

IAMC Toolkit

Innovative Approaches for the Sound Management
of Chemicals and Chemical Waste

CASE STUDY

Application of VOC solvents in paint formulation industry and substitution thereof by non-VOC greener alternative

1. Background information

While in many countries water-based paints are replacing paints containing volatile organic compounds (VOC), the Peruvian paint formulation industry still uses VOC-containing solvent mixtures. Some components of these mixtures could be even Chemicals of High Concern (CoHC) which cause serious health and environmental problems.

2. Introduction

A Peruvian company, Universal Colors, has been dedicated to the formulation and manufacture of paints (traffic, marine, house and automotive) for 14 years now, as well as of latex, coatings, sealants and varnishes for construction and industrial use.

Following a new strategy, the company makes efforts to optimize its overall performance and competitiveness in order to be one step further compared to other companies. It observes the industry trends and has a proactive approach towards the future environmental legislation in Peru, which is likely to become stricter in regard to industrial consumption of hazardous chemicals. In an effort to make their products and paint formulation processes more sustainable and safer, the company joined the UNIDO IAMC project in 2015.

3. Project start

With a help of the CER experts, the core innovation team was set up at the beginning of the project. The team consists of a technical manager, laboratory assistant, representative of purchasing department and chief of production. Applying the given methodology, a number of hotspots in paint formulations have been identified, among which the most important are related to generation of high amounts of VOC emissions mainly from solvents. The analysis of chemicals revealed that a mixture of solvents used in high quantities contains solvent naphtha, light aromatic. This solvent is classified as a CoHC and it may cause genetic defects and cancer, and it has also demonstrated acute and long lasting effects to aquatic life.

The team has also reviewed the forces and trends in the supply chain and have identified that more and more market segments prefer to use non-hazardous paints in order to reduce health and environmental risks. With the change of legislation, the demand of paints with lower content of VOCs is expected to increase.

Topics from the IAMC Toolkit addressed:

- Resource-efficient potential in the chemical industry
- Chemical classification and labelling
- Risk assessment
- Substitution of hazardous chemicals



Taken in account the company hotspot and supply chain demand (unmet business need), the project focus was defined as follows: to develop a new paint formulation, free of VOC-containing toxic solvents, maintaining the same properties and efficiency of the original formulation. The CER experts joined the core team to assist on the project development (options search and analysis) and to monitor the project progress.

Project focus: to develop a new paint formulation,
free of VOC-containing toxic solvents





4. Project implementation and key changes

The classification of chemicals and search for safer alternatives to the solvent naphtha, light aromatic has been performed applying the IAMC Toolkit. The team has carefully studied available literature, including web information and case studies from the industry, discussed with suppliers their experience of using safer alternatives, and reviewed the Peruvian legislation. Having some options available, the team has performed the assessment of three alternatives for the solvent and compared them using the GHS Column Model analysis in order to select the best one. As a result of research efforts, new formulation has been identified containing dimethyl carbonate instead of solvent naphtha, light aromatic.

Dimethyl carbonate (DMC) is considered to be a good alternative because it has similar solubility ranges to the mixture of solvents that contains solvent naphtha light aromatic, it is not regulated as VOC and it has no relevant environmental impacts. The substitution does not demand any technical changes or equipment installation. Although the cost of using DMC as a solvent at this moment is higher than the cost of using the mixture of solvents containing the solvent naphtha, light aromatic, the Universal Colors management supports the substitution project, since it corresponds to the company's sustainability vision and market differentiation strategy.

5. Estimation of results of the process improvement and potential benefits¹

Before	After
<p>Resource use:</p> <ul style="list-style-type: none"> Consumption of almost 6 tons of solvent naphtha, light aromatic per year. <p>Pollution and ecosystem impacts:</p> <ul style="list-style-type: none"> 6,000 kg of VOCs per year released to the atmosphere as a result of use of solvent naphtha, light aromatic. Paint formulations contain a solvent which is toxic to aquatic life with long lasting effects. <p>Health and safety:</p> <ul style="list-style-type: none"> Paint formulations contain solvent naphtha, light aromatic which may cause genetic defects and cancer. 	<p>Resource use:</p> <ul style="list-style-type: none"> Elimination of solvent naphtha, light aromatic in paint formulation. <p>Pollution and ecosystem impacts:</p> <ul style="list-style-type: none"> Reduction of 6,000 kg of VOCs emissions per year: dimethyl carbonate is not regulated as VOC. Dimethyl carbonate has no relevant environmental impacts. <p>Health and safety:</p> <ul style="list-style-type: none"> Reduction of workers' exposure to health and safety risks.

6. Company statement

In Universal Colors we see the importance of manufacturing the products with lower health and environmental risks, without compromising our quality. This is why we have introduced an ecological production line, aligned with our vision, and we are committed to a continuous innovation process to make our formulations better and safer.

1. The new formulation is expected to be introduced in 2017 after undertaking final tests, such as index of refraction, closed cup test for determining paints flammability, paint resistance and odour tests.



Project photo