Article **ECORFAN Journal**
December 2017 Vol.3 No.5 7-12

Proposal of a comprehensive management plan for hazardous waste in a solvent distiller

GÓMEZ-BELTRÁN, Guillermina*†, PEDROZA-BENÍTEZ, Socorro, MARTÍN-DEL CAMPO, Ma. Guadalupe and GONZÁLEZ-GONZÁLEZ, Bernardo

Universidad Tecnológica del Valle de Toluca. Carretera del Departamento del D.F. km 7.5, Santa María Atarasquillo, 52044 Lerma de Villada, México

Received April 15, 2017; Accepted October 18, 2017

Abstract

The hazardous waste that is generated in companies, especially in the production processes, have particular characteristics that demand to be taken into account in determining the most appropriate form for their management. In the company where the present project was developed, the hazardous waste generation sites were identified and information on their management was obtained. With the results, a comprehensive Hazardous Waste Management Plan and a Manual were prepared with which it is intended to comply with the requirements established by environmental legislation (SEMARNAT), and to value the waste generated. The manual contains eleven sections, which provide general information on the waste, the correct layout in each generating area; Labeling, containment, temporary storage, transfer, collection and final disposal, personal protection equipment for the management of the same and training. Subsequently, all personnel that generated hazardous waste were informed about the proper management to be given, as well as some risks to the environment and health.

Waste, CRETIB, Recovery

Citation: GÓMEZ-BELTRÁN, Guillermina, PEDROZA-BENÍTEZ, Socorro, MARTÍN-DEL CAMPO, Ma. Guadalupe and GONZÁLEZ-GONZÁLEZ, Bernardo. Proposal of a comprehensive management plan for hazardous waste in a solvent distiller. ECORFAN Journal-Republic of El Salvador. 2017, 3-5: 7-12.

* Correspondence to Author (email: Guillermina.gomez@utvtol.edu.mx)
† Researcher contributing first author.

1. Introduction

The industry generates pollutants in different ways, depending on the characteristics of the processes and the type of inputs and products. Mexican legislation classifies hazardous waste based on its intrinsic properties, so hazardous waste is defined as "Those that have some of the characteristics of corrosivity, reactivity, explosiveness, toxicity, flammability, or that contain infectious agents that confer them dangerousness, as well as containers, containers, packaging and soils that have been contaminated when transferred to another site, in accordance with what is established by the General Law for the Prevention and Integral Management of Waste (LGPGIR,) (SEMARNAT, 2003) .

With the entry into force of the LGPGIR and its Regulations, an innovative concept called the Management Plan was introduced, which aims to provide an overview of waste management that favors the valuation of the same, this being a management tool that allows both to companies as well as to the authority to design and control in a flexible manner the integral management of waste, through efficient management proposals that minimize the generation of waste and prioritize the valuation thereof.

1.1 Problem

The company does not currently have an Integrated Hazardous Waste Management Plan as established in the LGPGIR Regulation on Hazardous Waste. Likewise, due to the amount of hazardous waste generated during its process and in the productive areas, which oscillates in 50 ton / year, the company is registered as a great generator of hazardous waste before the SEMARNAT.

1.2 Justification

Faced with this situation, the company has focused on designing its management plan under the following considerations: the Plan is private, individual and of local application and according to the waste stream is of general modality, it does not accept adherents to its plan of driving. It is a technical / operational document, which identifies the responsibilities and describes the actions with respect to their management, taking into account the aspects related to generation, segregation, conditioning, collection, temporary storage, transport, treatment and final disposal of waste.

Based on the above, the company will benefit from the Comprehensive Waste Management Plan by establishing the identification of waste from its origin, an appropriate collection and segregation system, safe transport and final disposal in a responsible manner, considering its applicability, reuse options, recycling and volume, origin, costs, recovery possibilities, recycling and compliance with applicable legislation.

1.3 Objectives

1.3.1 General objective

Establish a comprehensive hazardous waste management plan for a solvent distillation company in accordance with the applicable Mexican environmental legislation, to value and manage such hazardous waste.

1.3.2 Specific objectives

- Identify hazardous waste outputs in a complete process diagram that allows for reduction actions through reuse, recycling, treatment and co-processing.
- Propose improvements in the management of hazardous waste in accordance with current legislation to maintain an adequate collection of waste.

ISSN-On line: 2414-4886

2. Theoretical framework

According to the SEMARNAT, the most recent estimate of the generation volume of hazardous waste in the country for the period 2004-2013 is equivalent to 2, 035, 068.85 tons. This information is based on the reports of 84,279 companies incorporated into the register of hazardous waste generators with the SEMARNAT registry. In the state of Mexico, the generation of hazardous waste for the same period is equivalent to 42,747.05 tons, with 4,464 registered companies. Hence the importance of establishing management plans in the companies considered as generators and that they take into account the life cycle of them.

- This cycle consists of a series of stages, which include, among others, the following phases: Generation, Transportation and Collection, Classification, Reuse, Storage, Treatment, Recycling and Final Disposition that should be contemplated in the Plan.
- A treatment can change the characteristics of hazardous waste and reduce its volume or danger, but it does not always guarantee that a waste ceases to be dangerous. However, in case the treatment eliminates the hazardous characteristics, the waste will no longer be considered as dangerous and its management and final disposal will be carried out as special handling. This is important in the case of management plans, since companies have the opportunity to reduce the generation of hazardous waste to give them an appropriate management as special handling waste.

In this way the prevention of the generation of waste is achieved, through measures that reduce the costs of its administration, facilitate and make more effective, from the environmental perspective, the procedures for its management.

3. Research Methodology

In order to establish the Management Plan, some priority actions were carried out, among which are mainly the following:

3.1 Identification of hazardous waste generating areas.

A tour of the company's facilities was carried out in order to recognize the different activities where hazardous waste is generated. The waste generation data of the internal binnacles was compiled, in case there are such documents identifying the waste generating areas.

3.2 Identification of hazardous waste

The types of waste generated in each area were identified, according to the CRETIB characteristics. The data was taken from the questionnaire that was applied, from the Logs for the management of Hazardous Waste in the Plant, and from the internal database of the control of waste entering and leaving

3.3 Proposals for improvements in the management of hazardous waste

It was verified that the temporary storage of hazardous waste of the plant, meets the requirements according to the Regulation of the General Law of Ecological Balance and Environmental Protection in the Matter of Hazardous Waste in accordance with article 82 of the LGPGIR. As well as the Hazardous Waste delivery / reception procedures and the hazardous waste transport route in the plant.

ISSN-On line: 2414-4886

GÓMEZ-BELTRÁN, Guillermina, PEDROZA-BENÍTEZ, Socorro, MARTÍN-DEL CAMPO, Ma. Guadalupe and GONZÁLEZ-GONZÁLEZ, Bernardo. Proposal of a comprehensive management plan for hazardous waste in a solvent distiller. ECORFAN Journal-Republic of El Salvador. 2017.

3.4 Preparation of the manual for the handling of hazardous waste

Questionnaires about hazardous waste were applied in the waste generating areas. The information obtained allowed proposing measures for the recovery and management of each of the waste generated in the plant, in accordance with the current regulations and taking into account safety and hygiene measures for the handling of hazardous waste, as these measures protect the environment as well as the interplay of workers.

4. Results

The first part was a detailed description of the processes that are carried out in the company, updating the Layout of the same. There are six main processes that include: Reception of raw materials, Initial treatment of raw materials, Recovery of solvents, Discharge of reactor tank waste, Storage of recovered solvents and Auxiliary Service. Likewise, six areas were identified, all of which are generators of RP Table I). In them were found some waste containers that were not properly identified, nor stored / separated according to their incompatibility.

Areas
Solvent Recovery
Chromatograph Laboratory
Drying Laboratory
Cutting and Welding Workshop
Shopping Store
Electrical workshop

Table 1 Areas of the Plant that generate Hazardous Waste

Total Waste Generation

Table II shows the Total Generation of Waste within the Plant and from which the recovery and management of each of the hazardous waste is determined for an improvement within the company.

According to the estimate of the total annual tons of waste generated (71.56), the plant is classified as a large generator since SEMARNAT states that after 10 tons per year it is characterized as such. The LGPGIR also establishes the obligation on the part of the generators of hazardous waste to notify it to the Secretariat (SEMARNAT) or to the authorities with competence in the matter at the local level The policies to be followed in terms of valorization were established in order to reduce the generation of RP by 20%.

Most of the waste is stored in metal containers of a capacity of 200L, in the case of waste generated directly from the reactors, they go directly to tanks that are exclusive for storage of waste until a pipe arrives for a final disposal outside of the installations. The warehouse is a construction under roof, with containment dam, concrete floor covered with epoxy paint, local closed, with natural ventilation, explosion-proof lighting, with a capacity of 400 m3. The storage time is maximum one month, the collection is done once a month.

The warehouse complies with 14 of the 18 operating and construction considerations according to Article 82 of the LGPGIR Regulation on Hazardous Waste. It was verified that RPs were labeled according to NOM-018-STPS-2015 and that their destination was identified, either for sale or for destruction, as well as the use of manifests as a mechanism for control, management and final disposal of waste.

Residue	Quantity	Features CRETIB	Physical state
Solids Contaminated with Oil	1	I	SOLID
Lubricant oils	0.8	I	LIQUID
Organic Solvents	30	I,T	LIQUID
Process Waste Liquids	1	I	LIQUID
Contaminated Containers with paint	0.1	I	SOLID
Biological infectious sharps	0.01		SOLID
Hydraulic oils	0.8	I	LIQUID
Lamps	0.02	T	SOLID

ISSN-On line: 2414-4886

Empty containers impregnated with solvents	1	I	SOLID
Sponges, Filters impregnated with solvent	0.5	I	SOLID
Hoses, cuvettes impregnated with solvent	1	I	SOLID
Batteries, batteries	0.2	T	SOLID
Residues of Raw Materials	10	I	LIQUID
Wastes from Sosa	10	I	LIQUID
Solvent residues with soda	10	I	LIQUID
Acid Residues with Toluene	5	I	LIQUID

Table 2 Total generation of RP in annual tons

The Solid Waste Management Plan and Special Management in the company Aceites Especiales, S.A. of C.V. considers an analysis of minimization alternatives, these actions being to avoid, reduce or reduce at source, the amount of waste generated. Consider, measures such as the reduction of generation, concentration, and recycling.

As part of the company's policy on waste management, the application of a hierarchical strategy is promoted, which indicates the following priority: minimize-treat-dispose. This order means, from an environmental point of view, the best alternative is to prevent, avoiding the generation of a waste; Secondly, if it is not possible to avoid generation, its minimization is sought (reduce, recycle and reuse, taking advantage of the materials and / or energy contained in the waste); third, if it is not possible to minimize its treatment is sought (with the aim of reducing its quantity before its final disposal); leaving as final option, the final disposal of the waste.

In addition, the segregation policies and the contingency plans were established, and the brigades established by the STPS were also organized. Finally, in the month of April, technical and operational personnel were trained on hazardous waste, in areas of solvent recovery, mechanical workshop, administrative area, warehouse personnel and cleaning, with an assistance of 44 people, according to their availability Of Schedule.

They were carried out in order to inform, make known in a general way the proper handling of their waste and raise awareness about the waste they generate both in their work area and in their home, as well as some safety measures that should be taken in account.

5. Conclusions

- Within the company, in the area where more hazardous waste is generated is the area of Solvent Recovery, so it is primarily to begin to reduce the waste generated within said area by proposing in the hazardous waste management plan that they are valued for a remuneration of the company and are better controlled from the productive area to the temporary storage of waste and give them the final disposition appropriate to each one.

- The generated hazardous waste is characterized as corrosive, reactive, toxic, inflammable and infectious biological to carry a correct handling of said waste from its generation to its final disposal.

- According to the amount of waste generated (70.0 tons) per year, the environmental legislation and authorization must be complied with in order for the company to comply with SEMARNAT with the comprehensive hazardous waste management plan and be discharged. before the corresponding authority.

- The handbook of hazardous waste prepared serves as a guide for proper management of waste, from its generation, labeling, type of container, compatibility, protective equipment to the final disposal thereof.

ISSN-On line: 2414-4886

6. References

Márquez Romegialli F. (2002). Manejo seguro de residuos peligrosos. Departamento de ingeniería química, facultad de ingeniería, Universidad de Concepción. Chile.

Office of Pollution Prevention and Toxics. (2006) Chemical Management Resource Guide for School Administrators. United states environmental protection agency. Washington DC, Estados Unidos.

SEMARNAT. (2014). Módulo de consulta estructurada. Generación estimada de residuos peligrosos según categoría de generador [en línea].
http://dgeiawf.semarnat.gob.mx:8080/ibi_apps/WFServlet?IBIF_ex=D3_RESIDUOP01_01&IBIC_user=dgeia_mce&IBIC_pass=dgeia_mce 18/05/2015

SEMARNAT. (2014). Módulo de consulta estructurada. Generación estimada de residuos peligrosos según clasificación de residuos [en línea].
http://dgeiawf.semarnat.gob.mx:8080/ibi_apps/WFServlet?IBIF_ex=D3_RESIDUOP01_20&IBIC_user=dgeia_mce&IBIC_pass=dgeia_mce 18/05/2015

SEMARNAT. Ley General para la Prevención y Gestión Integral de los Residuos. Publicada en el Diario Oficial de la Federación el 8 de octubre de 2003. Última reforma publicada DOF 19-06-2007

SEMARNAT. Norma Oficial Mexicana NOM-052-SEMARNAT-2005, Que establece las características, el procedimiento de identificación, clasificación y los listados de los residuos peligrosos. Publicado en el Diario Oficial de la Federación el 23 de junio de 2006.

SEMARNAT. Reglamento de Ley General para la Prevención y Gestión Integral de los Residuos. Publicada en el Diario Oficial de la Federación el 30 de noviembre de 2006.

ISSN-On line: 2414-4886