was set up in the very beginning of the project. The team consists of a general project manager, technical and operational manager, representatives of the quality, administrative and financial departments, as well as a human resource manager.

One of the main hotspots identified is the use of nonyl phenol during formulation of company's products. Nonyl phenol is required to hydrolyze raw materials such as linear sulfonic acid, acrylic polymers, caustic soda and surfactants in the production process.

As a response to regulatory pressure but also as a reaction to increasing demands by customers (i.e. requesting safer and environmentally friendlier products to comparable prices), companies have started to develop and market cleaning products with lower impacts to the environment and human health. This general trend is also one of the main reasons why Central Química has been continually looking for safer and environmentally

Topics from the IAMC Toolkit addressed:

- Resource-efficient potential in the chemical industry
- Chemical classification and labeling
- Risk assessment



friendlier alternatives, also considering the associated benefits of being one of the first companies in Colombia offering cleaning products free of nonyl phenol.

Taking in account the identified hotspot and supply chain demand (unmet business need), the general project focus was formulated as follows: to substitute nonyl phenol by safer and environmentally friendlier alternatives in several cleaning products.

**Project focus: to substitute nonyl phenol by safer
and environmentally friendlier alternatives**





4. Project implementation & key changes

Classification of chemicals and search for alternatives to nonyl phenol was performed by using the IAMC Toolkit. The team (especially the staff from the research and development department) carefully studied available literature, including web information and case studies from industry, discussed and exchanged information with suppliers, and reviewed the corresponding Colombian legislation. Besides, the company needed to investigate the optimal concentration of alternatives in each of their products and conduct pilot tests with every possibly feasible alternative. Furthermore, if the pilot tests showed an equal or even better product quality, they were followed by a cost-benefit analysis.

As a result of the research efforts, ethoxylated alcohols were identified as the most appropriate alternative to nonyl phenol. This option reduces ecotoxicity, since the content of phenols released into soil and water during production is removed. Besides, it also ensures that the company meets the regulatory requirements and can even enter new markets. This change has been made partially in time, because the cost of the ethoxylated alcohols is higher than of nonyl phenol, therefore the production cost is higher and the profit margin is lower.

5. Results of the process improvement and benefits achieved

Before	After
<p>Resource use:</p> <ul style="list-style-type: none"> • Nonyl phenol consumption: 2,777 Kg/a • % of products using nonylphenol: 100% <p>Health and Environmental impacts:</p> <ul style="list-style-type: none"> • It is proven that phenols affect the health of people and also persist in the environment for long time <p>Economic impacts:</p> <ul style="list-style-type: none"> • Ethoxylated alcohols have a cost in Colombia of about 2.3 USD/kg while nonylphenol of about 1.9 USD/kg. • Average cost of production using nonyl phenol: 559\$US/Ton product 	<p>Resource use:</p> <ul style="list-style-type: none"> • Nonyl phenol consumption: 1,278 Kg/year (reduction of consumption: 54.3 %) <p>Health and Environmental impacts:</p> <ul style="list-style-type: none"> • Eliminates of ecotoxicity impact on the environment, since the content of phenols released into soil and water is reduced • If the consumption of this substance is reduced, the impact by toxicity in employees and consumers also decreases <p>Economic impacts:</p> <ul style="list-style-type: none"> • Opening to new green markets such as laboratories, restaurants and food industry • Comparable cost of the final products • Cost of production with ethoxylated alcohols: 561 \$USD/Ton of product



Storage of raw material



Production area