

IAMC Toolkit

Innovative Approaches for the Sound Management
of Chemicals and Chemical Waste

CASE STUDY

Substitution of parabens (preservatives in cosmetics) with phenoxyethanol

1. Background information

Preservatives are present in cosmetics in order to reduce the risk of microbial contamination of the product and to ensure the product remains suitable and safe during its shelf-life and the consumers' usage period. Without the use of preservatives, cosmetic products - just like food and other products handled directly by consumers - may become contaminated with micro-organisms, leading to product spoilage, loss of product performance, and possibly irritation, infections or other adverse health reactions by the consumer¹.

2. Introduction

SEMCO is a laboratory specializing in the production of cosmetics, fragrances and personal hygiene products. It was established in 1979. With 33 years of experience, SEMCO has consolidated itself in the Colombian cosmetic industry as a leader for the development of beauty products for personal and body care of the highest quality, appropriate to the needs of the present market. About 97% of total sales are made to supermarkets, retail and companies that commercialize the cosmetics, while 2% of sales are for cleaning products and 1% for the pet line.

In an effort to consolidate the market position and find new customers in existing segments, as well as improving overall portfolios by developing more environmentally friendly products, the company joined the UNIDO IAMC project in 2015.

3. Project start

With the support of experts from NCPC Colombia, the core innovation team was set up at the very beginning of the project. The team consists of production managers and logistics managers as well as health and safety officers who have analysed the company's performance according to IAMC methodology. SEMCO was approached to conduct an innovation assessment to determine the three basic technical components of increasing material and energy efficiency. This included the manufacturing of more products with correspondingly less waste and pollutants, a reduction in toxicity of materials in use, as well as improving safety and reducing risks. Particular focus was given to finding innovative solutions in these areas.

Topics from the IAMC Toolkit addressed:

- Brainstorming on innovations to reduce chemicals use
- Resource-efficient potential in the chemical industry
- Risk assessment
- Substitution of hazardous chemicals



Using the given IAMC methodology, one hotspot identified during the innovation assessment was the extensive application of parabens as a preservative. Parabens are widely used in cosmetic and pharmaceutical products due to their efficacy as preservatives in combination with their low costs and long history of use. However, parabens pose a risk to the endocrine system, can cause allergic reactions and may have a weak hormonal activity². Furthermore, bans were enacted for two substances (propylparaben and butylparaben) in the European Union.

Taking account of this identified hotspot and related strategic marketing issues the general project focus was formulated as follows: to develop new formulas for cosmetics in order to replace paraben with a substitute to the largest possible extent.

Project focus: to develop new formulas for cosmetics in order to replace paraben

1. http://ec.europa.eu/growth/sectors/cosmetics/products/preservatives_en
2. http://www.bfr.bund.de/cm/343/verwendung_von_parabenen_in_kosmetischen_mitteln.pdf





4. Project implementation & key changes

Within the framework of the IAMC project and with the support of the NCPC Colombia experts, the chemicals used were classified and sustainability hotspots were determined. As one of the hotspots was the use of paraben as a preservative, safer alternatives to paraben were identified in a second step. This option consisted of developing a new formula for cosmetics using Phenoxyethanol as a preservative instead of parabens.

So far, the company has developed a formulation to produce certain cosmetics such as shampoo, hand cream, makeup and others using phenoxyethanol instead of paraben. Moreover, the production of cosmetics with phenoxyethanol has been up-scaled for all of the products.

5. Estimation of results of the process improvement and potential benefits

Before	After
<p>Resource use:</p> <ul style="list-style-type: none"> Consumption of 300 kg of parabens per year (25 kg / month) <p>Health and safety benefits:</p> <ul style="list-style-type: none"> Studies show that some parabens demonstrate estrogenicity and multiple hormonal activities in vitro³. 	<p>Resource use:</p> <ul style="list-style-type: none"> Elimination of the parabens in formulations of 70 products associated with 400 references; which means 96 % of all products <p>Health and safety benefits:</p> <ul style="list-style-type: none"> Reduction of workers and customer's exposure to health and safety risks

The cost associated with this option i.e. comparing parabens (~0.83 US\$/kg) and the alternative phenoxyethanol (~0.81 US\$/kg) is not significant, since the concentration used in cosmetic products is very similar. The implementation cost is associated with the

investigation and development of the formula along with analytical testing at the laboratory. This is estimated to be in the range of 10,000 USD. No additional equipment or significant modification in the structure of the plant is required.



Quality control



Laboratory

6. Company statement

The top manager of SEMCO is committed to ensuring: a. the quality of products while using less chemicals and

b. reduced energy consumption while meeting increased market demands and ensuring jobs for his workers.

3. <https://doi.org/10.1016/j.envint.2014.02.007>