

Solid Waste Treatment Unit



## Introduction

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Problems increasingly severe and intense generated from modern garbage, with high doses of heavy metals, organochlorines, benzene, dioxins, furans, among others, have been taking to the search for alternative methodologies that can provide an effective , definitive solution and more environmentally friendly solution, especially in the long term, by the awareness of responsibility to our descendants.

Incineration, Gasification and Partial Pyrolysis (with presence of atmospheric air), even via plasma processes, are techniques used by man.

These techniques, despite reducing the weight and the initial volume of garbage, cannot be considered effective, they are unable to dispose the waste, once the waste remains toxic, being presented mainly in the form of ash. More seriously, it is produced large amounts of greenhouse gases, which need to be addressed.

The ashes, despite concentrating on small volumes, are fine particulates of non-volatilizable materials and may contain high concentrations of active elements harmful to the environmental balance, such as heavy metals.

The gases in turn require appropriate filters and intensive maintenance because they contain significant concentrations of pollutants.

Additionally, the combustion process can form at inappropriate temperatures, by means of reactions catalyzed by the ashes, a family of hydrocarbons, usually cyclical, high-destructive power of genomic features of human cells, which results in the production of cancer cells.

Other procedures applied on a smaller scale such as autoclaving and destruction by radiation (including from sources of microwave), for not reducing the volume of disposable material, are not considered appropriate for the disposal of waste.

It is exactly against all negative factors of conventional procedures, also thinking on the survival of future generations, comes the most revolutionary technological innovation, called "Waste Treatment Unit - WTU DuoTherm" (with request for international patent), nicknamed Vorax, thanks to its power to "swallow" almost any waste disposal and give it an economic and highly efficient environmental destination.

## This process differs from the previously cited mainly by the following characteristics:

• It does not process the waste in the presence of atmospheric air. With that, does not produce considerable volume of greenhouse gases to be treated.

• No formation of carcinogenic molecules such as dioxins and furans, which need oxygen to form up. Furthermore, the gases to be treated, which occurs in a small quantity, undergo a thermal shock, not allowing a synthesis in the formation of complex molecules.

• There is no formation of ash in the process, toxic byproduct, as in incineration. The melting of residual particulates components (like gray) in iron and ceramic matrices inhibit the formation of ashes and consequently, there is no solid wastes for which other methods are necessary for their discharge.

• The process is totally automated, which allows the equipment operation to be extremely simple.

• The Vorax - WTU DuoTherm is able to dispose waste whatever its origins are, including the hospital ones, because the process makes all kinds of materials exhibit almost the same behavior: disintegration followed by liquefaction and, when cooled, a new solid composition in the form of inert and non-toxic matrix.

# The Problem

The big global problem over the garbage is to find an effective way to treat it. Incinerate it or gasify it (even with plasma technology) involves the presence of atmospheric air and there it is the real environmental ills. The presence of air entails introducing a lot of oxygen in the process for combustion or gasification.

Highly harmful components differentiate medical waste (considered biohazardous) and industrial from the municipal, such as laboratory dishes, syringes, PVC gloves, needles, transfusion bags and possibly harmful chemicals, as reagents, acid waste, expired drugs, radioactive material, sludge, oils etc.

The incineration or burning of garbage, whether hospital, municipal or industrial, produces large amounts of carcinogen substances, such as PCDDs, PCDFs and TCDD, this fact has been discovered through research carried out in the 1970s. Furthermore, the ashes are generated in this process and should be grounded, as already mentioned.

In the case of hospital and industrial waste, due to the components present in it, the quantity of heavy metals in the ash coming from the incineration is absurdly high, greatly increasing the risk of contamination of groundwater when accommodated in landfills.

The increased presence of chlorine components in these types of waste can also greatly enhance the generation of carcinogenic residues, which are present in the exhaust gases of combustion and in the generated microparticles.

The laws currently in force (as the National Solid Waste Policy, enacted in August 2010, which stipulates the prohibition of dumps) may become even more expensive the treatment of these special wastes, which practically requires the search for new technologies for waste treatment that can make the process cheaper and less polluting.

The technology used in Vorax – WTU DuoTherm of dry distillation, via thermal gradient in the absence of oxygen, is the most effective solution designed worldwide nowadays.



Urban Garbage



Industrial Garbage



Hospital Garbage



**Resulting Solid Material** 

## The Solution

The DuoTherm technology is a technological innovation in which a reactor containing two thermal sources generates heat gradient of high temperatures in these sources. The reactor has not refractory, as in conventional models, except in the melting pot. Therefore, it is lightweight and low maintenance equipment, suitable for use in hospitals, factories, ships, among other places of waste treatment.

The garbage is not mixed with the atmospheric air and suffers a dry distillation, what means, it is completely disintegrated and liquefied in the absence of air, which considerably reduces the formation of pollutants harmful to the environment and health, including carcinogens. The reduction in mass of organic waste in this process is approximately 10:1, by volume, of 100:1 to 200:1, according to the category of waste processed.

# The Process

The Vorax – WTU DuoTherm UTR is capable of processing solid waste of any class, based on innovative technology that generates a thermal gradient produced by two thermal sources. This is a dry distillation process which consists in heating the waste, resulting in three fractions from different physical states:

#### Solid

Glassy or ferric material depending on the composition of the garbage.

#### Liquid

Water and oils.

#### Gaseous

Fuel gas: CH4, H2, CO, and others.

The equipment is compact and completely destroys the garbage effectively and safely, without combustion or an auxiliary equipment. Inside the reactor, there are two thermal sources, one at a temperature of 900 ° C and another at 1600 ° C, forming a thermal gradient, liquefying all solids completely, even inert materials such as sand or iron.

The equipment presents an innovative method of treating solid waste, which requires no combustion of waste and disintegrates as a whole, completely destroying infectious, pathological and organochlorined materials, having as a solid byproduct a ceramic matrix (do not produce ashes) and inert in the bottom of the reactor, with commercial application - the gases formed in the process have no dioxins or furans and are of low volume because they only arise from the disintegration of the material and not from combustion or gasification traditional processes.

The reactor, in turn, works in negative atmosphere, preventing gas leaks. The process is dry distillation of the waste, with absence of air, no combustion of waste, which provides extreme reduction of the exhaust gases as compared with conventional processes and, moreover, does not allow the formation of dioxins or furans, in view of lack of oxygen and high temperature.

The gases formed inside the reactor, are suddenly sucked and cooled (quench) to then be treated and neutralized in an immersion tank, alkaline. Last generation filters, coal-based activated, ensure that the emissions meet environmental standards.

For its operation, the Vorax - WTU DuoTherm only requires a 220V or 380V outlet. The equipment allows to operate continuously or intermittently, as needed by the user. Its power consumption is low and purely electric - a unit of 2000kg/day consumes the equivalent of 5 electric showers (40Kw/hour), depending on the category of garbage.

The Vorax – WTU DuoTherm can be used at a plan environment at least 3.5 m in height. The reactor for medical waste (industry, ships, ports, airports etc). requires minimal training and contains the state of the art technology in the treatment of solid wastes. Its control is automatic - no operator, from departure to the disconnection of its cycle.

## Advantages

#### Applications

It can be used in hospitals, industries, condominiums, islands, villages, ships, ports, airports, among others.

#### Functionality

Anyone can feed the reactor with the material to be treated, which operates automatically. The waste to be treated does not necessarily require selectivity – at first, everything can be processed: organic matter, iron, metals, and even sand.

#### Logistics

The waste treatment occurs in a simple and totally safe way, without requiring any special logistics system.

#### **Environmental**

It treats all unrated materials. It meets the strictest standards. Produces no ash and exhaust gases are fairly low and nontoxic.

#### Safety

Users have complete control themselves as the destination of their waste, being free of any fines imposed by environmental control agencies, due to irregular actions committed by third parties.

#### Saving

The service cost is much lower than that charged by hiring third parties.

#### Types of waste that can be processed

- Pesticides and their containers
- Biomass
- Animal Housing
- Coal
- Ashes from incinerators
- Drugs
- Sewage
- Hospital
- Galvanic sludge
- Organic sludge from petrochemical
- Materials with low radioactivity
- Municipal
- Used oils
- Batteries and battery
- Tires
- · Waste of explosive material
- Hazardous industrial waste

**Technical Note:** There is almost no restriction on the material to be processed in the reactor.



The solid material, a byproduct of the process, is inert and commercially valuable.

In the process, heavy materials (Pb, As, Hg etc) are retained in the crystalline of the ceramic matrix, as well as lead in glass from good crystals.





Vorax UTR DuoTherm 2000

# Technical Specifications Overview

Weight (empty)	1600 kg
Height	2,14 m without the flexible exhaustion pipe
Width	2,23 m
Length	3,64 m
Primary Chamber Volume	0,40 m³
Load Volume	0,35 m³
Exhaustion Pipe Diameter	15,20 cm
Capacity	Etna - 2000 kg/day
Other Models	Tambora - 3000 kg/day Krakatoa - 4000 kg/day Greater capacity will be assembled as and when requested.

# Operational Requirements

#### Voltage

Power (UTR2000)

Installation

220V or 380V

40 kW

Level sanitary flooring and minimum ceiling of 3,5 m.

# Information

## Wide range of applications

- Highly effective process
- Low operating costs due to technology
- Innovative technology for solid waste treatment
- Inert byproducts and gases with pollution levels below from the required by international law

## Training

Training for operation Vorax – WTU DuoTherm is performed onsite installation and the running of the system during the period of 1 (one) day only.

## Investment

#### Implantation

The cost for deploying Vorax - WTU DuoTherm may be funded by Solum Environmental, physical facilities and electrical installations of the local will be provided by the customer.

## Guaranty

The equipment is guaranteed against defects in parts and / or production for a period of one (1) year from the delivery and installation date on the client operation site.

### Maintenance

After the guarantee period, all equipment maintenance will be the responsibility of highly specialized professional from Solum Environmental onsite installation and operation of equipment without cost during the period of the contract.

The maintenance covers expenses with manpower and corrective and/or preventive repairs when necessary. Any parts required will be budgeted separately. Expenses related to displacement, food and lodging of the technicians will be charged to the customer in accordance with the table of values of Solum Environmental for those costs.

## **Delivery Deadline**

The delivery deadline is 120 days.

## **Responsible Technician**

Engr. Carlos Alberto Pereira Filho. CREA: 601403719

TechnologyWTU DuoTherm. Brazil's First Green Patent - n. PI 1104219-2 Patents from other countries: China and Australia





Brazil's First Green Patent



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