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Solvents at the Algerian Enterprise of Paint
"ENAP SIG"

Karima Amel Mechken, Touria Dahane and Ibtissem Belabbad

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Karima Amel MECHKEN¹

1-Institut de Maintenance et de Sécurité Industrielle, Dép.SIE, Univ.Oran2 (Algeria)

Touria DAHANE²

2-Institut de Maintenance et de Sécurité Industrielle, Dép.SIE, Univ.Oran2 (Algeria)

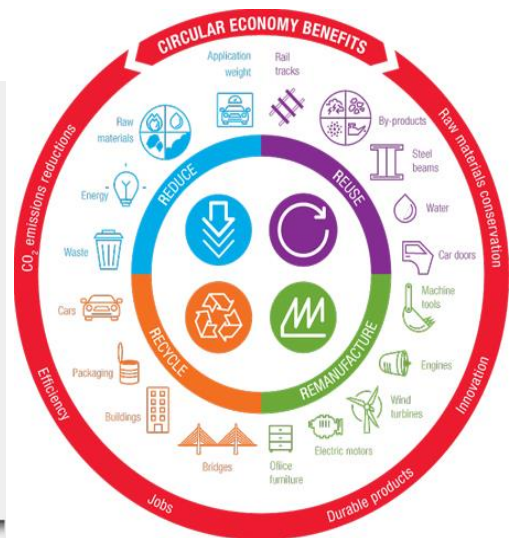
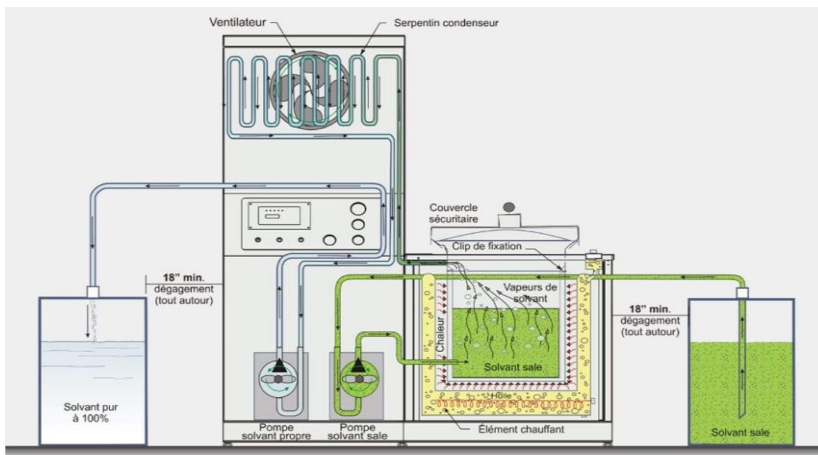
Ibtissem BELABBAD³

3-Institut de Maintenance et de Sécurité Industrielle, Dép.SIE, Univ.Oran2 (Algeria)

Abstract:

Many national companies are beginning to rely on recycling processes[1][2][3] to improve the overall efficiency of their manufacturing, including ENAP, as solvent recycling can lead to a reduction in waste generation, the reuse of some solvents and has many financial benefits. This process saves money, time, resources and reduces pollution and costs of fresh solvents. The larger benefits of using solvent recycling go toward a more circular economy[4][5][6] that prioritizes better distribution of resources and minimizes waste products. Solvent recycling is a large part of that larger benefit.

In this work, as part of an internship for the completion of a final year project, we will present the used solvent recycling unit of the national paint company ENAP SIG.



Keywords: Recycling Process, ENAP, waste Solvents, circular economy.

Jel Classification Codes : Q56 : Environment and Development; Environment and Trade; Sustainability; Environmental Accounting.

¹ E-mail : mechken.amel@gmail.com

² E-mail: touriadahane5@gmail.com

³ E-mail: belabbadibtissem@gmail.com

Introduction

Environmental protection has always been a collective concern. However, the management of industrial waste is still undeveloped from a technical and organizational point of view, so industrial units and structures struggle to eliminate their special waste. So Many national companies are beginning to rely on recycling processes[1][2][3]

The National Company of Paints ENAP is issued from the restructuring of the National Company of Chemical Industries (SNIC), ensures the research, development and production of paints, varnishes, inks and emulsion, resins, glues and derivatives "The company has been certified ISO 9001 version 2015 for more than fifteen years". Thus, among the various constituents entering the various formulations industrialized by this unit, the organic solvents which are volatile liquids that have the power to dissolve other substances such as fats and resins and materials without chemical change to solvents or the material. And among the methods of management and valorization of waste in this company, the regeneration of used impure solvents by recycling. The larger benefits of using solvent recycling go toward a more circular economy[4][5][6] and the preservation of our life, because spent solvents present a potential danger to human health and nature, if they are released into the environment[7] Solvents are volatile agents and, in general, human exposures occur through inhalation of solvent vapors. High exposure to solvents is associated with a number of adverse effects, including mild cognitive impairment, hearing loss, and subclinical color vision deficits[8][9].

The assumption of responsibility, of the environmental questions, by our country, in the perspective of a sustainable development, was consolidated by a legal arsenal set up[10][11][12].

1.Organic solvents in paint industries

Organic solvents are widely used in the world as they are ubiquitous and used in paints, pharmaceuticals, degreasers, adhesives, inks, pesticides, cosmetics and household cleaners. Commonly solvents used in paint production may include isopropanol, toluene, xylene, mixtures of solvents such as white spirit and chlorinated solvents, methylene chloride, trichloroethylene and perchloroethylene [8]. The solvents most used in painting in this National paint production Unit ENAP Sig are: aromatic hydrocarbons, mixed xylenes, aromatic naphthas with a high flash point, with the exception of benzene whose use in paints is prohibited. Aliphatic hydrocarbons include hexanes, heptane, naphtha, ether-oxides, esters and ketones. Despite the fact that the formulation of industrial products in ENAP Sig, requires the use of solvents, the great quantity of impure (dirty) solvents comes from the cleaning of tanks.

In order to absorb this large quantity of dirty solvent generated, the unit has acquired an automatic washing line for the mobile tanks, thus guaranteeing a closed circuit washing cycle, which avoids liquid discharges, and a and a solvent regeneration station to be used again in the production of paint or the cleaning of tools and equipment[13][14]. Concerning the small tanks, they are washed manually.

2. Regeneration of solvent at the spacious waste management sector within the paint Unit

According to the production department of the ENAP Sig unit, the quantity of impure solvents varies according to the nature of the paints, the activity and the seasons, so during the summer it increases and decreases in winter for example.

After the use of solvents in the different production processes in this company, the impure solvents are sent to the regeneration station in mentioned drums[15][14]. The principle is based on the distillation under vacuum, at temperatures determined according to the flash point of the impure solvent. The vapors of the distilled solvents are condensed in a multitubular condenser in which it passes back from the

gaseous phase to the liquid phase and extracted with the help of a pump, in drums called "Clean Solvent" and transferred to the production unit.

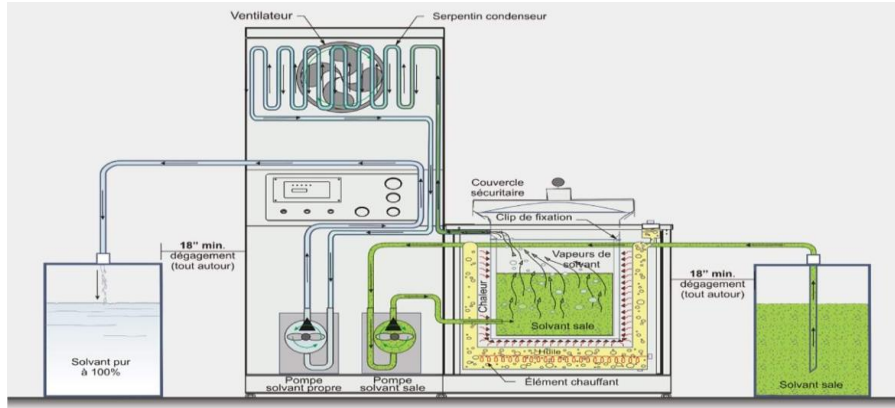


Figure.1. Schematic representation of an industrial solvent regenerator by vacuum distillation (Web source: istsurface.com)

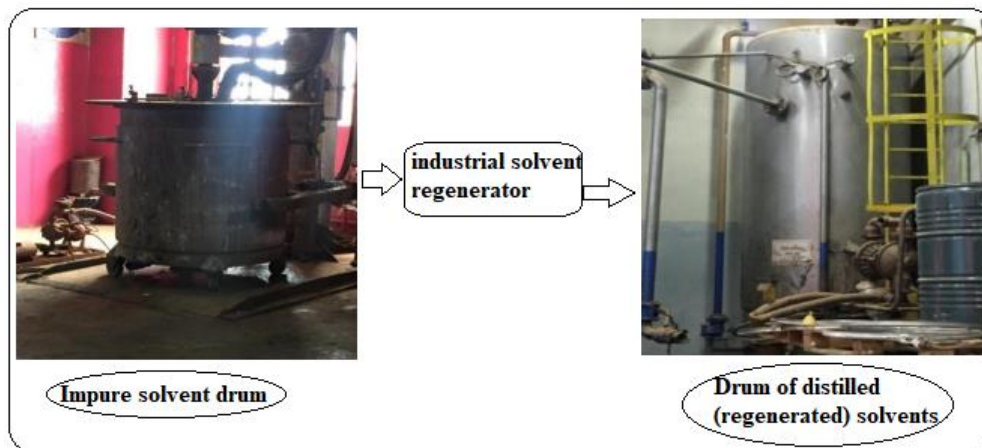


Figure.2. Impure and distilled solvent drums from the industrial regeneration plant (Source ENAP Sig)

3. Contribution of solvent regeneration (recycling) to the circular economy

Globally The circular economy is a principle of economic organization that aims to systematically reduce the amount of raw materials and energy over the entire life cycle of a product or service, in order to ensure the protection of biodiversity and a development conducive to the well-being of individuals[16]. First, circular thinking can help you extract value from waste and discover renewable resources in the supply chain. Solvent recycling is an innovative way to help a company meet its sustainability goals, reduce its carbon footprint, and improve its bottom line through the reuse or sale of materials. embracing the circular economy and maximizing the value of recyclable materials helps build a more sustainable society, so nothing goes to waste[17].



Figure.3.Schematic representation of Circular Economy[18]

The primary goal of the circular economy is to avoid as much as possible that resources (materials as well as energy) from escaping the development cycle in order to guarantee its optimal functioning. When waste is reused, everyone benefits because of lower energy use, reduced greenhouse gas, natural resource conservation, decreased disposal costs and, often, more efficient production by using recycled materials.

Recycled solvent is an advantage that manufacturers are interested in because it is used to replace virgin (new) solvent, which is often very expensive, and the method of solvent recovery within this paint production unit is both cost effective and environmentally friendly.

This company has equipped itself with a material (system), of recovery of solvents at the source what allowed it to save the expenses of purchase of virgin solvents, of their transport, of their storage. Because according to the department of production within this company: the Cost of the virgin solvent is much more superior to the Cost of the recovery at the source.

ENAP is a good example of a company that has been able to modernize to meet the new the new ecological requirements and preserve its place as leader of the Algerian market of the paint market.

Conclusion

The solvent recycling carried out by ENAP Sig, one of the key solutions to its circular economy and environmental friendliness.

And since everyone has a role to play in creating a more sustainable future and circular economy, factories that design products with complex processes and contain purchasing departments that source resources, need to have environmental departments that look for greener treatment and disposal options. This company provides a lot of efforts in the management of its waste, it respects the regulation in force concerning the dies of sorting, storage and elimination of special waste. Today, new technologies have simplified the process of distilling spent solvents and are helping manufacturers reduce their costs and find one of the new revenue streams, which is saving pure solvents while replenishing and protecting its resources. This encourages companies to take the path of continuous improvement of environmental performance.

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