

# IAMC Toolkit

Innovative Approaches for the Sound Management  
of Chemicals and Chemical Waste

## CASE STUDY

### *Use of solvents for cleaning in the paint industry and its recovery through distillation technology*

#### 1. Background information

In the ink industry solvents are needed in high amounts for the cleaning of equipment such as grinders, mixers, tanks and other supplies. The management of solvents and their residues results in release of VOCs, which are precursors of ground level ozone and can cause severe health effects. In addition, the waste generated through the use of those flammable chemicals is ecotoxic.

#### 2. Introduction

Tintas y Pinturas Especiales S.A. is a small manufacturer of inks, with 52 employees in total. The company is dedicated to manufacturing inks for textiles, finishing inks for industrial laundries, as well as inks for pad printing and other materials. Tintas y Pinturas Especiales markets around 70% of its products at national scale and 30% of its products are exported to several countries in Central and South America. The company covers 30% of the domestic market of the country.

Before having carried out this project, the company consumed huge amounts of solvents<sup>1</sup> (mainly cyclohexanone) for the cleaning of various equipment. After the use, the spent solvent was classified as hazardous waste and sent to an authorized waste treatment facility for disposal. This resulted in high consumption of new solvents and high costs for the company (for buying new solvents and for disposing spent solvents). Therefore, investigations have been carried out on how to optimize the production process and change towards cleaner technologies for several years. In an effort to make its cleaning process more sustainable and to save money, 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 from Tintas and Pinturas Especiales consisted of a production manager responsible for project coordination, a laboratory coordinator providing technical and chemical knowledge, a purchasing manager providing knowledge on raw materials used, and a human resource manager validating all information provided.

Using the given methodology, a number of hotspots were identified. One of the main hotspots identified was the management of solvents, especially cyclohexanone, used as cleaning agents.

#### Topics from the IAMC Toolkit addressed:

- Brainstorming on innovations to reduce chemicals
- Cleaning in place in cleaning processes
- Resource-efficient potential in the chemical industry



As a response to regulatory pressure, but also as a reaction to increasing demands by customers (i.e. requesting environmentally friendly processes and products), 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 Tintas y Pinturas Especiales S.A. has been continually looking for safer and environmentally friendlier processes.

Taking in account the identified hotspot and supply chain demand (unmet business need), the general project focus was formulated as follows: to recover the solvents, using them again and therewith saving resources, reducing generation and disposal of hazardous waste and VOC emissions related with risks to the environment, as well as reducing purchasing and disposal costs.

Project focus: to recover the solvents and to reduce generation of waste and emissions





## 4. Project implementation and key changes

In the frame of the IAMC project, NCPC Colombia presented to Tintas y Pinturas Especiales S.A. the distillation as an option to reduce solvent consumption, and also helped the company to identify and contact a distillation equipment provider. Distillation equipment of different capacities is now available on the market, therefore it was necessary to select the appropriate one. After a conducted technical test and financial assessment, the selected distiller was the one of 6 gallons of

capacity, which allows the recovery of up to 90% of spent solvents which can be re-used in the cleaning process.

The company carried out pilot tests with the solvents in use. As the pilot tests showed good recovery results with the solvents in use, they were followed by a cost-benefit analysis was. The company decided to use this technology, as the return on investment time was shorter than one year.

## 5. Estimation of results of the process improvement and potential benefits<sup>2</sup>

| Before  | After   |
|---|---|
| <p><b>Resource use:</b></p> <ul style="list-style-type: none"> <li>• Average solvent consumption: 660 gallon/year</li> <li>• Recovery of solvents: 0%</li> </ul> <p><b>Health and Environmental impacts:</b></p> <ul style="list-style-type: none"> <li>• 660 gallons of solvents are purchased and disposed of as hazardous waste every year.</li> <li>• Solvents are flammable and some of them carcinogenic and highly explosive, as well as eco-toxic. Solvents release VOCs which are precursors of ground level ozone and can cause severe health effects.</li> </ul> <p><b>Economic impacts:</b></p> <ul style="list-style-type: none"> <li>• Average solvent costs per gallon: 5 USD</li> <li>• Average solvent costs per year: 3,326 USD</li> <li>• Cost for disposal of hazardous waste per year: 3400 USD</li> </ul> | <p><b>Resource use:</b></p> <ul style="list-style-type: none"> <li>• Average fresh solvent consumption: 66 gallon/year</li> <li>• Efficiency of distiller recovery: 90%</li> </ul> <p><b>Health and Environmental impacts:</b></p> <ul style="list-style-type: none"> <li>• About 600 gallons of solvents can be saved every year, which reduces problems of ecotoxicity and negative impacts to human health and the environment caused by spent solvents to be disposed of as hazardous waste, and VOCs.</li> </ul> <p><b>Economic impacts:</b></p> <ul style="list-style-type: none"> <li>• Average solvent cost per gallon: 5 USD</li> <li>• Savings by solvent recovery: 11,131 USD/year. This savings include cost of disposal of hazardous waste, and raw material among others.</li> <li>• Investment for distillation equipment: 8,960 USD</li> <li>• Return of investment: ~9 months</li> </ul> |



Storage of end products



Laboratory for quality control and innovation

1. Solvent consumption per month: 580-600 kg Cyclohexane, 80 kg Xylol and 120 kg Varsol
2. At the time of drafting this case study, the installation was not in operation yet. Therefore, the figures provided in the table are estimations/potential benefits.