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## APPLICATION OF TECHNICAL STANDARD CETESB - P 4.231 FOR DISTRIBUTION OF AGRICULTURAL LAND IN STILLAGE RESIDUE OF THE AGROINDUSTRY STATE OF SÃO PAULO

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### Abstract

The present work main objective is to verify if the area used for the application of vinasse on the soil of the company under study meets the specifications of the Technical Standard Cetesb - P.4231, being, not being within the domain of the Permanent Preservation Areas (APP) or Legal Reserve (RL). The study will verify if the dosage for vinasse application for enrichment of agricultural land doesn't exceed the maximum concentration of potassium. It also aims to verify if the area to be used for the application of vinasse on the soil of the Company under study, meets the following conditions: a) Is not located inside a Permanent Preservation Areas - APP or legal reserve, as defined in the Forest Code, or is not located within the limits of the zone of damping set for protected areas for full protection; b) Channels master or primary use for continuous distribution of vinasse during the harvest to be waterproofed with waterproofing geomembrane or other more effective technique; c) Monitoring the dosage for vinasse application for enrichment of agricultural land, not exceeding the maximum concentration of potassium (5% of Cation Exchange Capacity - CEC).

**Keywords:** Vinasse. Ethanol. Main channel. Permanent preservation areas.

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## **1 INTRODUCTION**

This work is grounded in a case study conducted in an agribusiness company located in western Sao Paulo state.

### **1.1 Type of Study**

In order to describe a specific case under examination, a detailed case study of the agribusiness company located in Penápolis, SP, whose main product is sugar and alcohol. To perform the case study form the basis for the thesis of the Master in Environmental Management and Audit, will be used a research methodology. Will be made a survey (GPS), which contain all the Permanent Preservation Areas (APP), which are contained in the estate of the company under study, within which analyzes are made on the actual use thereof in relation to fertigation (vinasse), indicating where the Technical Standard CETESB - P 4231, is being applied correctly or not. And where the said standard being applied is not possible to propose a method for it to be framed.

### **1.2 Sealing the channel**

Demonstrate the proposed location and sealing of master distribution channels of vinasse, following Technical Standard CETESB - P 4231. Through the distribution plant and study "in situ", will be demonstrated, the current conditions of the channel masters, and appropriate proposals will be made so that it meets this standard.

### **1.3 Following the dosage of vinasse**

It is considered that the application of pure vinasse, at levels ranging from 4.0 kg of K<sub>2</sub>O/m<sup>3</sup>, is becoming a problem in areas with potassium content above 5% of the CEC, where the maximum dose in the standard will be 185 kg K<sub>2</sub>O/hectare. In such cases the depth of application should be 46.25 m<sup>3</sup> of pure vinasse per hectare.

## **2 POPULATION AND SAMPLE**

In Brazil there is currently a total of 414 sugar and ethanol companies that offer conditions to be developed in the research study, and only in the State of São Paulo are concentrated 184 of these companies representing 44% of the total, representing a percentage.

The choice of the Sugar Company of Penápolis for specific analysis, was due to it's 16 years of

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action as Area Manager for Agricultural and Logistics, so the flow of data and information is more naturally, thus research sources available with greater clarity.

Another important factor in choosing this company is that their study is its representative capacity (around 2.5 million tonnes of cane / year), reaching 120 million liters of alcohol / crop, generating around 1.5 billion liters of vinasse / harvest

### **3 FIELD SURVEY**

According to the agricultural map of the finding will be made on the channels of distribution stillage containing physical, dectando is progressing or not in Permanent Preservation Areas (APP) defined by the Forest Code. There are 25,500 meters linear channels open, constructed.

This survey demonstrates the rigor with which these channels are leased physically meeting all the specifications of the Brazilian Forest Code. Currently the channels mostly (76%), are constructed without sealing recommended by the Technical Standard CETESB P 4231, as shown in the picture of Fig 1, then approximately 19,500 meters linear channel "open" are built without waterproofing. According to the available time, manpower, material and technology, the channels are sealed, using the technique "concrete" and technical "geomembrane waterproofing."

The monitoring of dosage for seeking the application of vinasse soil enrichment is performed using data provided by analyzes performed periodically, for a total of five tests per month, three collections made in containment boxes and two channels in the open.

### **4 INTERVIEWS**

As this is a case study conducted, it was decided by a field research associated with interviews. MINAYO & SANCHEZ (1993), researchers using, respectively, qualitative and quantitative methodology of research, point out that, from the epistemological point of view, neither of the two approaches is more scientific than the other.

The quantitative research approaches emphasize the possibility of reaching explanatory principles and generalize to large populations. Qualitative methods produce contextual explanations for a small number of cases, with an emphasis on meaning - more than the frequency - of the phenomenon.

There are three types of interviews: structured interview, or closed, semi-structured interviews and free or open, having opted for a semi-structured interview that is part of that which certain basic

questions, supported by theories and hypotheses of interest to research and then offer wide range of interrogative, the result of new hypotheses that arise as they receive the answers of the respondent.

Were conducted three interviews with industry experts in the production of sugar and alcohol, and interviewed each professional taking into consideration his experience in the area and relevant opinions on the subject:

Interview 1:

Interviewed Agronomist Adilson José Rossetto.

Interview 2:

Interviewed Chemical Engineer Joseph Myasaki

Interview 3:

Interviewed Agronomist Mario A. Vianna Filho Egreja

Regarding environmental benefits, and suggestions to the search for sustainable development, according to the deadlines for implementing the requirements of Rule study, the three interviewees

According Myasaki: "One suggestion is that the sealing time is reduced to as small as possible and another is to be performed on a monitoring potential leaks that may occur during the harvest, when the vinasse is flowing through channels coated."

Egreja suggests: "Investing more towards the improvement of techniques aimed at high operating income during the sealing of the channels and greater integration between the technical team of company and government enforcers, thus seeking involvement in the mutual terms and techniques."

## **5 RESULTS AND DISCUSSION**

It is common knowledge that the world is experiencing a period of growing energy shortages, partly due to the reduction of inventories Oil, black gold, which reached stratospheric prices never before even imagined.

Coupled with environmental problems caused by fossil fuels, proves that the world needs, and depends increasingly on new energy sources, and it is believed that bioenergy is the fuel that moves the world's future. Within this framework allows to highlight the crucial role played by Brazil, Int. J. Knowl. Eng. Manag, ISSN 2316-6517, Florianópolis, v. 2, n. 3, p. 102-111, jul./out. 2013. 105

which has all the conditions and technologies needed to produce large-scale, major agro fuels: ethanol, biodiesel and biomass.

The adoption of the gasoline / alcohol had an impact on air quality in large cities. Initially, additives such as lead had their use as reduced to the alcohol gasoline increased and they were completely eliminated in 1991. Aromatic hydrocarbons such as benzene, which are particularly toxic were also removed and the content of sulfur in gasoline was also reduced. In alcohol-fueled vehicles only to the emission of sulfur was eliminated by bringing a double dividend.

Without these actions, vehicles equipped with catalytic converters would have found it difficult, due to the high level of sulfur in Brazilian gasoline catalysts would be contaminated quickly. As a result, the use of ethanol in a roundabout way made possible the introduction of catalysts in Brazil. The emissions of carbon monoxide, have been drastically reduced: prior to 1980, when gas was the only fuel used, CO were greater than 50 g/km, and they were reduced to less than 5.8 g/km 1995, thus meeting the goal of sustainability in the manufacture of alcohol. It is concluded that within a region of Brazil has better conditions and have been emerging as the great promise for the development of bioenergy.

This region is the center-south, with special attention to the states of Sao Paulo, Parana, Minas Gerais and Mato Grosso do Sul. The area more specifically known as Oeste Paulista, is now considered the last frontier of Sao Paulo cane sugar, and should become in the near future, the major driving force of development in Brazil, very linked to the development of bioenergy. Alcohol fuel is now the major front of the fuel that makes oil proof is the worldwide interest in the product. This new scenario emerges for the sugarcane agribusiness as the "top" of the great national economic growth.

Depending on the number of units producing sugar and alcohol projects already operating and ready for operation in the coming years, thus forming the State of an agro-industrial complex in the world most significant as regards the production of sugar and alcohol, requiring the implementation of the Technical Standard CETESB P. 4231, is taking place at the right time. The proposed procedures and required by Rule under study, will suffice for the problems of leaching, and spills (percolamentos) be solved completely, because in addition to the lining of the main channels and boxes containing the quantities of vinasse used, will be monitored as well, thus avoiding problems that currently occur.

These facts can be proven through the opinions collected through interviews, as all professionals

surveyed agreed that the application of the standard study will yield benefits in respect of maintaining the current balance of the ecosystem, to reduce or cancel altogether the aggression that may not occur depending on the coating channel containment boxes and inability to control the dosage of the application of vinasse, and thus can affect the physical composition of the soil.

Note that the three respondents' opinions converge to the difficulties of implementing the standard in a study, based on high cost, time available and specific coating techniques, it is a methodology that is being deployed recently in sugarcane agribusiness and this technique still is not adopted in practice by agro-industries, thus depending more time for observation, monitoring and careful analysis.

Regarding environmental benefits, the three agree, as these procedures will contribute immeasurably to avoid serious environmental problems that may occur by chance due to the handling and storage of vinasse on how it is done today. With regard to the benefits and the quality of sugarcane (raw materials industry), are also unanimous, for the strict control of serum in the stillage fertigation makes both cane crushed, and soil quality are used to high rates fully acceptable.

Turning attention to the company under study, the full deployment by the requirements of the standard will be met satisfactorily, as it has to the respect and no invasion of fertigation in Permanent Preservation Areas (APP) and is thus limited only to the availability of time and financial resources (costs) for the implementation of the requirements (coatings).

Another procedure already adopted in the company under study is the monitoring of vinasse applied throughout the analysis, thus demonstrating the physical and chemical composition of the same, quantifying the volume to be applied per hectare, thus avoiding a high level of CTC, trying not to salinization of soil that is receiving fertigation.

## **6 CONCLUSIONS**

The expanded use of ethanol from sugarcane can be the answer to many issues related to energy. One is energy security: more than 13 countries adopted the mandatory blending of ethanol in petrol and diesel, which can prolong the use of proven oil reserves.

They also benefit the environment, to represent the reduction of emissions of gases causing the greenhouse effect. Alcohol is also effective to increase the octane of gasoline.

Moreover, it is a practical way to adopt the guidelines of the Kyoto Protocol, created in 1997 to reduce the emission of pollutants, whose key concept is "sustainability" could be considered that the strength of Brazilian ethanol, the lowest cost world production, increasing productivity and generates the largest number of jobs in the formal field, reaching 95% in São Paulo. In the list of countries self-sufficient in oil are countries that make up OPEC (Organization of Petroleum Producers and Exporters), Venezuela, Ecuador, Great Britain, Norway, Argentina, Russia, Mexico and Egypt, and the largest oil consumer in the world the United States imports about 60% of the fuel. According Nastari (2006), notes that since 1976 alcohol replaces about 1.51, billion barrels of gasoline equivalent, meaning 11.6% of Brazilian oil reserves. In the same time, Nastari shows that were consumed 275 billion liters of ethanol, which would amount to 240.8 billion gallons of gasoline.

The Center-South of Brazil, more specifically the states of Sao Paulo, Parana, Minas Gerais and Mato Grosso do Sul, focusing special attention to the West Paulista, states that has been emerging as a large region conducive to the development of bioenergy , becoming the center of a large region of sugar cane business market. The region has a favorable climate, topography and logistics enviable, and have attracted the attention of numerous diurnal companies targeting the sector of agro-energy, which should boost the region in the near future, the quality level of one of the main centers of the country's sugarcane industry.

During the study clearly demonstrated the methodology used in warehousing operations, transportation and disposal on soils of stillage generated in the power plant company called Campestre, located in the city of Penápolis, State of Sao Paulo, comparing such operations well after deployments recommended by the Technical Standard CETESB - P 4231.

The company under study compared to storage, transportation and disposal of vinasse of each individual state is less advanced than others in the region, although their physical location is preferred over the disposition of aquifers and collection points, offering roads, facilitating logistics, surely there was slowness in the management of actions to meet the standard under consideration in relation to other companies, depending on the location of the plant Campestre be strategically prepared, certainly after implantation should provide more positive results in relation compared to other companies, taking into account topography, logistics and supply area available (own and leased).

Thus respecting the environmental regulations in respect of Permanent Preservation Areas (APP) which is the area covered by native vegetation or not, with the environmental function of preserving

water resources, landscape, geological stability, the biodiversity, gene flow of wild fauna and flora, soil protection and ensure the well being of human populations, determined by well-being of human populations, determined by New Forest Code which is being processed by the Board in final approval by the CONAMA resolutions. And 302. 303, 2002, Federal Law.

And the Federal Decree 9.605/98. 3.179/99, which considers APP forests and other forms of natural vegetation located along rivers or any water course in marginal strip, measured from the highest level reached by water during the rainy season or around ponds, lakes or water reservoirs or lagoons around the springs and eyes water, even temporarily, number of paths and marginal strip from the boundary of the wetland area in the upper third of the tops of hills, mountains, hills and rows of ridges, at altitudes above 1,800 meters, irrespective of the vegetation on the slopes, the edges of the trays and flat, or parts of these slopes with slopes greater than 45 degrees, the sandbanks in the areas covered by fixing vegetation or dune stabilization by mangroves, the mangroves along its entire length in places of refuge or reproduction of migratory birds and endangered wildlife, the beaches, nesting sites and breeding of wild animals, and that every owner should keep Permanent Preservation Areas on your property, covered or native vegetation, or Legal Reserve and their physical limitations, which is the particular area equivalent to 20% minimum of the total rural property or possession, necessary for the sustainable use of natural resources, promote the conservation of biodiversity, shelter and protection of native flora and fauna and the rehabilitation of ecological processes.

The vegetation of the legal reserve cannot be deleted, and may be used when approved by DEPRN, the sustainable forest management plan, being considered by the same the following to define the location and size of the area of Legal Reserve presence of vegetation, climax vegetation, engaged in vegetation due to watershed protection, vegetation that carries according prevention and erosion control, capacity class of land use, connectivity with APP `s or other areas of Legal Reserve, connectivity with other clumps of vegetation, under flora and fauna threatened with extinction, protection phytosionomy with floodplain forest, shrub or herbaceous border of the foot, basin plan, the city plan, zoning, environmental, proximity to the Conservation Units (UC) and other territorial areas especially and protected areas of exceptional scenic value or protected by municipal law, which shall be indicated on the margin of the entry of the registration of the property, the notary competent Real Estate Records, is forbidden to change their destination, where transmission and any title, dismemberment or grinding area.

Shall be permitted to include the Permanent Preservation Areas in the computation of the Legal



Reserve, provided that not involving removal of native vegetation in other areas of the property and when the sum of the Permanent Preservation Areas and the percentage equivalent to at least 20% of the area property, corresponding to the legal reserve exceeds 25% of the ownership or possession rural area less than or equal to 30 there, 50% of rural property with an area greater than 30 there. Such care is relevant as a demonstration of the policy presented, focusing on actions like searching for a connection to the current ecosystem, not attacking invasion of areas prohibited by law, as was common in previous years in agricultural industry in the region through studies, research professionals, it was decided that channels teachers cited the Standard CETESB P 4231, the permanent use shall be sealed with geomembrane due to the problems presented by the infiltration technique with concrete also used by other industrial units.

Depending on the analysis methodology already used by the company under study, a frequency of five monthly samples as shown, the recommended dosage for the stillage generated as a function of its composition is 400 m<sup>3</sup>, thus not exceeding the maximum concentration of potassium (5% of CEC - Cation Exchange Capacity).Already, undersizing immediately noticed the sprouting of sugarcane, as occurs in the same delay as a function of water stress caused by the reduced amount of vinasse applied to the soil, this procedure is common due to the mismanagement of fertigation process, but when working with trained personnel and equipment regulated and measured regularly through preventive and predictive maintenance as noted in the company under study, the probability of this occurring is practically nil.

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## **APLICAÇÃO DA NORMA TÉCNICA CETESB - P 4,231 PARA DISTRIBUIÇÃO EM TERRAS AGRÍCOLAS DE RESÍDUOS DE VINHAÇA DA AGROINDÚSTRIA NO ESTADO DE SÃO PAULO**

### ***Resumo***

*O presente trabalho tem como principal objetivo verificar se a área utilizada para a aplicação de vinhaça no solo da empresa em estudo atende às especificações da Norma Técnica Cetesb - P.4231, sendo: não estar dentro do domínio de Preservação Permanente áreas (APP) ou Reserva Legal (RL). Siga a dosagem de aplicação de vinhaça para enriquecimento do solo agrícola, que não exceda a concentração máxima de potássio. Também visa verificar se a área a ser utilizada para a aplicação de vinhaça no solo da Companhia em estudo reúne as seguintes condições: Não estar contido no campo de Áreas de Preservação Permanente - APP ou reserva legal, conforme definido*

*no Código Florestal, ou nos limites da zona conjunta de áreas protegidas de proteção integral; Canais mestre ou uso principal para distribuição contínua de vinhaça durante a safra a ser impermeabilizado com geomembrana impermeabilizante ou outra técnica de mais efeito; - Acompanhamento da dosagem para aplicação de vinhaça para enriquecimento do solo agrícola, que não exceda a concentração máxima de potássio (5% de Cation Capacidade de Troca - CEC).*

**Palavras-chave:** *Vinhaça. Etanol. Canal principal. Áreas de preservação permanente.*

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