



Odor Control Experience using Organic Biocatalysts and Field Olfactometry Measurement in Sanitary Landfill

The La Glorita Sanitary landfill located in Pereira - Risaralda Colombia, is operated by the company Atesa de Occidente SA ESP, In which the disposal of ordinary solid waste from the department of Risaralda, some municipalities of Caldas and north of Valle of Cauca and in which an average of 800 tons a day are received, causing environmental impacts due to the emission of offensive gases and odors, which generates problems with the community.

In Colombia, the problem of offensive odors is regulated in Resolution 1541 of 2013 issued by the ministries of environment and sustainable development, where the levels of immission are determined according to the generating activities, which forced the operator of the landfill to improve the current controls with a view to reducing odorant impact and in turn to quantify the odors emitted, in order to fully comply with current regulations.

Summary

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The objective of the project is to expose the experience of odor control used Organic biocatalysts, which oxidize the compounds that cause offensive odors. In the same way measurements were made by field olfactometry in the emitting source and in the surrounding community, in order to quantify the effectiveness of the product.

According to the methodology used for the application of the product, it was shown that it has a positive response in controlling offensive odors, with the specific conditions of the landfill.

1. Introduction

The final disposal of ordinary solid waste is one of the most important problems affecting the Latin American region in environmental terms. The sanitary landfill (Colmenares et al., 2007). Currently in Colombia of the 1,102 municipalities, 88% dispose of landfills, which corresponds to 26,537 tons / day (Santiago de Cali City Hall, 2010), of which 77% corresponds to organic waste, according to the Superintendence of Public Utilities Domiciliarios in its 2015 report (Ministry of Environment and Sustainable Development Final disposition of solid waste, national report prepared 2015).

Currently the landfill operators in Colombia have managed the odor control according to the country's regulations, in which they are obliged to carry out daily coverage of vegetable type or synthetic type in order to keep the exposed disposal areas covered, these being the main generators of offensive odors (MADS, 2000). However, this practice is not enough to mitigate this impact due to the operation times of the final disposal sites, which mostly including "La Glorita" operate 24 hours, therefore, will always have exposed areas for the reception, conformation and compaction of the waste, generating constant emission of offensive odors that affect the surrounding community due to the diffusion phenomena,

The sanitary landfill "La Glorita" advised by SAS Industrial Treatment, addressed the problem of odors with the aim of finding the best alternative for reducing the impact of offensive odors, in order to have a plan that allows timely response to episodes of smell, which can generate complaints before the environmental authority activating the current regulations. For this, the effectiveness of the control is validated using measurements of gases and odors as a verification tool in points defined by the sanitary landfill.

2. Materials and Methods

The landfill is operated by the company Atesa de Occidente SA ESP, it is located in rural area of the municipality of Pereira, department of Risaralda as shown in Figure 1. It is a regional type landfill in which an average of 800 ton / day, of which 60% correspond to organic waste (characterization of solid waste made by the company Atesa de Occidente SA ESP in February 2015) which, due to their degradation, become large generators of offensive odors.

The selection of the nine (9) points was made covering the emission (glass 6), around the glass and outside the sanitary landfill the glorita (immission), specifically in the Finca el Rincón, located about 1,500 m from the active glass. This being a point of great importance, given that complaints were presented by the inhabitants; which were not filed with the environmental authority, but handled between the community and the landfill operator.

Figure 1: Location of the La Glorita landfill

2.1 Odor quantification:

The initial stage and the final stage of the project in the La Glorita landfill consisted in quantifying the odors and gases in the emission source and in the immission. For this, a route was made in the landfill and in the community, identifying nine points for measurements by field olfactometry, which is a measurement and control tool that allows to quantify the odor in European Odor Units, this being the unit of measure required in the Colombian regulations. For this, the IDES Canada SM100i field olfactometer was used.





Figure 2: Stages of the project (Baseline, EccoMate® Application, Quantification of odor reduction).

2.1.2 Brief description of the olfactometer:

It is a device for measuring field odors that allows to accurately quantify the intensity of odor in ambient air in European Odor Units, which complies with the standards proposed in EN 13725 for designs of olfactometers.

This equipment must be used by a panelist, who must meet a specific sensitivity to N-Butanol, who must pass at least 10 evaluations of the individual threshold.

Operation: Generate dilutions from a tank of compressed air and ambient air. These dilutions are controlled by means of a Tablet which has the SI / Not method, this being the same method used for laboratory odor evaluation.

2.2. Control with Organic Biocatalyst:

EccoMate® is an organic biocatalyst composed of highly purified and biosurfactant (non-ionic) proteins from plants and organic biocatalysts and field olfactometry measurement in sanitary landfills minerals with two specific functions: to solubilize organic matter through the breaking of carbon chains and to accelerate the rate of oxygen transfer, which leads to more aerobic systems. The biosurfactants, due to their hydrophilic and hydrophobic character, encapsulate the VOCs, while the available oxygen oxidizes gases such as ammonia and hydrogen sulfide, reducing the odorant impact as shown in Figure 3.



Figure 3: Reactions generated by the BioCatalizador and mechanism of encapsulation of VOC's

A 3% aqueous solution was applied by direct spraying on the waste in the sanitary landfill, daily for one month (September 2015), at the moment of the arrival of the compaction cars as shown in Figure 2B.

3. Results and discussion

Resolution 1541 of the MADS was taken as a parameter to compare the results of the measurements made. For the case of the treatment and disposal of non-hazardous waste and transfer stations must comply with 3 or E in the immission. Once the EccoMate® was applied, the initial and final data were compared, which allowed identifying the effectiveness of the control alternative for the sanitary landfill, as well as taking into account the permissible limits in both odors and gases as observed in the Table 1.

Table 1. Results Field Olfactometry and Gas Before and After Eccomate®.

Point	Activity	Baseline	NH ₃ H ₂ S Measurements		NH ₃ H ₂ S		
		Measurements (ou E / m ³)	(ppm)	(ppm)	with Control (ou E / m ³)	(ppm)	(ppm)
one	Sanitary Landfill Emission (vessel 6)	3000	0	0	35	0	0
two	Landfill Landfill (front offices)	13	0	0	35	0	0
3	Sanitary Landfill Emission (In front of the glass 6)	24	0	0	319	36	0
4	Sanitary Landfill Emission (to 100m of the glass 6)	Four. Five	3	0	62	0	0
5	Sanitary Landfill Emission (to 200 m of the glass 6)	eleven	0	0	0	0	0
6	Landfill Landfill (behind offices)	35	0	0	19	0	0
7	Landfill Emission (Well I get leached)	35	0	0	19	0	0
8	Sanitary Landfill Emission (Scale)	35	0	0	13	0	0
9	Infiltration Sanitary Landfill (Finca el Rincón)	9	5	0	0	0	0

It was found that the emitting source (glass # 6 or vasoactive), passed ou 3,000 E 35 ou E and emmission (Villa corner) ou 90.

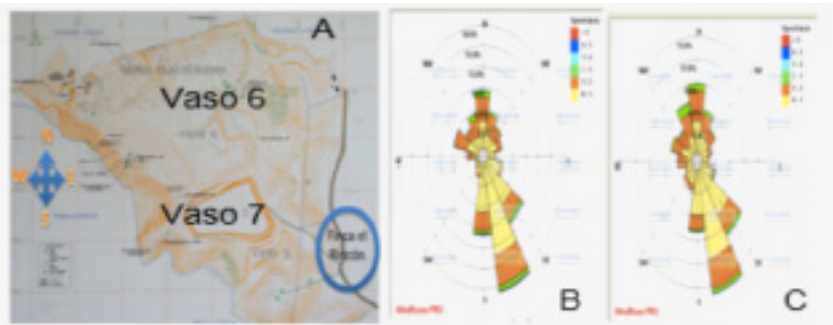


Figure 4. Location of the La Gloria and Rosa de los Saneamientos landfill in the June and September area.

Figure 4.A shows the location of the Finca El Rincón (point 9) with respect to the source which can be affected by the odors coming from the filling according to the direction of the wind (SE). In Figure 4B and 4C, the behavior of the wind in SE direction in the months of June and September is evident.

The measurements made in September, where spray control of biocatalysts was applied, showed an increase in points 2, 3 and 4, due to the filling dynamics of vessel 6 in operation, during the three months after the lifting of the baseline, this implied that the 3 points mentioned above were closer to the active zones.

The study was designed to carry out the application of the control in June, after the lifting of the baseline, however, this time was extended by internal procedures of the filling operator, initiating the control only until August.

At present, Eccomate® is used in Colombia in 4 other sanitary landfills since 2 years ago. The applications have been made in different ways, where the treatment starts from the compactor cars reducing the final impact. The monitoring in these applications has been carried out qualitatively, through surveys and organoleptic perceptions of the community to evaluate their performance.

4. Conclusions

The application of organic biocatalysts represents an alternative for the reduction of the offensive odors generated in the processes of solid waste collection and disposal. Field Olfactometry is a tool that allows a diagnosis to be made both in the emitting source and in the affected community, where odor units are determined under specific conditions. This tool can be used to define control systems and identify episodes of greater generation of odors. Implementing a control system with Biocatalysts that covers most of the process, starting from the compactor vehicles will reduce odors not only at the final disposal site, but also in transportation and collection, decreasing complaints that may be presented by the community for these processes. Perform a study where biotechnology is applied for a longer period, making monthly measurements using field olfactometry as a measurement tool.

4. References

Colmenares et al., 2007, Generation and management of Gases in Sanitary Landfills. Mayor of Santiago de Cali. (2010) The Problems of solid waste. www.cali.gov.co.
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Visit, https://www.olores.org/index.php?option=com_content&view=article&id=836:sanitary-landfill-odor-control-experience-using-organic-biocatalysts-and-field-olfactometry-measurement&catid=24:field-olfactometry&lang=en&Itemid=297 for the online article.