VOMM Impianti e Processi SpA

TURBO TECHNOLOGY FOR STERILIZATION AND DRYING OF HAZARDOUS MEDICAL WASTE

COMPANY PROFILE

Engineering and construction of heat treatment plants and waste/biomass combustion systems

Plant operation and maintenance

Key figures:

- More than 170 employees
- More than 50 international patents
- More than 600 projects successfully delivered
- More than 50 years of activity

CE *ISO 9001:2015 - ISO 14001:2015 - ISO 45001:2015*

THE VOMM CONTINUOUS SOLUTION FOR STERILIZATION

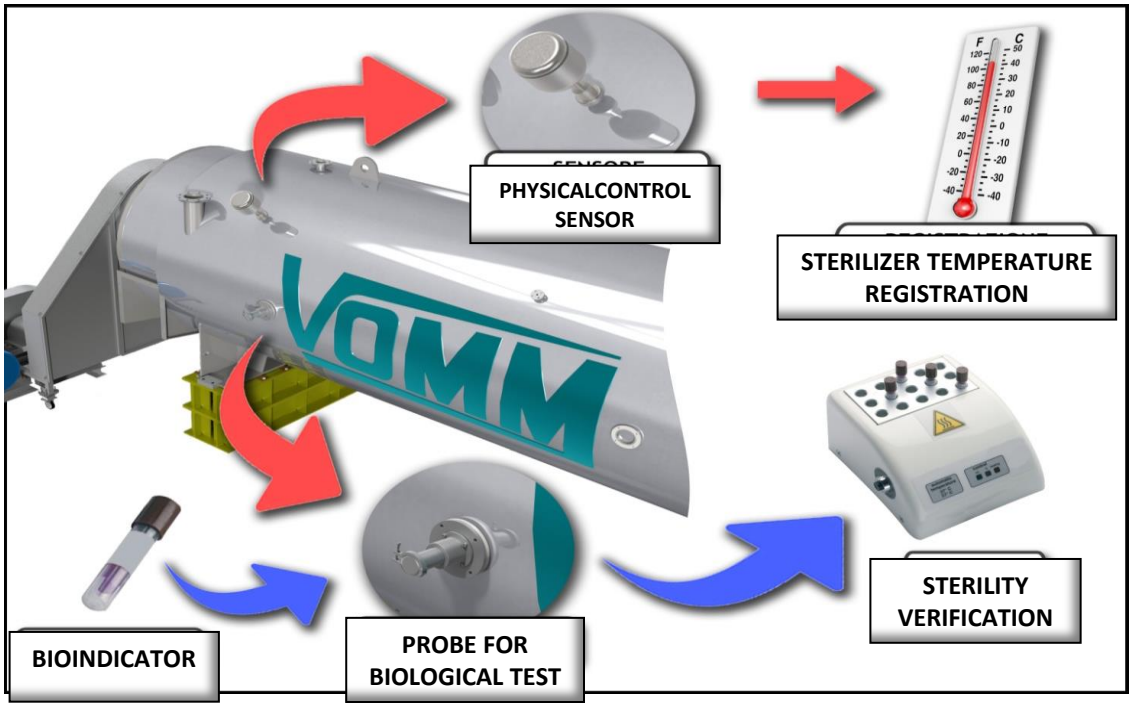
VOMM has developed an innovative solution for the sterilization of infectious or potentially infectious hospital waste, based on its know-how developed in over 50 years of design and construction of continuous industrial plants in the chemical-pharmaceutical, food and environmental sectors.

The system is designed and built according to the specific needs of the customer (the loading section based on the type of container used, the thermal power station, the heat transfer fluid, etc.)

The fully automated VOMM solution guarantees the sterilization of large quantities of waste with few dedicated personnel.

THE VOMM CONTINUOUS SOLUTION FOR STERILIZATION

STERILIZATION PROCESS EFFICIENCY CONTROL



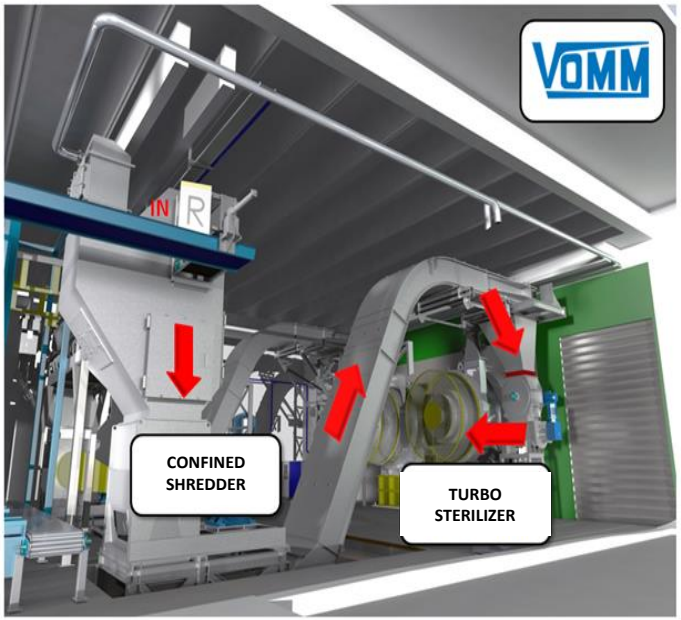
According to the ISO 11138-1/3 regulation, sterilization chamber is equipped with specific housings which allows to introduce a biological gauge during the sterilization process.
The biological gauge test is carried out during the continuous sterilization process in same thermal and temporal conditions of the treated material.

The biological gauge is ATCC7953 Bacillus Sterothermophilus type with the concentration 10^6.

A sterilization cycle takes about 15 minutes.

THE VOMM CONTINUOUS SOLUTION FOR STERILIZATION

The waste to be treated is identified according to the code CER 18.01.03* and 18.02.02*.



After the treatment the sterilized waste is identified according to the code CER 19.12.10 (CSS).

MEDICAL WASTE

Average quantity of infectious and potentially infectious medical waste, produced by one hospital bed in one day amounts around 2 kg.

The containers for the separate collection, treatment and disposal of infectious waste from healthcare facilities are reusable or disposable.

MEDICAL WASTE: COMPOSITION

The hospital waste description in accordance with European law (CER 18.01.03*):

- sanitary napkins, pediatric diapers and diapers;
- cotton buds for colposcopy and paptest;
- non-sterile eyepieces;
- ophthalmic sticks of TNT
- cannulas and drains;
- catheters (vesical, venous, arterial, for pleural drainage, etc.), fittings, probes;
- circuits for extracorporeal circulation, deflectors;
- single-use cuvettes for endometrial biopsy sampling
- contaminated phleboclysis
- disposable material: vials, pipettes, test tubes, protective clothing, masks, glasses, canvas, sheets, shoe covers, seridraps, overshoes, overalls;
- infusion sets, rectal and gastric probes
- material for dressings (gauze, tampons, bandages, plasters, lengths, tubular meshes)
- disposable gloves;

- dialysis filters, filters and glands from hoods (in the absence of chemical risk)
- bags (for transfusion, urine, ostomy, parenteral nutrition)
- tubes (nasogastric for bronchoaspiration, for oxygen therapy, etc.)
- brushes, catheters for cytological sampling
- auricular speculum, vaginal speculum
- plasters and bandages, single-use automatic saturators
- teeth and small anatomically recognizable parts, waste of denistic toilets
- empty containers, empty containers of vaccines and live antigen.
- plates, culture media, and other materials used in microbiology and contaminated with pathogens
- needles syringes, blades, glasses, lancets, lancets, venison, razors and disposable scalpels
- unidentifiable tissues, organs and anatomic parts

Moreover the same plant can treat also the medical waste from veterinary clinic (CER 18.02.02*).

MEDICAL WASTE: FEATURES AFTER STERILIZATION

STERILIZED WASTE PROPERTY

The treated waste is transformed in the dryed material in fine pieces, physically, chemically and biologically homogeneous, stable and unable to emit odors or vapors.

- doesn't contain any recognizable element,
- the glass is completely pulverized,
- the metal materials are reduced in small parts of few millimeters without any sharp or cutting parts,

REDUCTION OF WEIGHT AND VOLUME

The humidity of medical waste averages 25% and usually Client asks to reduce the humidity content up to 5 - 10%.
This means that:

- from 500 kg of medical waste to be treated will be obtained about 400 kg of treated waste;
- from 1000 kg will be obtained about 800 kg;
- from 1500 kg will be obtained about 1200 kg.

Specific weight of medical waste averages 0,1 kg/l, in other words, 1 kg of waste occupies 10 liters of volume. It means that the weight of a 60 liters container (the most used one) averages 4 kg, because according to the regulations a medical waste container shouldn't be filled more than for ¾ of total volume.

MEDICAL WASTE: FEATURES AFTER STERILIZATION

SECONDARY SOLID FUEL PRODUCTION

The properties of the material are in accordance with the regulation UNI EN-15359 for refuse-derived non mineral solid fuel. The material has a volume 3 - 5 times lower than initial volume and almost null humidity. This leads to 20-25% reduction of average weight (the value corresponds to average humidity of initial waste).

Thanks to dehydration the final material has a high calorific value, about 22.000 kJ/kg, higher than the minimum established by regulation (15.000 kJ/kg), this is also because of it's composition that includes a lot of cellulose and polyolefin plastic.

Such composition allows to confer the sterilized material to the authorized plants as secondary solid fuel.

VOMM HTS SERIES

The models offered by VOMM belong to the HTS Series:

- **VOMM HTS 500 for a maximum capacity of 500 kg/h**
- **VOMM HTS 1000 for a maximum capacity of 1,000 kg/h**
- **VOMM HTS 1500 for a maximum capacity of 1,500 kg/h**

VOMM HTS 500 MODEL

VOMM HTS 1500 MODEL

STEPS OF THE PROCESS

PHASE 1 *TRANSPORT AND LIFTING*

PHASE 2 *LOADING AND SHREDDING*

PHASE 3 *STERILIZATION*

PHASE 4 *AIR CIRCUIT*

PHASE 5 *EFFLUENTS*

PHASE 6 *STERILIZED WASTE UNLOADING*

PHASE 1 TRANSPORT AND LIFTING

Hospital waste is transported to the treatment plant in approved containers, made of cardboard or plastic, respectively disposable or reusable.

Before entering the shredder hopper, the containers are subjected to radiometric checks to verify the presence of radioactivity, and to a metal detector that alerts in the event of the discovery of large metal masses such as prostheses, etc. (systems not supplied by VOMM). In the event of a positive response from the radiometric control or the metal detector, the containers are isolated and stored in a reserved area.

The containers are transferred to the lifting system, designed according to the customer's needs (for containers of 40-60-600-1100 liters, etc.), which lifts and unloads the containers into the loading hopper.

PHASE 2 LOADING AND SHREDDING

The loading hopper is constantly kept in depression to prevent the spread outside of infectious agents.

In the lower part of the loading hopper there is the continuous shredder with rotating blades, which reduces containers and waste into homogeneous pieces, according to the customer's specifications.

PHASE 3 STERILIZATION

Continuously shredded hospital waste is collected, transported and dosed by a screw in the TURBO STERILIZER.

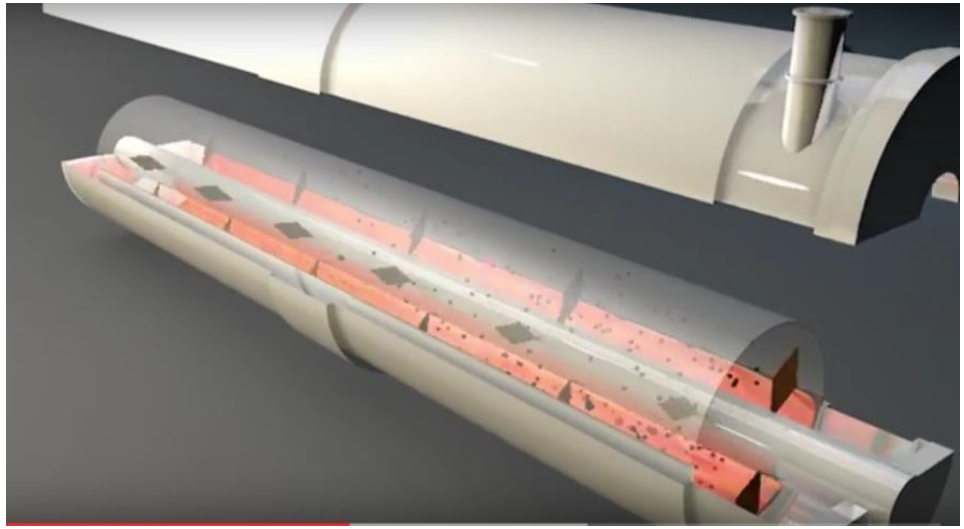
The TURBO STERILIZER is composed of a sterilization chamber, equipped with a double jacket for the circulation of diathermic oil or steam, and a bladed shaft.

The bladed shaft rotates at an appropriate speed to shake the material and bring it into contact with the internal wall of the sterilization chamber ensuring a minimum transit time for sterilization (~ 15 minutes).

The heat resistant probes measure the internal temperature of the chamber to control process conditions from 151° C up to 180 ° C. Their measurements are recorded and stored in a protected file.

The sterilized waste is discharged after treatment.

PHASE 3 STERILIZATION



Heat transfer occurs by convection and conduction:

- circulation of vapor (convection), or the "moist heat" method, which penetrates the core of the particles,

- by contact of the shredded material with the internal wall of the TURBO STERILIZER (conduction), thanks to the action of the rotor..

Heat transfer fluid: diathermic oil or steam.

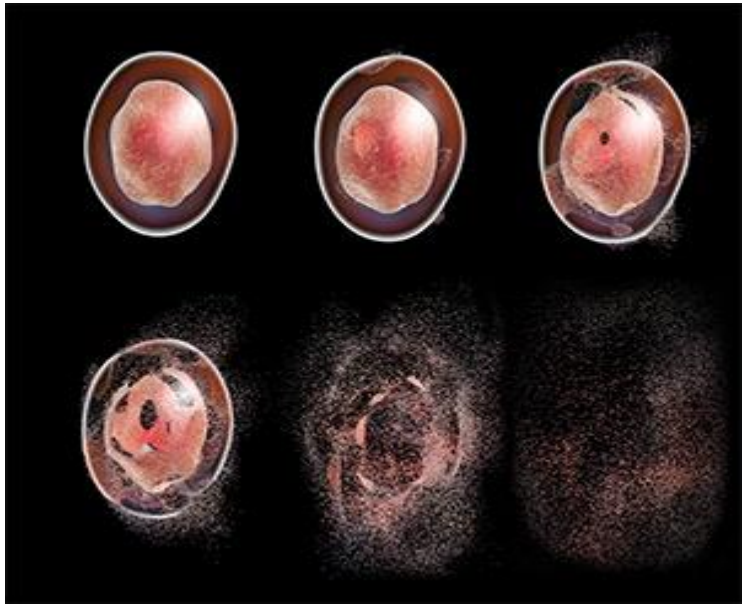
The heat transfer fluid used in the VOMM process is diathermic oil or steam, heated by a boiler that uses fossil fuel, solid recovery fuel or thermal waste made available by the customer.

The heat transfer fluid is circulated in the double jacket to heat the **TURBO STERILIZER** and in the exchanger to heat the process gas. Their temperatures are regulated separately, in order to optimize the sterilization and drying process.

After releasing the heat, the heat transfer fluid returns to the boiler.

PHASE 3 STERILIZATION

The combination of time / temperature / steam causes the protein denaturation of microorganisms up to cell lysis.



CELL LYSIS

The steam, produced thanks to the humidity of the material or introduced by injection into the VOMM process constitutes the heat transfer fluid, transmitting the heat necessary for sterilization to the treated material.

PHASE 4 AIR CIRCUIT

The steam is introduced into the **TURBO STERILIZER** in co-current with the material to be treated. At the outlet of the **TURBO STERILIZER**, the steam formed during the process and that put into circulation are collected by a hood mounted on a transport system.

The steam is filtered to capture any dust and, subsequently, is circulated by the fan which ensures its flow to the exchanger or is superheated before returning to the sterilization chamber via an aeraulic circuit.

PHASE 5 EFFLUENTS

The steam, substantially corresponding to the water evaporated during drying, is automatically extracted from the closed sterilization circuit and sent to the condensation column.

The condensate is collected in the lower part of the column and sent by pumps to a collection tank (not supplied by VOMM).

The non-condensables extracted from the top of the condensation column and the air extracted from the loading hopper after specific filtration are sent for treatment (not supplied by VOMM).

PHASE 6 STERILIZED WASTE UNLOADING

The transport system collects the material unloaded from the TURBO STERILIZER.
It is equipped at the opposite side with a rotary valve which guarantees the tightness of the system.

The sterilized material assumes the CER code 19.12.10. Its average calorific value is around 22,000 kJ / kg.

THE ADVANTAGES OF THE CONTINUOUS VOMM SOLUTION

The **VOMM** continuous sterilization solution has many **advantages**:

- Process based on the method of moist heat;
- High efficiency, without limits for the bacterial load at the entrance.
- Reduction of the weight of the sterilized material;
- Reduction of the volume of sterilized material;
- Production of recovered solid fuels with high calorific value (about 22,000 kJ / kg, certainly higher than the minimum required by the UNI EN-15359 standard of 15,000 kJ / kg for the CSS classification, also thanks to its cellulosic and plastic composition of an essentially polyolefinic nature;
- After sterilization the material is dry, stable and odorless;
- A single collection point for liquid effluents (condensate);
- A single collection point for the gaseous effluent;
- Minimal impact on the environment;
- Emergency cycle applicable in case of breakdown;
- Minimum use of bactericidal substances for maintenance safety;
- Absolute compliance with current regulations.

CASE HISTORY – Salerno ITALY – 500 kg/h

Sterilization plant was designed and built in accordance with prescriptions of DPR 254/2003 “Discipline for medical waste management, according to the art. 24 of the law 31/07/02 n.179", and allow to treat medical waste packaged in both disposable and reusable containers, by processes of sterilization, shredding and drying.
The plant is based on one treatment line and guarantees the following performances:

CAPACITY’	0,5 t/h
	3.750 t/y
HUMIDITY at the entrance	about 20%
HUMIDITY at the outlet	about 5%

CASE HISTORY – Caserta ITALY – 500 kg/h

Sterilization plant was designed and built in accordance with prescriptions of DPR 254/2003 “Discipline for medical waste management, according to the art. 24 of the law 31/07/02 n.179", and allow to treat medical waste packaged in both disposable and reusable containers, by processes of sterilization, shredding and drying.
The plant is based on one treatment line and guarantees the following performances:

CAPACITY’	0,5 t/h
	3.750 t/y
HUMIDITY at the entrance	about 20%
HUMIDITY at the outlet	about 5%

CASE HISTORY – Arenzano (Ge) ITALY – 3.000 kg/h

Sterilization plant was designed and built in accordance with prescriptions of DPR 254/2003 “Discipline for medical waste management, according to the art. 24 of the law 31/07/02 n.179", and allow to treat medical waste packaged in both disposable and reusable containers, by processes of sterilization, shredding and drying.
The plant is based on two treatment lines and guarantees the following performances:

CAPACITY’	3 t/h
	24.000 t/y
HUMIDITY at the entrance	about 20%
HUMIDITY at the outlet	about 5%

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