

# Technical Memorandum

## DOMESTIC WASTE



# OXALOR® PROCESS

*Nothing is lost ...  
Nothing is created ...  
Everything is transformed.*

**Antoine Laurent de Lavoisier**  
*Chimiste, philosophe et économiste français.*

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## Introduction

The **OXALOR® GROUP** offers governmental organisations and private companies a solution for the treatment and valorization/recovery of domestic waste. Since its creation in 1997, the **OXALOR® GROUP** has gained national and international recognition, thanks to its unique and patented concept.

Thanks to its partnerships with various companies, the **OXALOR® GROUP** offers an increasingly wide-ranging number of products and services to its national and international clients. The valorization by means of by-products resulting from the treatment such as the fertilizing by-products **OXYOM®** and **OXYOB®** offer large possibilities for agricultural use and its Refuse Derived Fuel **COX®** allows an energy-to-waste valorization.

The **OXALOR®** technology is an innovative, ecological, safe and proven industrialized solution for the treatment of raw domestic waste, sludge produced by wastewater treatment plants, plant waste, poultry droppings, liquid manure, etc. The **OXALOR® GROUP** and its national and international experts offer tailor-made waste treatment solutions corresponding to customers' specific needs.

The **OXALOR® GROUP** covers the following areas: consulting, engineering, risk analysis, safety procedures, solution integration, implementation and construction as well as training and technical support.

In a fast-growing economic climate with major environmental issues at stake, the **OXALOR® GROUP** occupies a strategic place at the crossroads between large companies, consultants, equipment suppliers and government decision makers.

The **OXALOR® GROUP** and its experienced team offers a range of operational products and an active partnership policy. The **OXALOR® GROUP** has gained a key position as a supplier of tailor-made solutions for the treatment and valorization of domestic and allied waste.

We take great care to ensure that our production system and solutions are in line with an approved quality policy. Each product is tested individually to ensure that it is suitable for sensitive environments.

The **OXALOR® GROUP** and its waste treatment solutions allow you to participate in the safeguarding of our natural resources.

### **Research in the field of sustainable development**

#### A global mission

Today, environmental and health issues are major concerns for all of us, and the capacity for innovation in these fields has certainly become a priority. Therefore, constant investment in R&D is a key element of our environmental policy.

Our Research centre for the Environment, Energy and Waste, in Alsace, has an overall sustainable development mission with three principal objectives:

- \* **To evaluate** the long-term environmental effects of new processes;
- \* **To develop** new methods for re-using and reducing waste at source;
- \* **To reduce** all types of harmful effects and to improve quality of life and sanitary safety. This is also one of the missions of our company project "**OXALOR® GROUP Reference**".



The growing “globalisation of the markets” and “knowledge-based economy” has made the protection of new ideas and technological innovations absolutely essential.

## OXALOR® re-use technology

This section reiterates the principal claims and objectives of the promoters of the **OXALOR®** process.

### **Origin and principles**

The process originated in the search for a solution for treating grease from wastewater treatment plants. After several tests, the company DCM which has since become the **OXALOR® GROUP**, promoter of the process, comes to the conclusion that grease could be treated at the same time as household refuse or by mixing them with calcium oxide.

The origins of the process were intended for the treatment of household refuse possibly mixed with grease or sludge from wastewater treatment plants.

After several years of experimental research, **OXALOR®** became the trademark for a waste-sorting process, the processing of sorted domestic waste and the resulting product which is used in the agricultural domain.

**The OXALOR®** technology consists of a process of **controlled chemical stabilisation of the fermentable portion of domestic waste, organic waste resulting from selective collection or sludge and doughy or solid by-products.**

This chemical reaction consists of attacking the fermentable portion of household refuse using a calcium oxide based reagent, natural organic additives and water or organic aqueous solutions (diluted liquid manure, liquid manures, cleaning water, slurries, etc.).

This 100% natural reaction is mechanised into a **100% industrial process** generating **0% air or liquid waste.**

The process was optimised by the **OXALOR® GROUP** with the submission of various patents and was integrated in an uninterrupted industrial mechanised system. These patents were the subject of many successive technical improvements at the purpose-built experimental pilot site in the Bordeaux region.

The reaction is established in stoichiometric proportions as follows:



The active chemical reaction and the production of the stabilised product only take around **TWO HOURS**.

The process does not include:

- Crushing (raw waste is not crushed)
- Composting (no controlled aerobic fermentation)
- Incineration (no high-temperature combustion) of treated waste, and does not constitute dumping or depositing as described by law.



- **Principle**

We create an exothermic reaction (heat production) between the reagent and a liquid (sediment, liquid manure, waters) that finds its combustible in the humidity of organic products.

Then, this chemical-physical reaction generates heat which dehydrates and sanitizes the products (killing of pathogenic germs).

At the end of this phase, **all products are stabilized and sanitized.**

- **Separation of the composing elements of the waste stream**

**The products resulting from this process are made of two distinct fractions:**

- Degraded and sanitized organic matter, between 0 and 12 mm (mostly 0/4 mm).
- Non-organic matter (films, bottles and plastics, synthetic or by-products, ferrous and non ferrous metals, textiles, glass, inert and wood).

**According to the expected objective/s, separation by product is possible.**

- **Organo- calcic separation:**

The riddling by trommel (rotating riddle) allows the separation of the organo-calcic fraction, 0-12 mm, from other products.

- **Refinement of the organo-calcic matter:**

A densimetric table and a cyclone allow the refinement of the product through shaking off the heaviest particles (inert, glass, metals, heavy synthetic products) and light particles (plastic films particles, polystyrene balls...).

A cutting riddle of 0-2 mm can be added to this set in order to have two types of extra products:

- A fraction of 0-2 mm mainly composed of lime.
- A fraction of 2-12 mm mainly composed of the organic part of the organo-calcic matter.

- **Separation of other products:**

All products > 12 mm are the products that cannot be transformed by the exothermic reaction because of their composition:

- Plastic products (containers and films, different objects)
- Inert products (glass, stone)
- Ferrous and non ferrous metals
- Different textiles and synthetic products
- Wood
- Other products



N.B: With the exception of closed containers, these products are sanitized and separated from the organic matter. Therefore, they can be collected and recovered respectively through the existing valorization sectors;

According to the expected objective/s, these products are separated successively.

- **Plastic films recovery:**

A windshifter “separator” separates films and plastic bags from the waste stream by blowing and sucking.

These products are collected in skips or packed in bales (from 200 to 300 kg) with a bale press.

- **Recovery of ferrous metals:**

A magnetic separator (OVERBAND) allows us to recover ferrous objects.

These products are collected in skips or pressed into 20 to 30 kg bales.

- **Recovery of non ferrous metals:**

A Foucault current separator (SNF) ejects non ferrous objects.

These products are conveyed to skips or packed into 200 to 300 kg bales with a bale press.

- **Recovery of plastic bottles:**

Plastic recoverable bottles taken into account are:

- PET (water bottles, soda)
- HDPE (milk bottles, detergent containers)

Through reading the infrared spectrum, an optical separator ejects plastic bottles, according to the type as one family (PET and HDPE together) or as two different families (PET and HDPE separately).

These products are collected in skips or packed in bales (200 to 300 kg) by a bale press.

- **Separation of inert matter / wood:**

The remainder of these different separation stages include all the elements which have not been selected before, especially inert matter, glass, different objects and wood.

According to the requirements, wood recovery can be carried out.

A ballistic separator allows the separation of the heavy and voluminous objects (glass, inert, different objects) and lighter ones (wood).

Then, wood can be placed in a skip and evacuated for specific use (cement, incineration) or grinded and reinjected in the treatment process to be used for sediment treatment, or simply to increase the rate of recovery in organo-calcic matter.

- **Storage and packing of products:**

Refined or non refined organo-calcic matter can either be:

- Stored outside
- Or stored in a specific building.



All products resulting from these different separation stages have to either be placed in skips or packed into bales or packs.

## Conception of the Organic Recovery Unit

### Introduction of the Organic Recovering Unit:

This chapter highlights the conception and construction of an organic recovery unit for raw household waste, FFHHW, food waste, community and market waste and purification stations sediment.

### Capacity of the Recovery Unit:

The organic recovery unit was established to treat 16 t/h of waste; i.e. 30 000 to 75 000 t/year in one or two shifts.

- **Broad lines of the process:**

The broad lines of the process are the following:

**From a closed dock located at N+1.5, the HHWT unload their content on three large metal collection vehicles applying the principle of First in, First out, in order to insure that no product remain in the reception hall more than 8 hours.**

*This installation allows the reception of 3 HHWT simultaneously.*

**All received and stored products on the collection vehicle are sent to a sorting control vehicle, where an operator removes unwieldy and pollutant products (plastic covers, appliances, bulky ferrous and all products resembling to BIW) and puts them in specific skips with a hydraulic manipulator arm.**

*This alternative functioning of the 3 vehicles reduces the fluctuation of distribution of the products forming the deposits.*

*The pre-sorting control operator sits in a cabin equipped with air treatment according to the recommendations in vigour.*

**Then the products are put in a homogenization barrel.**

*This process reduces the fluctuation of dividing the products forming the deposit.*



**Then, the homogenized products are mixed with the gathered liquids, the reagent, and the vapor-washing water and depending on the treated products, with sediments, dirty water, green waste, or recycling wood of the process. Then the products are loaded into barrels of exothermic reaction.**

*During an hour, the mix is stirred slowly in order to homogenize the reaction.*

*The vapours resulting from this exothermic reaction are caught, washed then reinjected in the mixer in the next batch.*

**The mix done in each batch is sent to the thermo absorber where the exothermic reaction continues and dehydrates the product.**

*The vapours resulting from this exothermic reaction are caught, washed then reinjected in the mixer in the next batch.*

*Step by step, the thermo absorber moves the product in reaction according to the principle of First in, First out.*

**When the raw products gets out of the thermo absorber, they are riddled with a trommel of a granulometry of 12mm**

*The products > 12mm are expelled from the trommel as stable refusals.*

*The products < 12 mm head for the refinement unit.*

**A densimetric table separates from the 0/12 mm fraction:**

- *The heavy products (glass, inert, metals, heavy plastics, button piles...)*
- *Via the cyclone, the ultra light products (plastic films particles, polystyrene balls...)*
- *The extra heavy products (glass particles or metal particles < 3mm)*
- *The final product called light is the organo- calcic.*

**An aeraulic separator/windshifter divides the products > 12mm into two families, the light and flat/heavy and voluminous**

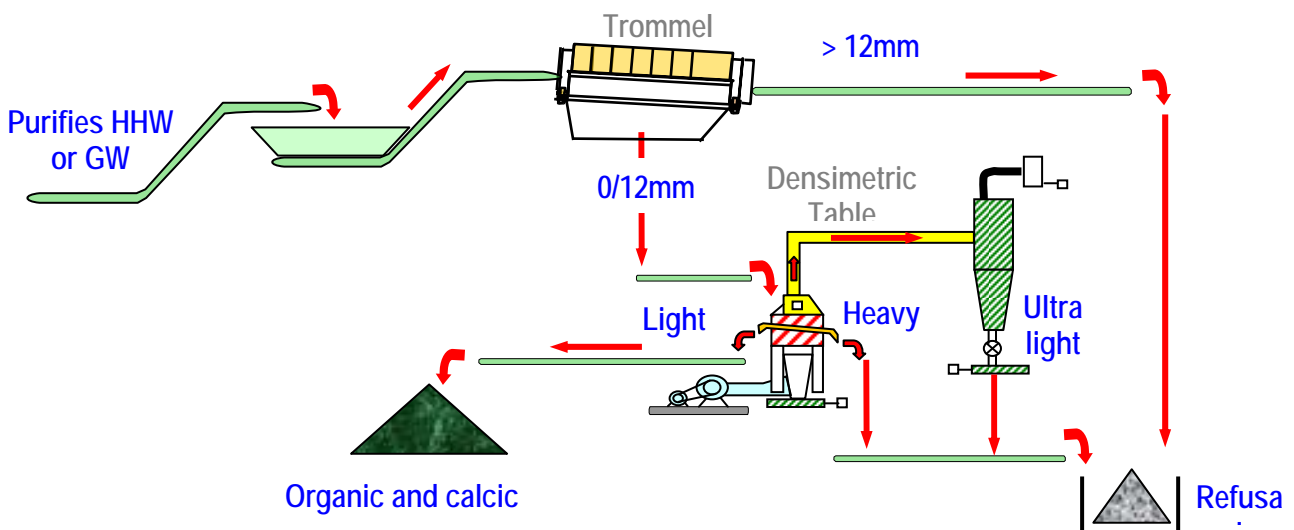
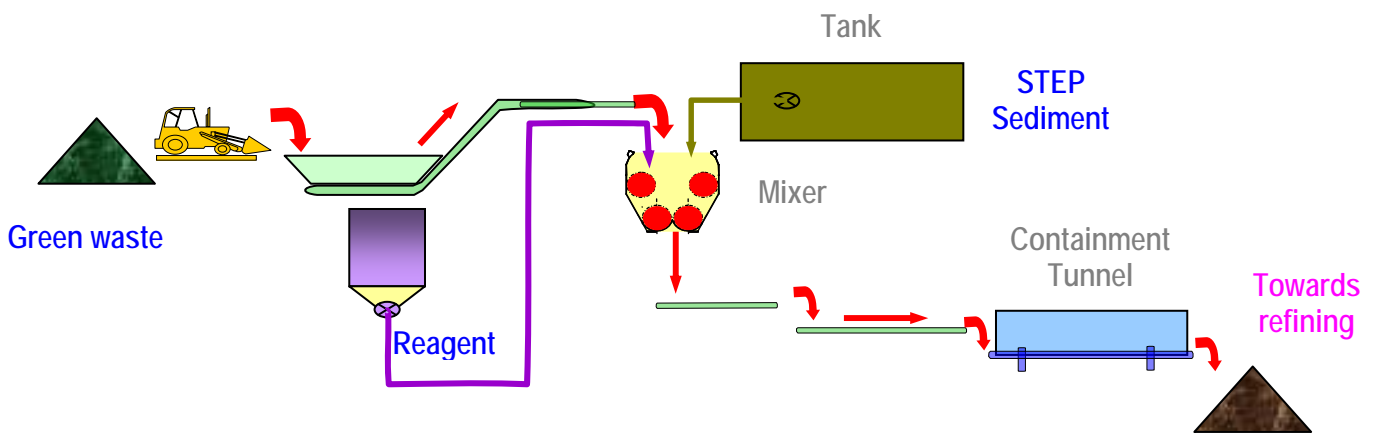
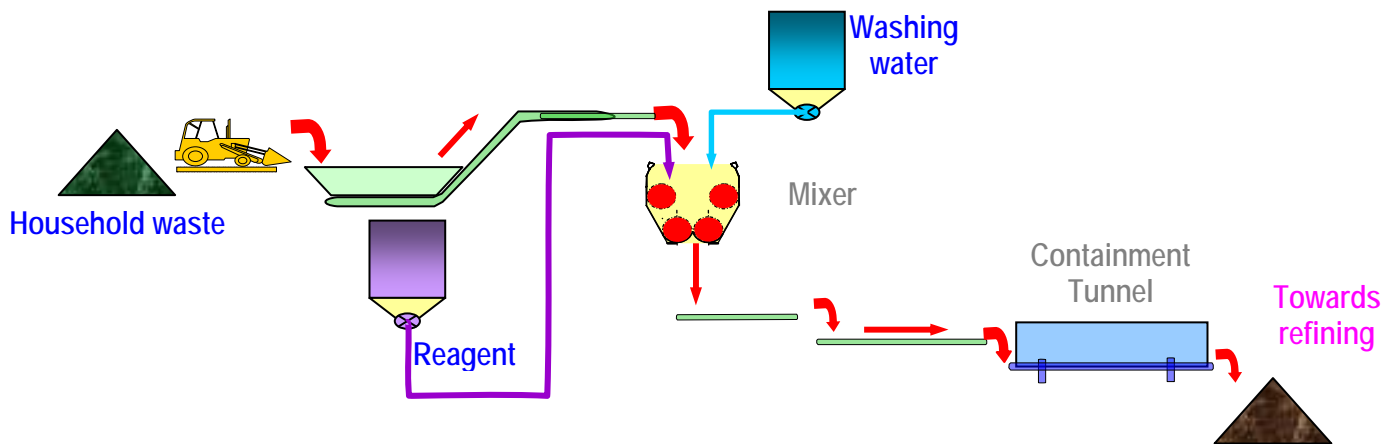
- *On one side plastic films, textiles and polystyrene*
- *On the other side, inert matter, glass, bottles, metals and wood.*

**Then, the heavy and voluminous matter is separated according to the quality of the products:**

- *Ferrous are caught by a magnetic separator*
- *Non ferrous are ejected by a Foucault Current separator*
- *Plastic bottles are ejected by a spectrum separator*
- *Inerts and wood are then separated by a ballistic separator*
- *Wood products are reinjected in the mixing unit in order to be used again.*



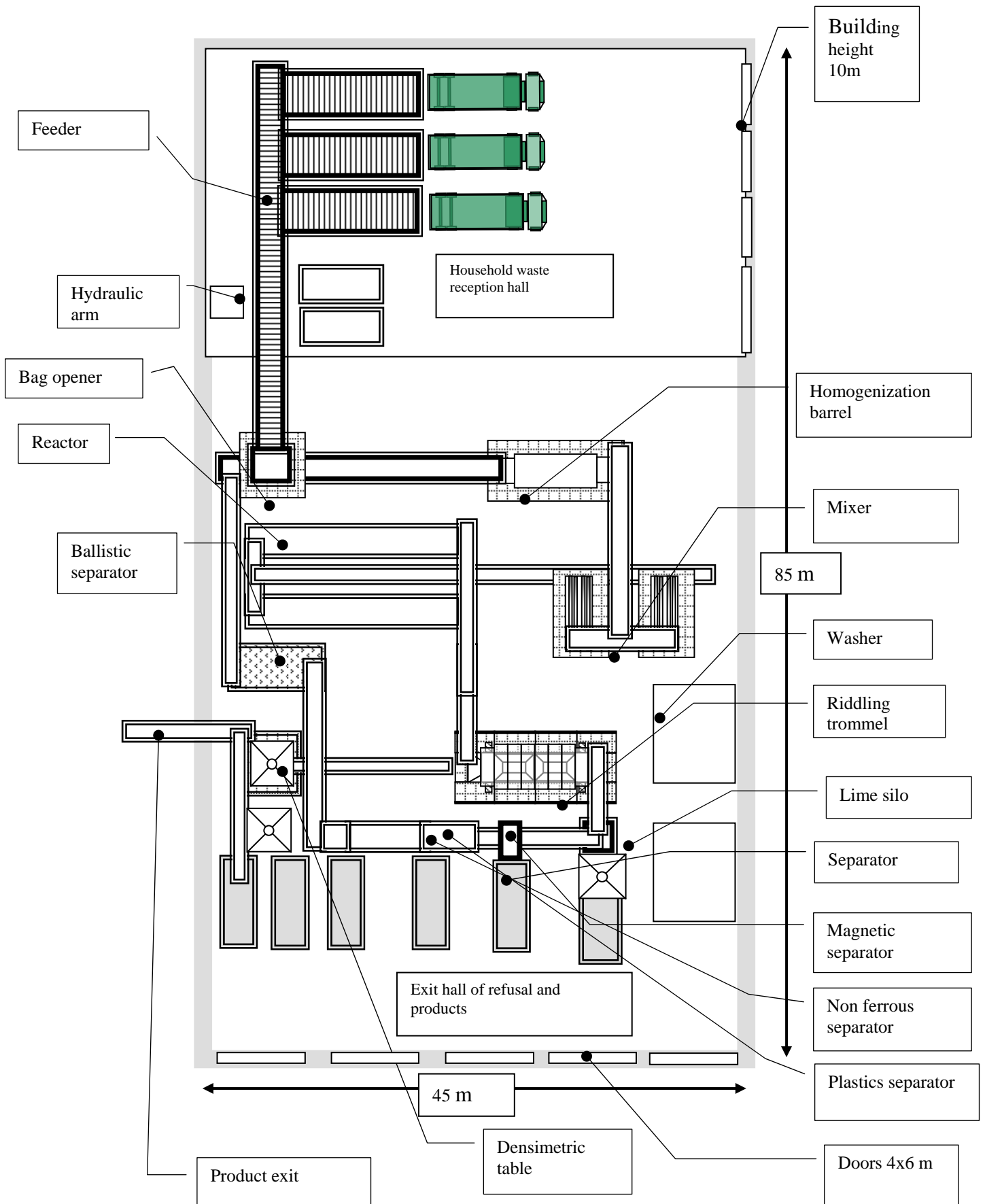
- Principle flow chart of the basic line of treatment







• Basic model of setting up type:





## Pollution treatment

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### Odour treatment:

#### **Air treatment**

The organics reception zone is totally closed and equipped with quick open doors.

#### **Ramps of diffusion**

The three reception extractors are topped with ramps of diffusion of bactericides and essential oils of covering and colour cleaning.

#### **Homogenization trommel**

The “trituration, homogenization” trommel is equipped with aspiration flange to catch odours.

#### **Reactors and thermo absorbers**

In these equipments, the reaction takes place in a closed environment. The odours and vapours emitted are continuously aspirated, then treated in a washer.

### Liquids treatment:

The metallic vehicles that receive waste aren't put in pits, rather on the same level as the other preparation equipments.

Here, the ground is coated with resin. It is inclined by 1%, which eases the flow of liquids in a main gutter, equipped with a sewage pump. Hence, the liquids are sent to the water processing tank.

A sprinkling ramp insures the daily cleaning of the ground.

Water and electrical plugs are available for the use of a high pressure cleaner for weekly integral cleaning of the reception equipments.

Like the ground below the reception zone, the ground under the homogenization trommel of the reactors is inclined by 1%; it is coated with resin and has main gutters for liquids and water, which facilitates the cleaning processes.

The transfer and conveying of liquid-generating waste are ensured by tunnels. All liquids gathered by these tunnels are sent to the water processing tank, like all other liquids.

### Noise treatment:

All equipments used in the process are noise-free.

They abide by the standards and recommendations, i.e. 85 dBA at 1m

According to the set up location and the acoustic regulations, it is necessary to proceed to an acoustic modeling in order to determine the corrective and palliative measures to be installed in the building (acoustic speakers, double weatherboarding, specific sound proofing).



## Positive sides of the process

- **The quickness of the treatment :**

The reaction is quick (3 hours in the reactor and thermo absorber) compared to the best speeds of production of the urban compost (hot fermentations, slow maturation from several weeks to several months); methanization (several days to several weeks of contact time).

- **Stabilisation and sanitization :**

All the products or materials forming the treated deposits undergo the same exothermic reaction which makes them stable and sanitized.

- **Absence of related pollution:**

No liquids or odours are generated by this process.

- **Optimal recovery:**

This process allows the separation and classification of most of the products and materials forming the deposits. Hence, it offers the possibility of evacuating these products and materials to the recovery channels, or the most appropriate and economical treatment.

- **Reduction of the volumes to landfill or incinerate:**

This process permits an optimal degradation of the fermentable products, specifically cardboards, and a separation of the different components (ferrous, non ferrous, films, plastic bottles, glass, inert, wood). Therefore, this process limits landfilling and incineration.

The industrial chain is mechanical and automatic: mechanical sorting is developed to insure maximum recuperation of recoverable materials.

- **Limitation of built surfaces:**

Given the speed of the process, it doesn't require big reception surfaces. In addition, given that the product resulting from the installation is stabilized, and doesn't emit odours, it can be stored outside without problems and does not require specific constructions.

- **Limitation of investments:**

Given the limitation of the built surfaces, and the easiness of the process and the used equipments, investments needed are perfectly controlled.

- **Low operating costs**

Given that the process requires a small number of personnel (4 persons for operating the unit), and the strength, simplicity and energy-saving equipments, operating costs are totally.

- **Quick implementation**

A unit of 70 000 t/y is feasible (without administrative deadlines) in a period of 10 to 12 months depending on the site on which it will be built.



- **Concept modulation**

The implemented concept aims at treating 16 t/y of raw HHW (without BIW) and/or similar products. This means that the module is capable of treating 35 000 t/y when operated with one shift or 75 000 t/y in the case of 2 shifts.

Then, this concept has the capacity to treat from 30 to hundreds of thousands of tons annually, simply by adding a supplementary module similar to the previous one, without adaptation or modification on the existing module.

- **Gaining an organo- calcic amendment to be used in agriculture**

The buyer should make the necessary procedures with the instructor bodies and decision makers in order to obtain the authorization for the agricultural use of this product.

## *Scientific Validation*

### *RITTMO*

RITTMO is an RCITT (Regional Center for Innovation and Technology Transfer) specialized in the field of organic fertilizers.

The RITTMO operational team includes 2 agricultural engineers holding a PhD and a specialization in earth sciences, a microbiologist holder of a PhD and a state thesis, a physiologist preparing a PhD, 3 high technicians, a scientific librarian and an administrative.

Based in Alsace region, RITTMO operates in France. RITTMO is an association of professionals. It receives the support of the EU, Ministries of Agriculture and Research, the ADEME and Alsace region.





### Our product logic

“**Product logic**” is the term used for the possibility of referring to regulations relating to the marketing of traditional manures or soil conditioners, whether they are organic or inorganic.

All texts regulating the spreading of sludge in a “waste logic” explicitly exclude sludge or sludge-based products which have been approved in accordance with the law of July 13 1979 (or have obtained a Provisional Authorisation of Sale) or which are in conformity with a compulsory standard. Progressively with the establishment of the texts governing the spreading plans, the legislator thus wanted to retain this possibility.

Regulations relating to registration or standardisation are clearly more restrictive when dealing with the safety of these products, and the justification of their agronomic value and thus of its consistency. Composition consistency is indeed very difficult to control for waste products.

This superior product quality considerably reduces the environmental impact and health implications and even enables the use control as practised within the framework of “waste” logic to be by-passed.

**On July 11 2002, within the framework of its registration request, the OXALOR® GROUP obtained a two-year Provisional Authorisation of Sale from the Ministry for Agriculture and Fisheries, in its capacity as a basic organic soil amendment for large-scale farming use on neutral and acid soil.**

**“registration guarantees the quality of a product and its manufacturing process”**

### ***WASTE TREATMENT CODE***

*SAS Capital 100.000 €*

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