ENVIRONMENTAL MANAGEMENT SYSTEM FOR THE USR TREATMENT PLANT IN THE CITY OF APOSTLES, MISIONES, ARGENTINE REPUBLIC

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SUMMARY

For the development of the work presented here the data was surveyed at the USR (Urban Solid Residues) treatment plant of the municipality of Apostoles, Misiones, Argentine Republic. It consists, in the first place, in simulating the nonexistence of said plant with the idea of installing it in the area, determining the environmental impacts caused by this construction. Next, the current operation of the plant is analyzed, identifying the most outstanding environmental aspects and its treatment; so as to later propose possible solutions with the implementation of an Environmental Management System.

The system will include from the gathering of the residue up till its final disposal, considering as residue only the domestic ones, leaving aside those considered as industrial, of services activities, dangerous and toxic.

KEY WORDS: Environmental Management System, Urban Solid Residues, Evaluation of Environmental Impact, Compost, Recycling, Leached.

INTRODUCTION

Urban Solid Residues (USR) is all material discarded by the population, this could be domestic, commercial, street waste and the resultants of construction, and which is not considered dangerous within the framework of National Law 24.051 and its regulation ordinances and amendments, and neither industrial residues and of service activities whose regulation figure within Law 25.612.

The management of urban solid residues is part of the daily activity of an ecosystem subsidized as it is in a city. Food, energy, construction inputs and maintenance, administration inputs, etc., arrive there, which allow the functioning of the city, human life and other beings and they leave it as gases, liquids, radiant energy, and solids, in general not compatible with life.

The solid residues are gathered, moved and are deposited in different types of "landfills" or treatment plants.

The plants for solid residues treatment can be recycling, deposition and burning in the open or sanitary filler.

The best system is that of paper, glass, plastics and metals recycling and production of compost with the organic residues.

The worst is the open burning of all the garbage that is combustible and the accumulation of metal remains, until they are oxidized and leached through time.

In this case the Apostoles City' recycling plant is studied, which is in charge of the treatment of the solid residues of only three neighborhoods belonging to this city: San Jorge, 25 de Mayo and Andresito.

OBJECTIVES

- To analyze the current situation of the plant with the purpose of knowing the different activities and processes carried out in it, analyzing which are the factors and environmental impacts that are taking place and which will take place.

- To carry out an EIE (Environmental Impact Evaluation) to identify the environmental impacts caused by the plant which allows to assure the knowledge and diagnosis of the situation in order to propose the pertinent corrective measures.
- To outline an EMS (Environmental Management System) on the ISO 14,001:2005 Standards' requirements with the purpose of optimizing and making effective the operations carried out in the plant.

STAGE Nº 1

It will be supposed that in a plot of land of an area of the town of Apostles there exists the possibility of installing a plant that will be for the treatment of Urban Solid Residues (USR).

This area is almost uninhabited, located just 7 Km. from the city, reason why it has been decided to carry out an EIE with the purpose of determining the environmental aspects provoked during the construction phase.

General analysis of the project

Organization which will place the project and localization:

The plant that will place the project belongs to the Municipality of the City of Apostles, the land chosen to develop the activity has running water service and the roads are dirt ones. There is a project to build a USR treatment plant which will have sectors for the storage, classification, burning, compost and worm cultivation.

Raw material and inputs: Urban solid organic and inorganic residues,

Legal Requirements

As to the principles of sustainable development, regarding the incorporation of environmental variables to the development projects, it is necessary to introduce in an effective way the juridical matters that refer to the application of a clean technologies development model, as well as

rationality in the use of our resources, requiring for it an institutional and political framework adequate for the different levels, be they municipal, provincial, national and international.

National Environmental Legislation

- National Constitution
- **Law Nº 25.916:** Domestic residues – Minimum Budgets of environmental protection for the integral management of domestic residues.
- **Law Nº 25.675:** General Environment Law
- **Law Nº 19.587:** Law of Hygiene and Workplace Safety
- **Law Nº 24.557:** Labor Risk
- National plan for Residues Appraisal

Provincial legislation

- **Law N° 4.274:** Basic demands for the integral management of solid urban residues.
- **Law Nº 3.079:** Relative to the environmental impact.

Municipal legislation

There is no regulation or legislation regarding environment and ecology.

- **Ordinance Nº 12/83:** Establishes the General Ordinance for Environmental Clean up for the Municipality of Apostles, added as ANNEX I and II.

Environmental Impact Evaluation (EIE)

The concept of Environmental Impact Evaluation can be defined as a group of techniques that look for as fundamental purpose, a handling of human matters so that a life system is possible, in harmony with nature.

The management of environmental impact seeks to reduce to the minimum our intrusions in the diverse ecosystems, to elevate to the maximum the possibilities of survival in all ways of life, no

matter how small and insignificant that are from our point of view, and not for a kind of magnanimity for the weakest creatures, but for true intellectual humility, to recognize that we do not really know what the lost of any live species can mean for the biological balance[1].

The purpose of the EIE is to identify, to predict and to interpret the impacts that the activity will take place if it is executed. The steps to carry out in the EIE are:

Environmental Impact Assessment

To make an Assessment of the Environmental Impact, first it is necessary to do a Study of Environmental Impact that is the document that the technicians do identifying the impacts, the possibility to correct them, the effects that will take place, etc. it should be the most objective possible, without interpretations nor valuations, but gathering data. It is a multidisciplinary study for as it has to notice how it will affect the climate, soil, water; to get to know the nature of what will be affected: plants, animals, ecosystems; the cultural or historical values, etc.; to analyze the legislation that affects the project; to see how it will affect the human activities: agriculture, views, employment, life quality, etc[2].

Importance of the impacts[3]

The importance of the impact is definable as a qualitative attribute of the environmental impact that is measurable in function of the alteration of the factor and of the characteristics of the produced effect.

i: Intensity (alteration degree)

E: extension (influence area)

M: moment (manifestation term)

P: persistence (permanency of the effect)

R: reversibility (quality of the factor to return to its original state)

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1 Fragment extracted from the paper “Impacto Ambiental” by Cristina Rojas (www.minografias.com)

2 Fragment extracted from the post graduate study material “Gestión Ambiental”, Oberá, Misiones, Agentina. 2008

3 Idem reference 2

S: synergy (sum of impacting effects)

To: accumulation (progressive increase)

Rc: recuperation (recovery capacity)

Ef: effect (impact manifestation)

Pe: periodicity (regularity)

I: importance (impact appraisement)

I = ± (3i + 2E + M + P + R + S + TO + Ef + Pe + Rc)

In the importance matrix the points assigned presented to each one of the attributes of the importance index. In this way the importance of a certain impact can take values that oscillate between 13 and 100 points.

By means of these points, it will be possible to assign impact importance levels, being able to categorize them as:

a) Compatible Impacts	Im ≤ 25
b) Moderate Impacts	25 <Im≤ 50
c) Severe Impacts	50 <Im≤ 75
d) Critical Impacts	75 <Im≤ 100

Environmental factors susceptible of receiving impacts at this stage[4]

Analyzing the environment where the construction of the plant will be carried out the following factors have been determined:

Natural subsystem

- Soil
- Air
- Water
- Flora

[4] Idem reference 2

- Fauna
- Landscape

Socioeconomic subsystem

- Urban activities
- Working condition
- Economic activity
- Living conditions / Health and Environmental Hygiene
- Economic and ecological benefits

Project actions susceptible of generating impact

- Topographical alteration
- Erosion
- Affectation due to use of the soil
- Noises and vibrations
- Emission of particulated material
- Emission of gases, smells and smoke
- Soil movement
- Contamination of water courses through spills.
- Contamination risk
- Bird habitat alteration
- Soil usage
- Water, fuel, electric power consumption
- Land animal alterations
- Work landscape modification
- Loss of vegetation coverage

- Employment Levels
- Manpower offer
- Rodent proliferation
- Home resettlement
- Hygienic sanitary conditions
- Education necessity
- Energy saving
- Saving water consumption

In the case of the Apostles' USR Treatment Plant, a simplified Evaluation will be carried out which is medium depth study on the environmental impacts. In the environmental study of this kind of evaluation, not only is a qualitative valuation carried out, but also a quantitative one, although this last one is not very strict nor deep.

In general, ponderative demands of this type, for the impacts, are not established, using a global type valuation, in those cases in which different alternatives exist for a same project.

Impact matrix

After the identification of the different susceptible factors of receiving impacts and the possible actions that can generate impact' the impact matrix will be used to relate them and to determine the relationship action - factor that will originate impacts on the environment.

CONSTRUCTION PHASE

Natural environment

Factor	Action	(±)	i	E	M	P	R	S	To	Ef	Pe	Rc	I	Impact type
Air Quality	Noises, vibrations	-1	3	2	2	2	1	1	1	4	2	2	**28**	**Moderate**
	Emission of gases, smells, smoke	-1	3	2	2	2	3	2	4	4	2	4	**36**	**Moderate**
	Emission of particulated material	-1	2	2	2	2	1	1	1	4	2	4	**27**	**Moderate**
	Soil movement	-1	1	2	2	4	2	1	1	4	2	2	**25**	**Moderate**
Hydro Resources	Contamination of water courses through spills	-1	1	1	1	2	2	2	1	4	2	2	**21**	**Compatible**
Soil	Topographical alteration	-1	2	2	2	4	2	2	4	4	2	4	**34**	**Moderate**
	Erosion	-1	1	2	2	2	2	1	4	4	2	4	**28**	**Moderate**
	Affectation due to soil use	-1	2	2	2	2	2	1	4	4	2	4	**31**	**Moderate**
	Contamination risk	-1	3	2	2	3	3	2	4	4	2	4	**37**	**Moderate**
	Soil usage	-1	1	2	2	2	2	2	1	4	2	2	**24**	**Compatible**
Natural Resources	Consumption of water, fuel, electric power	-1	4	2	4	2	2	2	4	4	2	2	**38**	**Moderate**
Fauna	Loss of fauna	-1	2	2	1	2	2	2	1	4	2	4	**28**	**Moderate**
	Proliferation of rodents and plagues	-1	4	2	3	4	2	2	4	1	2	4	**38**	**Moderate**
	Modification natural habitat	-1	2	2	2	4	3	2	4	4	4	4	**37**	**Moderate**
Landscape	Morphological changes	-1	2	2	2	4	2	2	4	4	2	4	**34**	**Moderate**
Vegetation and flora	Loss of vegetation coverage	-1	2	2	2	4	2	2	4	4	2	2	**32**	**Moderate**

Source: Own elaboration (data recorded during field work)

Social environment

Factor	Action	(±)	i	E	M	P	R	S	To	Ef	Pe	Rc	I	Impact type
Urban Activities	Residential resettlement	-1	1	1	1	2	1	1	1	1	1	1	**14**	**Compatible**
Labor Condition	Employment level	+1	3	2	2	2	2	1	1	4	1	1	**27**	**Positive moderate**
	Manpower offer	+1	3	2	2	2	2	1	1	4	1	1	**27**	**Positive moderate**
Economic Activities	Services sector	+1	2	2	2	2	2	1	1	1	2	2	**23**	**Positive compatible**
Life Conditions / Sanitary Hygienic Conditions	Environmental security and hygiene	+1	2	2	2	2	2	1	1	1	1	2	**22**	**Positive compatible**
	Proliferation of rodents and plagues	-1	4	2	2	2	2	1	4	4	2	2	**35**	**Moderate**
	Education needs	-1	4	2	2	2	2	2	1	1	1	2	**29**	**Moderate**
Economic and ecological benefits	Energy savings	+1	1	1	1	1	2	2	4	4	2	2	**23**	**Positive compatible**
	Saving in tree felling	+1	1	1	1	1	2	2	4	4	2	2	**23**	**Positive compatible**
	Saving in water consumption	+1	1	1	1	1	2	2	4	4	2	2	**23**	**Positive compatible**

Source: Own elaboration (data recorded during field work)

Residues produced during construction stage

- Emission of combustion gases (movement of machinery, heavy duty machines, use of auxiliary machinery, etc.)
- Emission of powder (demolitions, blowing up, embankments, soil movement, gutter excavations, machinery movement, storing of pulverized materials, etc.)
- Generation of noises (vehicles, foundations, demolitions, etc.)
- Vibrations (soil compacting, explosions, etc.)

- Spills (washing and cleaning of machineries, waters coming from the phreatic layer, etc.)
- Use of soil (building access roads, clearance, rock excavation, drains, dumps etc.)
- Soil contamination (machinery storage, storing of materials, etc.)
- Consumption of natural resources (water, gas oil, gasoline, electric power, etc.)
- Landscape alterations

As one can see there are no actions which cause a critical impact that requires minimization, but they do produce moderate impacts that will have to be kept in mind for their mitigation.

In the construction stage of the plant, one wishes to carry out the minimum intervention in the environment,, the choosing of the location in an area that, in spite of having native forest, the action of the cleaning of the vegetation is moderate and the leveling will be the minimum one required. The morphological changes of the landscape will be moderate but of punctual extension, since the plant will be surrounded by native vegetation and cultivations. Modifications will not take place in the course and flow from the stream near the site sector, preserving it from the contamination that could be caused. The environmental contamination will be due to noises and powder in suspension in the first building stage. The consumption of resources, as water, electric power, etc. will be moderate but temporary until the building of the plant is concluded. As for the loss of fauna it will be of moderate to low intensity due to the plant influence area as to deforestation and soil usage, the proliferation of rodents and plagues will be directly related to the activities of material storage that favors their appearance and reproduction. All these actions are transitory and governable.

As for the residential resettlement, located in the anthropic media, it will not have great intensity since the area is barely populated and the construction of the plant will not modify this situation. The employment level and manpower offer will be favorably affected due to the necessity of workers at this stage, the same thing will happen with the services as they will extend to this area to contribute to the construction work and later on to that of operation of the residues

treatment plant, The hygienic - sanitary conditions of the workers will be under the control of the Industrial Risk Insurers that will supervise the execution of protection measures and workers' work conditions,

STAGE Nº 2

In this stage, after carrying out a survey, one will proceed to the description of the current operation of the plant, it has been determined as limits of the system being studied from the gathering of the residues until the their final disposition:

Location and infrastructure

The recycling plant is located about 7 Kms. from downtown Apostles, having ample park land, whose access becomes difficult on rainy days due to the bad conditions of the adjacent roads. This property has the entrance offices, boxes for storage of different residues (glass, plastic, compost, etc.) where they wait for their final disposition. It has a deposit for used dry batteries, another one where worm cultivation is carried out and a last one for storage of tools, scales and compost.

The main building will have a residues conveyor belt, a sieve, two presses, one for cardboard and another for cans, besides transport for crushed residues.

In front of the storage boxes there is a kind of paved sidewalk where the crushed residues are deposited for the compost, there is also a space for open burning of broken furniture, branches, etc., leaving an area belonging to the company AESA, located to the bottom of the plot of land, where the rest of the domestic and pathogenic residues of the city are deposited in containers

The plant has a person in charge that verifies all the activities carried out inside it, six residue classifiers, a person that deposits the residues manually on the conveyor belt, and another that is only in charge of handling the machinery. These people do not receive any kind of training on environmental topics, but they do as to plant processes of which they have daily practice.

Neither is there a planning, coordination and organization of the activities, everything is carried out in an informal way in spite of belonging to a public organism such as the municipality. They do not have established environmental policies that guide their action, neither clear objectives for their development. There is total ignorance of environmental legislation that regulates this practice, neither a statistic or registration of the quantity and type of residues gathered so as to be able to carry out the mentioned functions.

The only standards followed have to do with work safety and hygiene, due to the controls carried out by Industrial Risk Insurers, as it is a job with high probability of accidents (cuts and knocks during the process of gathering of residues and machinery handling) and infections due to the type of material manipulated. According to the person in charge, the personnel uses the whole protection equipment such as helmets, mouth and nose masks, gloves, aprons and boots during the operations of the plant, which favors to the drop of accidents or illnesses characteristic of garbage.

It also has three residue dump trucks and a spare one for emergency cases, which are not In perfect conditions because they are quite old and are not correctly conditioned to carry out the collection activity, and other eight dump trucks for gathering branches and trunks of the city.

The plant works with residues only taken from three Apostles' neighborhoods, leaving the rest in the area reserved by the AESA Company that later on deposits them in the Fachinal sanitary filling. The neighborhoods mentioned are San Jorge, 25 de Mayo and Andresito, which produce, according to what was commented by the person in charge of the plant, approximately 15,000 kg. of garbage per week (the figure is not exact due to the lack of data).

DESCRIPTION OF THE PROCESS

Classification at origin:

It is practically null due to the lack of the population's concretization with regard to the treatment of residues.

Gathering and transport:

Each truck has three people that carry out the gathering. Theoretically the organic residues are gathered on Mondays, Wednesdays and Fridays, while the inorganic ones are gathered on Tuesdays and Thursdays; it is necessary to highlight that this is not totally true, since if a classification is not correct at the origin, the trucks would be gathering all kind of residues every day without exception.

Segregation or Classification:

The trucks enter to the recycle plant and a person carries out manually the unloading of the residues, placing the organic and inorganic ones on the conveyor belt, the rest of the residues of the city and the pathogenic ones are taken to the area reserved for AESA.

Once the residues are placed on the conveyor belt, six people carry out their classification, placing in metallic cars the different types of residues, except for the organic ones which the conveyor deposits in the garbage shredder.

Treatment:

Burning: branches, tree trunks and wooden furniture are burnt in the open air, according to the person in charge this is done, although it is known to be polluting, they do not have another way of reducing this type of residue since they had a chipping machine for the branches but it is out of order because it was too small and broke down.

Recycling: The plastic and glass gathered is stored in boxes for their later sale to recycling enterprises in the city of Posadas, (capital of the Province of Misiones) which later on sell them to factories in Buenos Aires. The used dry batteries are used in the construction of city streets and gutters. Cardboard and cans are pressed and later sold. While the construction residues serve as plant land filler, where needed.

Compost:: Once the organic residues are triturated, these are treated for the production of compost. The process lasts approximately 90 days, during which the triturated residues are spun and humidified once per week.

Decantation: Once dry the compost is passed through a sieve, where the decantation process eliminates paper remains, plastic, etc. leaving the pure compost that is used in the plants of the squares, boulevards and parks of the city or distributed among the farmers of the area.

Worm cultivation: Part of the decanted compost is placed in worm bed containers for growing worms. This process lasts approximately 45 days until one obtains a more refined compost product due to the Californian earthworm. In any way a large quantity is not obtained, due to the lack of personnel, the quantity of gathered organic residue is not enough and also due to the long process. As for another type of organic residue, such as dead animals, they are buried, in an area which is distant from where the plant is located.

Leached: The liquids produced by the residues are placed in tanks without carrying out any kind of treatment.

Identification of the residues in each process stage

- Gathering and transport: the old trucks which are not in good condition, increase the exhaust emanations as also the number of trips that they should do because the neighbors do not respect the garbage gathering schedules, it is necessary to remember that this causes more noise due to the frequency increase; the boxes have been conditioned in a very inconvenient way for the workers, those that must throw the packages upwards, due to their considerable height.
- Recycling: the running of the machines causes auditory contamination from moderate to high intensity.
- Open Burning: produces an intense emanation of smoke, ash, smells, causing visual and environmental contamination.
- Storage: the deposits for glass, plastic, compost, cardboard, newspapers, etc. is carried out in open boxes what favors the proliferation of rodents and plagues and the wind can spread them.

- Decantation: can take place, due to the characteristics of this process that the extracted material be taken by the wind being spread around the area.
- Leached: the garbage juices do not have an appropriate treatment, causing a contamination risk due to evaporation and pouring.

Residues Classification

Organic residues: leached, smoke, ash and smells, emission of particulated material, water from the cleaning of the plant.

We can say that the residues generated in the process are, in their majority, solid residues but that they require an immediate and effective attention.

Identification of susceptiblef impact actors at this stage

- Workers' health
- Air
- Soil

Identification of actions susceptible of generating impact at this stage

- Smoke and smells generated by open burning
- Production of particulated material
- Electric power consumption
- Noise
- Proliferation of insects and rodents
- Leached Poured

Characterization of the Environment

Natural subsystem

- Territorial Environment: The plant would be placed about 7 kms. from downtown Apostles, in a not very inhabited area, covered by native vegetation and cultivations.
- Water:: the Chimiray stream is a few kilometers away from the establishment
- Environment: Loss of air quality, due to smells from transport, storage and smoke, open burning, besides the evaporation danger of the leached, deposited in tanks without appropriate treatment.
- Flora: The existent vegetation is abundant, containing several types of native species and cultivations in the surrounding of the possible establishment.
- Fauna: The fauna contained in the area consists on bird species, small rodents, etc.
- Landscapes: The landscape is characteristic of the province, of high quality, made up of numerous types of arboreal species (Lapachos (Tabebuia avellanedae Lorentz ex Griseb)., Paraiso, (Melia azedarach L.dises) etc.).
- Earth and soil: felling for the construction of the plant, which caused partial destruction of the bordering forest.
- Surface and underground waters: to maintain without treatment those leached caused by the juices of the organic residues, contained in tanks whose danger is spills and evaporation.

Socioeconomic subsystem

- Territorial System: The area near to the installation of the plant has an intensive use of the soil, for agricultural or cattle activity, but it has urban plans proposed by the provincial state through the IPRHODA (Provincial Housing Scheme Program).
- Population: The population density of the area is not high, the land is relatively isolated from urbanization, but as mentioned previously, there exists, the possibility of population expansion toward that area.
- Socioeconomic Activity: As to employment, the plant maintains a structure of about 8 municipal employees that work in shifts, subject to the government changes. There are no

garbage gatherers, as there are very few people that carry out this activity in the city of Apostles, and they are not allowed into the plant.

Impact matrix

OPERATION PHASE

Natural environment

Factor	Action	(±)	i	E	M	P	R	S	To	Ef	Pe	Rc	I	Impact type
Air	Noises	-	4	2	2	2	1	1	1	4	2	1	**30**	**Moderate**
	Emission of gases, smells, smoke	-	8	4	4	4	4	2	4	4	4	4	**62**	**SEVERE**
	Emission of particulated material	-	2	2	2	2	2	2	4	4	2	4	**32**	**Moderate**
Soil	Erosion	-	1	2	2	2	2	1	1	1	2	2	**20**	**Compatible**
	Value loss	-	2	2	2	2	2	1	1	1	1	2	**22**	**Compatible**
	Topographical alteration	-	2	2	2	2	2	1	1	1	2	2	**23**	**Compatible**
	Contamination risk	-	2	2	2	2	2	1	1	1	2	2	**23**	**Compatible**
Water	Drainage network modification	-	2	2	2	4	2	1	1	1	2	2	**25**	**Moderate**
	Contamination due to poured leached	-	8	4	4	4	4	4	4	4	4	4	**64**	**SEVERE**
Flora	Vegetation cover loss	-	2	1	2	2	2	1	1	1	2	2	**21**	**Compatible**
Fauna	Fauna loss	-	2	1	2	2	2	1	1	1	2	2	**21**	**Compatible**
	Increase of dangerous fauna	-	4	2	2	2	2	1	1	4	2	2	**32**	**Moderate**
Landscape	Landscape alteration	-	2	2	2	4	2	1	1	4	2	4	**30**	**Moderate**

Source: own elaboration (data surveyed during field work stage)

Social environment

Factor	Action	(±)	i	E	M	P	R	S	To	Ef	Pe	Rc	I	Impact type
Urban Activities	Relocalización residencial	-	1	1	1	2	2	1	1	1	1	2	**18**	**Compatible**
	Actividades extractivas	-	1	1	1	2	2	1	1	1	1	2	**18**	**Compatible**
Labor Condition	Nivel empleo	+	2	2	2	2	2	1	1	4	2	2	**26**	**Positive moderate**
	Oferta de mano de obra	+	2	2	2	2	2	1	1	4	2	2	**26**	**Positive moderate**
Economy Activities	Sector servicios	+	2	2	2	2	2	1	1	4	2	2	**26**	**Positive moderate**
	Comercialización	+	1	2	2	2	2	1	1	4	2	2	**23**	**Positive compatible**
Life, health and environmental hygiene conditions	Hygienic-sanitary conditions	+	2	1	2	2	2	1	1	1	2	4	**23**	**Positive compatible**
	Illnesses associated to garbage	-	2	2	2	2	2	1	1	4	2	2	**26**	**Moderate**
	Proliferation of rodents and plagues	-	4	2	2	2	2	1	4	1	2	2	**32**	**Moderate**
	Education necessity	-	4	2	2	2	2	1	1	1	2	2	**29**	**Moderate**
Economic and ecological benefits	Save energy	+	1	1	2	2	1	1	1	4	2	4	**22**	**Positive compatible**

Source: own elaboration (data surveyed during field work stage)

REFERENCES:

IMPACTS POSITIVE	1	LOW INTENSITY	1	*IMPACTS NEGATIVE*
	2	MODERATE INTENSITY	2	
	3	HIGH INTENSITY	3	

As you can observe there exist 2 (two) actions that cause a critical impact which affect the natural environment, which will have to be worked on to try to minimize those impacts.

Analysis of the enterprise regarding the environment

According to what observed in the plant and what talked on with some people, we can mention some important aspects that have to do with the safety, hygiene and environment in the sector object of the study.

- Absence of eye protection elements (audio protection, goggles, helmets, lumbar belts, face masks, etc.), although according to comments they are used due to Industrial Risk Insurers constant inspections.
- Open burns of organic residues due to tree pruning and maintenance of green spaces, likewise of used wooden furniture, which cause high air contamination due to smoke and smells in the atmosphere.
- Deposit of leached in tanks without treatment, running the risk of contamination due to evaporation and accidental pouring.
- Evidences of training absence in topics related with environmental protection and on the effective environmental legislation of the employees of the plant; nonexistence of municipal legislation on this matter.

STAGE Nº3

Proposal of a EMS based on ISO 14001:2005 standard

The EMS proposed here will be structured in 2 parts:

The EMS manual: that it will collect all the elements that the EMS integrates and summarizes its operation, being the nexus between what is required by the standard and its application in the plant.

The documented procedures:

- **General procedures:** That regulate the execution of the requirements of the standard.

  Among them we will have:

  a) Documentation Control (requirements 4.4.5)

  b) Identification of environmental aspects (requirement 4.3.1)

  c) Objectives, goals and programs (requirement 4.3.3)

  d) Environmental Communication (requirement 4.4.3)

  e) Competence, Formation and Becoming conscious (requirement 4.4.2)

  f) Registrar Controls (requirement 4.5.4)

  g) Follow up and measurement (requirement 4.5.1)

- **Operational procedures:** They will establish the responsibilities and mode of environmental performance of the different areas of the plant. Among them we will have:

  a) Resources, Functions, Responsibilities and Authority (requirement 4.4.1)

  b) Division of Human resources

- Specific procedures: That describe prevention measures, safety and control of significant environmental aspects. Among them we will have:

  a) Noise control

  b) Residues management.

  c) Natural resources control.

For this proposal it will be necessary first to suppose that Phase 1 (one) "Commitment" of the upper management has been achieved and that it will offer all the necessary resources for such an objective, for it we will begin proposing a flowchart which we will call, in this case, "organization and methods" that could have also the subordinates "environment" and "quality" (we will leave it for another case study) and human resources.

For this we would have to incorporate additional personnel such as the one in charge of the Environment sector that will have among the most important functions, coordinating, administrating

and supervising the planning of the implementation, to sensitize the personnel on the benefits, to plan audits, promote the continuous improvement and innovation, etc. assistants for the making and writing of the manual, work registrations and instructions. Human resources to carry on with the personnel's continuous formation and organization and methods, will be formed by different persons in charge of sectors, thus forming the environmental committee that will have among its functions the continuous revision of the environmental policy, the adaptation of its objectives and goals, to revise the documents and the results of the audits among other things. It also intends to move the handling of the leached to the Treatment sector, to make the management, more effective.

Phase 2 (two) of "initial revision", in the most significant aspects, it has already been carried out in stage 2.

Regarding the environmental policy, to fulfill with requirement 4.2 of the referred standard we propose:

The Plant commits itself:

- To develop its activities in a responsible way, with the purpose of preventing contamination.
- To fulfill the environmental laws, regulations and other commitments adopted by us in environmental matters.
- To periodically revise the environmental policies.
- To revise the goals and environmental objectives with the purpose of adapting them to the policies.
- To publish and communicate this policy to plant personnel, all person or organization that work on behalf of it and to put it to the public's disposition in general.
- To periodically train the personnel on environmental matters.
- To study and to promote all the means within our reach to minimize the impacts generated by our activity.

Following we will show for a particular process how we adapt it to the standard requirements, they have been grouped according to Deming's PDCA cycle, the (Plan – Do – Check - Act):

Process: Treatment of leached

Client: Storage sector.

Supplier: Treatment Sector (triturating of organics)

Responsible for the process: Plant Boss.

Used input: none

Waste: contamination of air and soil due to evaporation and poured.

4.3 Planning - to PLAN

4.3.1 Environmental aspect: The leached, can be defined as liquids that when strained to the soil layers or other permeable solid material, they go dissolving it in their entirety or to some of their components. They can have a horizontal movement, that is to say that will move along the land, contaminating and damaging in this way the soil, and vegetation be it on the soil or surrounding areas. A vertical movement can also take place that penetrates underground and in many cases, reaches the phreatic and aquiferous levels, which causes gigantic problems of underground water contamination, main source which supplies drinkable water in our cities. The leached produce a pH of 9 and the presence of a great quantity of salts as a result, which is reflected in a high conductivity, absence of oxygen and a high content of heavy metals, such as cadmium, chromium, copper, iron, lead and zinc whose concentrations surpass the toxicity limits.

4.3.2 Legal requirements: Law 25.916 - Integral Management of Domestic Residues that establishes the minimum budgets for environmental protection for the integral management of domestic residues, be these of residential, urban, commercial, assistance, sanitarium, or institutional origin, except for those that are regulated by specific standards.

Law 25.675 - establishes the minimum budgets for the achievement of a sustainable and appropriate management of the environment, the preservation and protection of the biological diversity and the implementation of sustainable development.

Rules to regulate reuse and pouring of residual waters – its objective is the protection of public health and of the environment, through an appropriate environmental management, of residual waters. It will be applicable in the whole national territory for the handling of residual waters which independent of their origin, are poured or reused. The physiochemical and bacteriological parameters that should be analyzed in the residual waters that spill into a receiving body or sanitary sewer system be it for the effects of the projects, as for the making of operational reports.

4.3.3 Objectives, Goals and Programs

Objective 1: To have an instrument that allows measuring the pH of the leached.

Goal 1: To acquire in less than 2 (two) months 2 instruments to measure the pH in the disposition tanks. One for daily use and another for back up.

Objective 2: To maintain the leached pH within the limits allowed, until achieving the removal of the pollutants in it.

Goal 2: To maintain the year pH average level during the first semester of the year between values of 6.8 and 7.2

Management program for goal 2

Daily revision controls of pH level will be taken, for which there will be a schedule where the responsible for the sector (plant boss) will register every day what is shown by the instrument, then it is loaded in the system and if during the day some incidence exists on the pH average, a preventive action it will be carried out. In the case of being above the average, corrective action will be done for not fulfilling the requirement 4.3.2 of the reference standard, which will be issued to the plant engineer, who is the one in charge of carrying out the follow up and advance. This process will begin to be carried out once the measuring instruments have been acquired, that is to say, goal 1 fulfilled.

In the first place the physiochemical and biological characterization of the effluent to be used in the treatment; then based on the tolerance degree of the liquids employed and the maximum acceptable concentration of organic matter resistant to the biological degradation, measured as

Chemical Oxygen Demand (QOD), one will proceed of the selection of aquatic vegetation species to be used in it.

If the treatment is satisfactory, be it from the point of view of efficiency in the reduction of pollutants, as in economy terms, one could apply the technique of the Fito re-measure technique in substitution of the current Treatment.

4.4 installation and operation - to DO

4.4.1 Resources, Functions, Responsibility and Authority:

The management assures the resources to establish, implement, maintain and to improve the EMS and not only for the implementation and control.

Structure in the environment	Function - responsibility	Functional Structure
Process General Coordination	Coordinate, administrate y supervise the implementation and follow up of the process.	Plant Engineer
Process Leader	• Fulfill the expected process results. • To determine and document the process requirements. • To formulate opportunities to improve the process.	Plant Boss
Key Personnel	• To make the personnel be aware on the importance of the execution of the goals. • To be involved in the process and to unconditionally back process leader. • To create personnel training and awareness plans.	Human Resources

Source: Own Elaboration[5]

4.4.2 Competence, Formation and Becoming Aware: All the personnel will be trained as to treatment of the leached and the danger in its wrong use, as also to all person that work on behalf of the organization such as (contractors, temporary personnel, etc.), a registrar will be made as to all instructed personnel, the date and trainer, length of training and also a registrar of the

[5] Chart based on the Guide for applying UNE – ISO 14,001 Standard in the SMEs, modified according to the 2004 updating.

happenings, (accidents and consequences and reasons) which will determine the lack or not of formation.

Responsible for formation: Human resources

Revision and pursuit: Plant boss.

4.4.3 Communication: The internal communication network of the different information on the treatment and the recommendations will be carried out through billboards in each place of the plant, indicating possible symptoms for personnel affected by the residues. As for the external communication this will be carried out by means of official bulletins issued by the municipality, likewise by means of pamphlets for public knowledge on the important environmental aspects.

4.4.5 Document controls. Its objective will be to define the work rules to assure that the registrations as to the work instructions are up-to-date, and in the corresponding places for their use. As for the structure of the requirements it will take into account that established for the ISO 9001:2000. Standard

Responsible: Personnel in charge environment sector.

Revision: Environment committee.

4.4.7 Emergency plans: This Plan contains procedures to be carried out in three phases:

- **Phase I: "Before". In this phase the plan is limited to the following activities:** - To define the structure of the plant's emergencies committee, with general and specific functions. To describe the alerts (yellow, orange and red) in a very general way; without describing what type of signs will be used, neither who will be in charge.
- **Phase II: "During". The following activities are defined,** without being specific as to the actions to be carried out:

- Alarms: Preventive internal notification and external reactive notification.

- They are determined as standard operative priorities to control the event and the conservation of properties.

- They are standardized operative procedures that include some general procedures for the attention of an emergency within the plant, considering only the following threat: *accidental* pouring.

- Phase III: "Later". The necessity is mentioned as to making an evaluation of damages and analysis of necessities through formats, but none is proposed; the same as the holding of meetings on behalf of the Emergencies Committee and of the rehabilitation of the basic services.

Finally, the following projects for the prevention, mitigation and attention of emergencies in the plant, are proposed:

- Training of the Emergencies Committee.
- Acquisition of equipment for the prevention, mitigation, attention and control in emergency situations.
- Placing signs in the plant

In the elaboration of a Plan of Emergencies and Contingencies an inventory is necessary, as complete as possible, of the available elements to give a systematic, appropriate, opportune and agile answer to the happening of an adverse event.

Responsible: Plant boss

Revision: Plant engineer

4.5 Verification - CONTROL

4.5.1 Follow up and measuring: the follow up and measuring process for this case will be carried out registering in a chart the pH levels per day, the applicable operational controls and the conformity with objectives and environmental goals of the plant.

They go accumulating and calculating the average based on the quantity of hours worked and in a graph they indicate the behavior of the leached in the environment. If progressive incidence exists a preventive action is issued so that the program is executed to fulfill the corresponding goal. In the case of being above the limit fixed by the legal requirements a corrective action will be issued to revise why it was not possible to achieve and who were responsible.

4.6 Revision for the management - to ACT:

A registrar of the meetings held by the environmental committee, date, personnel present, personnel absent, reasons of the absenteeism and topics treated (which can be revisions of the different corrective actions generated by the system, frequency of the happenings, etc.) and matters to be treated at the next meetings.

The entrance elements for the revision should include:

a) Results of the internal audits and evaluations of fulfillment with the legal requirements and other requirements that the organization subscribes;

b) The communication of the interested external parts including the complaints;

c) Environmental results of the plant;

d) The degree of fulfillment of the objectives and goals;

e) The state of the corrective and preventive actions;

f) The follow up of the resulting actions of the previous revisions carried out by the management;

g) The changes in the circumstances, including the evolution of the legal requirements and other requirements related with their environmental aspects; and

h) The recommendations for improvement.

CONCLUSION

The Integral Management of the Urban Solid Residues constitutes a permanent concern within the different social and political environments of the country, that demand effective solutions due to the pernicious effects of their wrong handling causes to the population and to the environment This problem, is in itself complex, it acquires for a developing country such as Argentina, dimensions of such a magnitude that, doubtlessly, they are one of the new municipal challenges of the 21st century.

At present, the management of the Urban Solid Residues carried out by the municipalities, depending on their size and of the resources which they have, is generally reduced to domestic gathering, sweeping and cleaning of streets and final disposition in landfills not controlled and in

the open air, a situation which is aggravated when the places where those garbage landfills do not have the minimum environment aptitudes required for this use. What corresponds is the treatment, recycling, and final disposition in places for final disposition of urban solid residues as indicated by the enforced standards.

What we have tried to show in this paper is that the correction of this deficit should be made by means of the elaboration and execution of a correct Integral Plan for the Treatment of Urban Solid Residues, that contemplates among other things training of the personnel and of those who work in the treatment plant, as the population in recycling techniques, classification and separation of residues, correct disposition, analysis of the type of generated garbage and formulation of preliminary designs of places for the final disposition of urban solid residues, with all the base technical studies and evaluation of environmental impacts.

For the Municipalities the elaboration of a correct Plan of Integral Management of Solid Residues, does not only solve the problem of environmental sanitation, but rather it generates a great number of work posts that in some cases can be partially self-financed, or it is a classic destination for employment plans for the unemployed.

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