

# LEGAL ASPECTS OF THE DISPOSAL OF INDUSTRIAL WASTES ON SOIL

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## ABSTRACT

It is, clearly, a Government responsibility to enact laws and promulgate regulations for control of industrial pollution.

The main techniques for soil industrial wastes disposal, namely, landfarming and landfilling, profit from the extensive knowledge acquired, in past decades, in the field of water and air pollution control and must be analysed within a comprehensive system for hazardous waste management, with its legal and administrative aspects.

This paper presents some general principles of a Hazardous Waste Management System, which are broadly applicable, regardless differences between States or Countries. Finally, it discusses the specific case of Hazardous Wastes Management in the State of Bahia, Brazil and makes some suggestions for its improvement.

## KEYWORDS

Legislation; hazardous waste management; oily wastes; landfarming; landfilling; waste disposal.

## INTRODUCTION

The problem of industrial pollution control is clearly a case for Government action. Government takes such action by defining their responsibilities and identifying the requirements for pollution control by enacting laws and promulgating regulations.

Government regulations and programs for prevention and control of pollution may take many forms. In general, however, they involve one of two general approaches, or, frequently, a combination of them, to various extents.

One approach is the establishment of specific levels of environmental quality to be achieved or maintained, and the imposition of various emission control requirements, constraints on activities or requirements for actions deemed necessary to achieve that environmental quality.

The other approach is the establishment of limits on the amounts of pollutants which may be emitted by specific sources and acceptance of resulting environmental quality.

The first of these approaches may be identified as environmental quality standards. The second approach may be identified as best technology-based control action.

There is, generally, a great discussion, among environmentalists, about what should be the best of these approaches for pollution control action. This discussion is extremely important in the decision making process, but, obviously, it is beyond the scope of this Seminar. However, I would like to say that, in my opinion, best technology-based control action is likely to prevail in a developing country. In fact, in this way, it seems more easy to assess positive effects over the environment, because, since there are not environmental quality standards for most of the industrial pollutants, it is quite impossible to assess any improvement or maintenance of that environmental quality.

Fortunately, the discussion about the two approaches above mentioned are more concerned with water pollution and air pollution control. Most hazardous wastes are generated by the chemical and related industries, and result from the various techniques designed to eliminate or reduce atmospheric pollution or discharge of pollutants into waters. So, hazardous waste management, whichever the approach considered, profits from the extensive knowledge acquired, in past decades, in the field of water and air pollution control, and calls for safe disposal methods of these substances whose dangerous properties are previously recognized. In other words, whenever a waste is characterized as hazardous, the same care and attention are required, from generation to final disposal. In this context, a comprehensive system for hazardous waste management, with its legal and administrative aspects, is of high relevance.

#### PRINCIPAL TECHNIQUES FOR SOIL INDUSTRIAL WASTE DISPOSAL

In this section we will briefly discuss the techniques for soil industrial waste disposal, with the sole purpose of pointing out some aspects which may be useful to the final explanation of our theme.

#### LANDFARMING

Landfarming is the controlled application of a known quantity of oily or biological sludge to a given soil and the promotion of naturally occurring microbial assimilation, to convert the hydrocarbons and organic matter to the end products  $\text{CO}_2$ ,  $\text{H}_2\text{O}$  and increased humus content of the soil.

Landfarming of oily refinery sludges has been practiced in the U.S.A. since 1954 and, as refineries have installed a large number of wastewater treating facilities, the sludges have increased tremendously. These sludges are concentrated by centrifugation, filtration, etc, and consequently large amounts of semi-solid oily wastes remain for disposal. In this sense, hazardous wastes are "by-products of environmental protection".

From both an environmental and cost standpoint, landfarming has been the preferred disposal technique for many oily petroleum sludges.

## LANDFILLING

A common definition for sanitary landfill is: "an engineered method of disposing of refuse on land, in a manner that protects the public health and the environment , by spreading the waste in thin layers, compacting it to the smallest practical volume, and covering it with compacted soil after an adequate work time".

Although a hazardous wastes landfill has many similarities with a common sanitary landfill, it has its own peculiarities and requirements. Hazardous waste landfilling is a very specific operation, requiring comprehensive preplanning to avoid costly or irreparable circumstances.

Before planning the design of a landfill for any hazardous waste disposal facility, there are some fundamental considerations:

- a) The disposal site must be large enough to accommodate all the wastes to be generated and a properly located area must be reserved to allow future facility development.
- b) Sufficient equipment redundancy or emergency/contingency plans must be provided to ensure that wastes can be accepted at all times.
- c) Surge capacity, equalization and pretreatment facilities must be built in, to allow for changes in quantity and quality of wastes.
- d) The disposal system must be operable at all weather conditions. If this is impractical, sufficient storage must be provided to accommodate wastes until operations can be continued.
- e) The disposal system must conform to all applicable legal and regulatory requirements and it must not cause water, air or noise pollution or endanger public health.

## LEGAL AND ADMINISTRATIVE ASPECTS OF A HAZARDOUS WASTE MANAGEMENT SYSTEM

A hazardous waste management legislation is to be investigated within the legal system of the individual State concerned. There are, however, general principles with regard to legal requirements for hazardous waste management that are broadly applicable, regardless of the above mentioned intra-state differences. This section therefore includes some of these general principles, before discussing the specific case of State of Bahia.

A comprehensive system for the management of hazardous waste will not develop unless its basic constituents are prescribed by law.

The first step in developing hazardous waste legislation should be the assessment of existing laws and regulations, (for example, legislation on air emissions control, production and transportation of goods, water management, labour safety, etc.), which might be of relevance for this field. This assessment is also necessary to avoid duplications and contradictions. Furthermore, a law should only cover principles for which it is absolutely necessary to have a law. As many questions related to hazardous waste management are still in flux, too detailed regulations by

laws might prevent flexible decisions. Hazardous waste management should, therefore, rather be regulated by administrative regulations. Wherever there is uncertainty about principles of legislation or about technical aspects, guidelines can, successfully, be used.

We will discuss, now, some general principles which should be considered in any hazardous waste management system, regardless of the differences between States or countries.

#### DESIGNATION OF RESPONSIBILITY

One of the most important tasks for hazardous waste management legislation is the designation of responsibility for waste disposal.

There are three different approaches to regulate this.

Government can either leave the responsibility with the generator, designate it to specialized enterprises or take it over itself. Obviously, each of these approaches has advantages and disadvantages. Leaving responsibility with the waste generator has some advantages: the generator knows better the constituents of the waste and their inherent potential hazards and is, generally, best equipped to deal with them. Leaving the responsibility with the generator may also be an incentive for minimising the amount of wastes. A disadvantage, clearly, is that, since on site waste disposal facilities will be based mainly on economic principles, they will tend to follow minimum requirements, i.e., execute the cheapest possible way to dispose of wastes. So, a decision to make waste producers legally responsible for waste disposal would call for stringent standards for disposal facilities. In the case of small industries (small generators) it is, generally, not feasible and economically not reasonable to designate to them that responsibility. In this case, there will be always a need for some well equipped facilities which are available for those industries and for the general public.

The second approach based on designating responsibility for wastes disposal to specialized private enterprises has similar advantages and disadvantages, as in the first approach. They will also tend to use low cost disposal methods, unless there are stringent standards, and there will be also price competition which will be a handicap for facilities using highly developed techniques (e.g. landfill disposal vs incineration or chemical treatment).

The third approach, a hazardous waste disposal system based on public responsibility has also advantages and disadvantages. Public responsibility, provided that the necessary funds are made available, will lead to the rapid build up of a comprehensive disposal system, but it will tend to be less flexible because the influence of the concerned parts of the public will be low.

In summary, any system for the management of hazardous waste will have certain advantages as well as certain weaknesses, which must be assessed according to the requirements of each individual country.

## CONTROL OF THE HAZARDOUS WASTE MANAGEMENT SYSTEM

To ensure that the technical and organization methods legally defined are used in practice, comprehensive control mechanisms must be established.

There are, basically, three different groups of control measures for the implementation of a reliable hazardous waste management system, and all three require a legal basis.

The first is the control of waste generating production processes, by:

- proper choice of materials, processes, operation and maintenance procedures.
- recycling of waste and recovery of valuable materials.
- on-site treatment of waste for mass reduction, dewatering, detoxification or transformation into an immobile and/or chemically inert form.

The provision for waste generation control need not necessarily be included in hazardous waste management legislation, but could also, preferably, be achieved through legislation on the production of goods. In this case, onsite treatment of waste is not a part of a hazardous waste management but an integral part of production processes.

The second step of a control system is the permitting procedures for potentially hazardous activities. All facilities in which hazardous waste are stored, treated or disposed of must apply for a permit and the same is valid for transportation of hazardous waste. The duty to apply for a permit prior to the start of operations should be made obligatory by law. Special consideration should be given to the conditions under which a permit can be granted, and withdrawn, and to the financial liability of the permittee and his professional reliability, mainly private enterprises for transportation and disposal of wastes.

The third essential part of a comprehensive system of control is a mechanism of notification of waste, ("trip-ticket") establishing a link between the different activities (generators, transporters, treatment and disposal sites).

## DECLARATION OF THE NATURE OF WASTE

The initial control step is the declaration by the waste generator of the nature of wastes to be disposed of. This must be clearly defined as his responsibility. The declaration must give sufficient details for the evaluation of the waste properties and of any potential hazard throughout the different phases of the management cycle. The declaration must be made on a standardized form, that is, all waste generators must provide information in uniform manner.

Waste declarations should be based upon the State adopted definition of hazardous waste and should include sufficient details to enable prediction of the kind of hazards that can be expected for:

- handling (labour safety requirements).
- storage (evaluation of storage risks).
- transportation (assignment of appropriate means of transportation and packaging).
- disposal and treatment.

The practice of waste characterization should be based, so far as possible, on already existing schemes for characterization of hazardous substances.

#### SYSTEM OF NOTIFICATION OF WASTE

This system implies that all stages of waste disposal must be controlled. Necessity, form and intensity of control measures have to be linked to the overall concept of hazardous waste management as adopted in the individual country.

Control in the generation stage of waste is of great importance. Production facilities must, in particular, be subject to measures for predisposal options and for measures to separately collect waste at source.

The control of transfer of wastes deals with problems related to transportation safety and improper dumping, that is, transport is a management phase with a great risk that wastes might get "lost". Control measures for this stage should, therefore, also ensure that the wastes reach their ultimate destination, and that wastes only reach facilities where they can be safely disposed of.

#### COLLECTION AND TRANSPORT

Collection and transport are important parts of the disposal cycle, particularly in terms of control. Therefore, collection and transportation of wastes should be allowed only for permitted enterprises and it is necessary to put high demands on the qualification of such enterprises.

Permits should only be granted when there is sufficient evidence that a reliable service can be guaranteed. With regard to this, applicants for a permit should be required to prove reliability and proficiency by verification of technical equipment, financial situation, adequate insurance and trained personnel.

According to the evidence given in the application procedure, the permit should be given either for collection and transport of hazardous wastes in general or of certain types of waste only. In any case, the permit should be subject to alteration and withdrawal in case of non-observance of the conditions of the permit.

## TREATMENT AND DISPOSAL

Disposal of hazardous wastes should be allowed only in permitted facilities and such a permit should be required for all kinds of waste treatment and disposal facilities (storage facilities, plants for chemical, physical and biological treatment, landfills, landfarming, plants for thermal treatment, etc.).

Facilities should be licensed for the disposal of specific groups of wastes only and the listing of waste disposal shall form part of the permit. Exceptions should need prior written approval of the permitting authority.

The applicant for a permit should be legally obliged to provide the necessary information to evaluate site selection, if site selection is not subject to a general plan. This is of particular importance for landfills, but also for incinerators (compliance with air quality standards).

## THE HAZARDOUS DISPOSAL PROBLEM IN STATE OF BAHIA-BRASIL

The major regulation concerning the management of hazardous wastes in the state of Bahia, entitled "Hazardous Wastes Control in the State of Bahia" is based in the State Law 3.858 of november 03, 1980 and was approved by the Resolution Nr. 313 of the State Environmental Protection Council (CEPRAM), of may 30, 1984.

This regulation covers the following principal aspects:

- Criteria for identifying and listing hazardous waste, identification methods and a hazardous waste list.
- Requirements applicable to generators of hazardous waste for recordkeeping, labeling, containerizing and using a transport manifest.
- Requirements applicable to hazardous waste management facilities.

This regulation is addressed for and affects mainly the industries of our two more important industrial centers, namely, the Petrochemical Complex of Camaçari and the Industrial Center of Aratu.

In these industries, great amounts of wastes were created in form of sludges or slurries as a result of air and water pollution treatment systems, or originated from other process points.

This regulation, therefore, intended to close the circle of pollution control begun earlier with regulatory control of emissions and discharges of contaminants to air and water.

We never can underestimate the complexity and difficulty of implementing a hazardous waste management system. So, CEPRAM's Resolution Nr. 313 has enough flexibility to allow for improvements in this regulation. We have, now, a little more experience and have gathered more data than two years ago. This Seminar is, then, a good opportunity of trying to make a first exercise in detecting our particular needs of improvement, with reference to the general Hazardous Waste Management above described.

### RESPONSIBILITY FOR WASTE DISPOSAL

CEPRAM's Resolution Nr. 313 prescribes in its article 16 that waste generators can store, treat or dispose of hazardous waste only in permitted facilities. There is not, therefore a particular designation of responsibility to the waste generators, to private enterprises or to the public authority.

In practice, we have licensed a few facilities for on-site disposal and treatment of wastes. In The Petrochemical Complex of Camaçari the Government, clearly, took over itself the responsibility for hazardous waste treatment and disposal, through CETREL's landfilling and landfarming facilities.

We have not, until now, a precise assessment of the adopted approach, but the medium or long-term tendency is to make more stringent requirements for hazardous waste pre-disposal, such as mass reduction, thickening, dewatering, concentration, etc. These pre-disposal operations could be made by the industries or by the final disposal facilities.

### CONTROL MECHANISMS

Always with reference to the general Hazardous Waste Management already described, we will comment, briefly, on the following mechanisms.

### WASTE GENERATION CONTROL

It's very difficult, or even impossible, in reality, to implement this mechanism. In fact, it implies, in interfering with the proper choice of raw materials and production processes, what could be made rather in the context of a specific legislation for production control of goods. As said above, what is more likely to occur is the requirement of more stringent standards for hazardous waste pre-disposal on-site or in external facilities.

### WASTE NOTIFICATION

CEPRAM's Resolution Nr. 313 (Chapter 7) specifies the manifest and recordkeeping requirements for hazardous waste generators, transporters and disposal facilities.

Owners or operators of disposal facilities must sign and return the original manifest to the generators within 10 days and must make periodical reports to the State Environmental Control Agency, CRA. The manifest system should be "the heart" of the Hazardous Waste Management as a whole, tracking the hazardous waste transported from the point of generation to its ultimate disposal.



Since there are in State of Bahia only two external disposal facilities (operated by CETREL), relatively near the waste generation sites, the waste notification mechanism must be adapted to these peculiarities, to become more effective.

First, in my opinion, we need to develop a more basic document, named "Declaration of nature of wastes", discussed below in more details. Second, and based in this previous document, we need, during the permitting process of existing and new sources, to get more specific informations about the wastes intended for disposal. Furthermore, this procedure, once well discussed with the interested parties and adequately regulated, could improve the decision making process about adequacy and/or responsibility of the existing facilities for soil disposal of these wastes. Finally, the manifest document, which remains absolutely necessary, could profit from this previous information, could be simplified and, what is more important, become effective.

#### WASTE CHARACTERIZATION

CEPRAM's Resolution Nr. 313 (Article 15) prescribes that it is a generator's responsibility to determine if his waste is hazardous. This determination can be made by evaluating waste against the characteristics outlined in Chapter 2, Articles 5 to 8, or by identifying the waste on the hazardous waste lists presented in its Annex Nr. 3.

The generator has knowledge of the raw materials input into his process and knows these materials to be present in the waste. He can, therefore, utilize this information to determine whether the waste would match the characteristics above mentioned, without testing. This can be accomplished by using the manufacturer's specifications and data or by consulting scientific literature and comparing the physical and chemical properties of the raw materials in the waste to the hazardous characteristics. CEPRAM's Resolution Nr. 313 prescribes also (Article 4) that, any facility, before receiving hazardous wastes for storage, treatment or disposal, must obtain from the generator a detailed physical-chemical analysis of a representative sample of the waste.

I think that this responsibility of generators concerning the perfect and previous characterization of wastes, even though well expressed in the Resolution Nr. 313, must be better detailed and specified through an administrative regulation. A document like a "Declaration of nature of waste" could be developed, with the clear advantages of standardizing procedures, avoiding duplication of efforts or loss of resources and optimizing the decision-making process.

#### COLLECTION AND TRANSPORT

CEPRAM's Resolution Nr. 313 prescribes (Article 24) that only persons with a previous authorization of CRA, State Environmental Control Agency, may accept hazardous waste for transportation. Again, as in the case of responsibility for waste disposal, there is not designation of a unique

responsibility for waste transportation. According Resolution Nr. 313, transporters may be private specialized enterprises, the waste generators or, also, the State (receiving facilities). Curiously, (and this is another peculiarity of our system) no one private enterprise applied for a full permit to transport wastes. Obviously, the waste generators had to take over themselves this responsibility. Nevertheless, the lack of permitted specialized and reliable enterprise remains a serious problem we must urgently face, in order to avoid situations potentially very harmful to the environment. The tendency, in the short term, clearly, is the enforcement of more stringent requirements for wastes transportation, with regard to adequate equipment and personnel training.

#### SOIL DISPOSAL FACILITIES

We want again to emphasize that the basic idea of a Hazardous Waste Management System is that public health and environment will be protected if there is careful monitoring of transportation of hazardous waste and assurance that such waste is treated or disposed of either at the site where it is generated or after it is carried from that site to a special facility, according certain standards.

Since many questions concerning hazardous waste disposal are still in flux, CEPARAM's Resolution Nr. 313 prescribes only general design operating standards for soil waste disposal facilities. This is a very realistic approach because allows for analysis of each situation on a case by case basis and for use of the best technical knowledge available.

Although some escape of waste constituents conceivably may not present a hazard to the environment, the state-of-the-art for predicting discharges or releases from soil disposal facilities is still poor. So, the best option to ensure protection of human health and the environment is to prescribe design and operating standards which will provide maximum containment of hazardous waste constituents in soil disposal facilities. Unlike our more traditional control action of prescribing standards for releases of contaminants to air and water, we are not aware of any method for designing soil disposal facilities to allow specific constituent release nor are we aware of any method to determine what release rates would be acceptable. Accordingly, the only viable alternative is to require that soil disposal facilities be designed, constructed and operated so that discharges are minimized or do not occur. Nevertheless, the actual knowledge and technical and economical availability of more reliable techniques for waste treatment, e.g., incineration, calls for the establishment of some more stringent requirements for soil disposal facilities, i.e.:

- a) soil disposal facilities would be allowed to dispose of only specific groups of wastes and wastes listing should be an essential part of the facility permit.
- b) the soil disposal of some hazardous waste should be expressly banned, by regulation.

## CONCLUSIONS

The hazardous waste management profits greatly from the extensive knowledge acquired in past decades in the field of air and water pollution control. In this sense, it calls, mainly, for the establishment of requirements for safe disposal of substances whose dangerous properties are, in most cases, previously recognized. Once a waste is identified as hazardous, it must be controlled within a system whose mechanisms must have the same care and attention in all steps of the cycle, from generation to disposal.

The regulation for hazardous waste control in State of Bahia, Resolution Nr. 313 of CEPRAM, covers the main aspects of the problem. This regulation has enough flexibility to allow for future improvements. Such improvements would include a "declaration of the nature of waste", standardized by the State Environmental Control Agency - CRA, and of responsibility of the waste generator, in order to avoid duplication of efforts, to accelerate the decision-making process and to make effective the manifest document. Other improvements are the establishment of more stringent requirements for pre-treatment disposal of wastes, more stringent requirements for the transport of waste, designation of wastes which can be disposed of in a particular facility and designation of wastes which must be subjected to other forms of treatment, e.g., incineration.

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