STRONG POINTS OF ECOSYST® TECNOLOGY





MEDICAL WASTE STERILIZATION SYSTEM



ABOUT US

Eco.System S.u.r.l. is a private company founded in 2007 with the aim of designing and manufacturing special industrial machinery. Following the rise of global awareness of the environmental crisis, Eco.System has developed new equipment and plants to be used in the transformation, recovery and processing of potentially infectious biomedical waste, contributing to the maintenance of a healthy and safe environment and to the promotion of sustainable development.

Research and technological development has taken place over the years since its establishment and has resulted in the construction of a **certified**, **patented** plant which has received positive reviews and approvals from relevant institutions.

Eco.system S.u.r.l. has developed a technology called ECOSYST[®], an innovative method for the sterilization of potentially infectious hospital waste (CER 18.01.03 * and 18.02.02 *).





Our technology has been designed to treat a wide variety of regulated medical waste, including hospital and laboratory waste, medical, solid and liquid waste, human and animal pathological waste, sharps containers and hospital waste as well as any other waste listed in state/federal regulations as biomedical waste.

Eco.System plants are renowned for superior performance in terms of safety, speed, reliability and flexibility.

Eco.System is currently based in Puglia in the city of Modugno (BA), Italy.

Its business premises consist of a design/engineering workshop, an area dedicated to marketing and administration, as well as a production workshop. Eco.System has already entered into agreements nationally and internationally with companies specialized in the management of medical waste.





STERILIZATION

A process capable of killing all microorganisms, pathogenic and non-pathogenic, and of

inactivating all viruses present in an object or environment, including spores.

- PHYSICAL MEANS: Heat (dry, humid) Radiation (UV, ionizing) Filtration
- CHEMICAL MEANS: Liquid Gas (ethylene oxide)

ECOSYST STERILIZATION PROCESS

> STERILIZING AGENT: humid heat – water vapor at high temperature

(good thermal conductivity and high penetrating power => increased efficiency),

- Used in the following form: pressurized steam;
- The technology does not require sewage system involvement;
- > The technology creates no polluting emissions into the atmosphere;
- It does not emit liquid waste by-products





The technology, in addition to complying with the provisions of Presidential Decree 254/2003 and the related UNI Standard 10384/94, has been reviewed by means of:

- Opinion by the Higher Institute for Environmental Protection and Research (ISPRA the public research institute utilized by the Ministry of the Environment) underlining how the treatment with saturated steam at high pressure is sufficient for the sterilization of potentially infectious biomedical waste
- **Test** carried out by the Department of Biomedical Sciences and Human Oncology of the University of Bari "Aldo Moro", which confirms compliance with the provisions of UNI 10384/94
- Test by the "Labour Center Ambiente" Laboratory in Bari.

Among the major international bodies which officially recognize the need for a shift to alternatives other than incineration, as well as numerous national regulations in different countries, the following stand out:

- World Health Organization (WHO), a UN specialized health agency, founded on 22 July 1946 and entered into force on 7 April 1948 headquartered in Geneva,
- United Nations Environment Program (UNEP): an international organization that has been operating since 1972 against climate change in favor of protecting the environment and promoting the sustainable use of natural resources,
- Health Care Without Harm: a coalition of 500 members from 53 countries working to innovate the health sector worldwide





ISPRA - Higher Institute for Environmental Protection and Research (public research body used by the Ministry of the Environment)

ISPD A	Roma,	07	011. 20	801
Initiano Superiore per la Protezione e la Ricerco Ambienzale	Prot. n.	0	331	78
	Spett.le ECO.SYSTI Via delle Me 70126 BARI e.a. Dr. Mar	M S.r.l. daglie D'Ori io Damiani	5, 19	
	Spett	ECOSYSTI	IN ME	1
Oggetto: Valutazione dell'impianto di sterilizzazione de Rif.: Vs. noto del 04/08/2008	ella ECOSYSTEM	di Bari.		
Con riferimento alla Vs. nota del 04/08/2008, si con	nunica quanto segue.			1
Sotto l'aspetto operativo, l'impianto di sterilizzazione E trattamenti che rientrano tra quelli indicati nella Nor sterilizzazione deve avvenire con un trattamento che cons tale da garantire un S.A.L. (Sterilità Assurance Lev procedimento che comprenda anche la triturazione e l'ess e maggiore efficacia del trattamento, nonché, della diminu	cosystem esaminate ma UNI 10384/94, enta un abbattiment vel) non inferiore siccamento, ai fini di zzione di volume e p	effettua u che prevo o della cari a 10 ⁻⁶ , m ella non ric peso dei riff	na serie ede che ca batte iediante onoscit iuti stes	e di e la erica e un pilità si.
Infatti, l'impianto è strutturato in modo da garantire le s preventivamente effettuata la triturazione del rifiuto: 1) trattamento con razgi UVC:	seguenti tre fasi di	trattamente	o, dopo	aver
2) trattamento con vapore saturo;				
 trattamento termico con microonde. 				
Nella prima fase i rifiuti, trasportati su un nastro all sottoposti all'azione di raggi UVC aventi un'energia trattamento è all'incirca 3-4 minuti. Nella <u>seconda fase</u> di trattamento, i rifiuti vengono tratta em di una coclea, con vapore saturo ad una pressione di 4 di 0.5-0.8 minuti, in modo da mantenere i rifiuti stessi pe 140°C.	a velocità di 2-4 a specifica di 380 tti, all'interno di un bar e temperatura r tale durata ad un	metri/min) J/m2. L n tratto ini di 160°C a temperat	uto, ve a dura ziale di per una ura mi	i 50-80 i durata nima di
Nella terza fase, infine, i rifiuti già umidi, vengono trati superiore a 121°C per un tempo non inferiore a 20 minuti	tati con vapore sa	turo ad ui	na temj	peratura
L'efficacia dell'impianto, inoltre, deve essere verificata all'Allegato III del DPR 254/2003, con l'impiego di b nell'impianto stesso.	periodicamente, ioindicatori adeg	secondo o uati al pro	juanto ocesso	stabilito adottato
A livello indicativo, la sola fase 3) del trattamento ne esidenza di 20 minuti, sarebbe sufficiente per un abbattin	ell'impianto Ecos mento della carica	ystem, co batterica	on un di cire	tempo di ca 10 ¹³ .
afatti, il trattamento, in autoclave con vapore si ereathermophilus presenta un D-value pari ad 1,5 min cessario per assicurare una riduzione della carica batter	saturo a 121°C nuti, che consiste rica ad 1/10 di qu	, del b nel temp ella inizia	atterio oo di t ale).	Bacillu
Distinti saluti				
	Ser	vizio Rif	iuti	
	11.1	Resnoncal	hile	
	5-1	10 misa	Lauri	
	Dright	2000	Lara	C.





TEST CONDUCTED BY THE UNIVERSITY OF BARI





WASTE TREATMENT PROCESS





2 AUTOMATIC TIPPER **3** LOADING HOPPER

5 STORAGE

COMPARTMENT

7 STERILIZATION CHAMBER

8 FINAL UNLOADING SCREW

10 UNLOADING SCALE







The filling of the trolley initiates the waste preparation phase for subsequent dispatch to the sterilization phase. The two phases are batch processes that can take place simultaneously, i.e. during the sterilization process it is possible to start the preparation of a new load of waste.

The automatic preparation cycle encompasses the following steps:

1. LOADING:

The infected waste which has been loaded inside the bin (10) at the entrance after an initial weighing (1), is raised and overturned (2) in the hopper (3). Once the loading operation has been completed, the hopper will then be closed before entering the next phase.

3. ACCUMULATION:

The shredded waste is gathered into a storage compartment (5) which directs the screw conveyor towards the sterilization chamber (7). In addition to homogenizing the shredded load, the storage compartment regulates the introduction of new waste to the hopper via its filling sensors.

2. SHREDDING:

Shredding takes place using a 4-axis knife shredder (4) equipped with an automatic anti-blocking system. The waste is unloaded into the shredder through a grid to adjust to the desired size. During the operation, a sodium hypochlorite solution is sprayed within the loading hopper to sanitize the hopper and to reduce the dispersal of dust

4. TRANSFER:

The waste accumulated in the storage compartment is sent to the sterilization chamber via the screw conveyor designed to transfer the incoming waste. The filling sensors in the storage compartment verify the emptying process through a PLC control system (9) which allows the solenoid valves to be managed via a pneumatic circuit operated by a compressor.



THE PROCESS



5. EMISSIONS TREATMENT:

The automatic preparation cycle takes place by maintaining the loading hopper in a state of depression in order to avoid the discharge of emissive components. The flow siphoned by the filter group (6) is treated by means of:

- Pre-filter
- H14 HEPA Filter
- Activated rigid-bag carbon filter
- 3kW Centrifugal compressor

This emissions treatment system enables compliance with workplace air standards

7. DRYING:

Following the sterilization phase, the chamber pressure is reduced by means of a valve in order to release steam, which is then captured and condensed through a cooling unit allowing for re-use in future cycles. Subsequently, a depression is generated in order to evaporate any residual moisture. This process of evaporation also cools down the waste.

6. STERILIZATION:

The saturated steam produced by the steam generator is blown into the waste and is subsequently circulated continuously by a spiral stirrer. The combined process of continuous flushing and circulation allows the saturated steam to evenly infiltrate the waste being treated. This procedure allows the core of the treated waste to reach a maximum temperature of 165°C at 6 bars of pressure, allowing a reduction of bacterial load sufficient to guarantee a S.A.L. (Sterility Assurance Level) not less than 10_{-6} . Bioindicators in the form of strips containing Geobacillus Stearothermophilus are placed inside a compartment within the sterilization chamber in compliance with the provisions indicated in UNI 10384/94.

8. UNLOADING:

Before the sterilized waste is unloaded, a customized screw (8) automatically positions itself, using PLC management, beneath the sterilization chamber in order to receive the exiting waste. The screw conveyor is then activated to transfer the waste into a final container. Once the unloading phase is complete, the screw conveyor returns to its initial position. The process is completely managed by a PLC (9).



STRONG POINTS OF ECOSYST[®] TECNOLOGY





MEDICAL WASTE STERILIZATION SYSTEM



ADVANTAGES OF THE TECHNOLOGY

EFFICIENCY

- \bullet Sterility safety level not less than 10^{-6}
- Volumetric reduction of 80%
- Weight reduction of 15%
- Highly productive process
- Outgoing dry waste reusable as RDF (waste derived fuel)
- No emission of odors into the atmosphere and no discharge into the sewer system

ECONOMY

- Competitive investment owed to high levels of productivity and operational capacity
- Reduced waste disposal costs
- Low operating costs
- Two operators are sufficient to manage multiple plants
- Optimization of calorific value \rightarrow RDF

TECHNOLOGY

- Powerful shredding technology
- The technology is also ideal for clinical and hospital settings
- Complete automation by means of PLC
- Air treated by means of absolute filtration
- Treatment capacity of up to 500 kg/h

SAFETY

- Electrical and plumbing systems in line with CE regulations
- Automatic cross-checking mechanisms
- The automatic lifting system eliminates accidents
- Sterilizing procedure activated in case of malfunction
- Superior level of sterilization compared to microwaves
- Reduced responsibilities of personnel





ADVANTAGES OF THE TECHNOLOGY

LOW ENVIRONMENTAL IMPACT

- · Zero liquid waste at the end of the processing cycle
- No sewer system involvement
- Zero harmful emissions into the atmosphere
- Zero odor emissions
- •Outgoing waste is non bio-hazardous
- No use of chemical products in the treatment, storage and disposal of waste

FURTHER ADVANTAGES

- Waste treatment costs may be below 0,08€ per kilo.
- Easy to install the plant and its hydraulic and electrical connections
- The plant can easily be transferred and transported overseas
- Plant lifespan is beyond 10 years

The waste treatment and sterilization methods used by ECOSYST[®] technology with pressurized humid steam, allow the installation of small plants directly at medical waste production sites (hospitals and clinics, public and private, small, medium and large) and inside industrial warehouses, where several plant types can be built in logistically strategic areas serving an extended geographical area.

This results in notable savings and efficiency in terms of economics, the environment, energy and reduced staff risk.



INBOUND HAZARDOUS MEDICAL WASTE



The Presidential Decree 254/2003 indicates that hazardous medical waste at infectious risk must be packed in a double container:

- An interior, which may also be flexible, and consists of a nylon bag
- Rigid exterior, either:
 - disposable, consisting of a cardboard box
 - reusable, polyethylene or alveolar polypropylene container

The aforementioned containers will also house the rigid containers destined for sharp/pungent waste, once filled







TYPES OF WASTE

The potentially infectious biomedical waste that can be treated with the ECO-S SERIES plant has the following European Waste Catalog (CER) codes:

18	WASTE FROM THE HEALTH AND VETERINARY SECTOR OR RELATED RESEARCH ACTIVITIES	
18 01	Waste from maternity wards and waste related to the diagnosis, treatment and prevention of human diseases	
180103*	Waste that must be collected and disposed of requiring extra care in preventing infectious exposure	
18 02	Waste related to the research, diagnosis, prevention and treatment of animal diseases	
180202*	Waste that must be collected and disposed of requiring extra care in preventing infectious exposure	

In accordance with the provisions of article 2, paragraph 1, letter m of Presidential Decree 254/2003 which reads

"... Only hazardous medical waste at infectious Risk can be sterilized...".

In Italy, production data shows that over 90% of special waste produced by healthcare facilities falls under these codes.







STERILIZED MEDICAL WASTE CAN BE SENT TO RDF PRODUCTION PLANTS OR USED DIRECTLY AS A SOURCE OF ENERGY

The high calorific value, owed to the contents in cellulosic materials and plastic polymers, combined with the fine size of the treated waste renders the output useful to the following:

- Energy recovery plants (waste-to-energy and cogeneration)
- Secondary solid fuel production plants (CSS that can use the material as a "cut" for the flows deriving from urban waste that have lower calorific values, thus giving the CSS the characteristics provided for by the UNI9903.-1 standard for the so-called Quality CSS (CSS-Q);
- Gasification plants
- Plants in general that use high quantities of traditional fuel in the production cycle such as:
- Cement factories or steel plants Lime kilnds;
- Thermoelectric power stations or thermal power stations for district heating;







THE TECHNOLOGY

OUR RANGE



ECOSYST® TECHNOLOGY GUARANTEES REDUCED COSTS AND INCREASED SAVINGS DUE TO:

- ✓ Reduced labor requirements (only 2 operators required for multiple plants)
- ✓ Increased operator safety
- ✓ Affordable yet high quality spare parts available
- ✓ Lower costs compared to incineration
- ✓ Environmental compliance





raratteristione principal

di unonette i	Fino a 500 kg/h
Capacità di processo	400 V; 3P-N-PE; 50 Hz;
Capadità di processo Tipo di alimentazione elettros standardi impanto Tipo alimentazione Generatore di Vapore (G.V.) Potenza elettrica nominale instalatan Potenza elettrica media assorbita Consumo massimo di gas combustibile a regime Tipo di trituratore ad elevata resistenza Consumo medio di vapore Cincuito ad ania compressa Ernisioni in atmosfera impianto sissioni in entre	400 V; 3P-N-PE, 50 Hz; Gas 84 KW 90 KWrolo 45% 0.3 Nm3/cido 45% 0.3 Nm3/cido 45% 0.advalabero 44 KW 2.5 Licio 55% 6 bar Zaro emissioni Non presenti < 70 dB(A) @ 1m < 70 dB(A) @ 1m
Scandu and Scande Emissioni sonore Dimensioni implanto	23,000 kg ±5%

attamento

trattamento	Bonn eine
attoristiche trananne	60 min. 0.00
arallenon	1,600 IL
and the second	Vapore saturo
Durata cicco	185°C/6 bar
Volume carriero de la contractione de la contractio	Non interiore a 10"
Agente stente	> 80%
Temperatura	> 30%
Abbattimento con itiuti	15%
Riduzione voluna	
Riduzione peso torilizzato	
Umidità rifiuto sterio	
Unit	0 minito
nlicazione	Contratore autom
inte di apprice	Hice and cesti

-Tipo di processo

Sistema di scarico rifiuto steriizzato Tipo di controllo Tipo d report the cido Servizi aggiunini di serik

Aspetto estern Conduzione dell'enpla Requisiti dell'operator ute le macchine

toni in atmosfera G.V. gas METANO ennissioni matmodera GV oas Gel. Emissioni natmodera GV oas Gel.

SERIE ECO

Consumo massimo di gas combustibile a reg Tipo di trituratore ad elevata resistenza Consumo medio di vapore Circuito ad aria compressa Cortor Emissioni in atmosfera batteria filtrante Scarichi in fogna Emissioni sonore Dimensioni impiante

0

1170L x 710P x 600H (cm)

Continuo Ribaliatore automation

Automatico gestito da PLC

Telecontrolic e Telegestione

PLC - monifor 19"

Stampa su scontino

impianto a vista

N. 1 operatore Corso di formazione per la c

GY AGAS

Peso configurazione standard aratteristiche trattamento

Capacità di processo

Tipo di alimentazione elettrica standard impian

Potenza elettrica nominale installata

Potenza elettrica media assorbita

Tipo alimentazione Generatore di Vapore (G.V.)

Durata ciclo Volume camera di sterilizzazione Agente sterilizzente Temperatura / pressione Abbattimento carica batterica Riduzione volumi rifiuti Riduzione peso rifiuti Umidită rifiuto sterilizzato

lote di applicazione

Contin Tipo di processo Tipo di carico Ribalt Sistema di scarico rifiuto sterilizzato Auton Tipo di controllo PLC -Tipo di report fine ciclo Stamp Servizi aggiuntivi di serie Telec Aspetto esterno Impia Conduzione dell'impianto N. 1 c Requisiti dell'operatore Corso

Fino

400 \

84 kV

20.14

0,3 N

Quad

2,5 L/

6 bar

Asser

Non p

< 70 0

1170

23.00

60 mi

1.600

Vapor

165°C

Non in

> 80%

> 30%

15%

Gas





TECHNICAL REPORTS

	чи ниме неконого раз на нараки		
	Canacità di processo	Eine a 200 ka/b	
	Tipo di alimentazione elettrice standard impiento	400 V: 3B-N-BE: 50 Hz:	(*)
	Tipo alimentazione Generatore di Vapore (G.V.)	Geo	0
	Potenza elettrica nominale installata	77 kW	
	Potenza elettrica media assorbita	30 kW/ciclo ±5%	G.V. A GAS
	Consumo massimo di gas combustibile a regime	0,3 Nm3/ciclo ±5%	
	Tipo di trituratore ad elevata resistenza	Quadrialbero 37 kW	
	Consumo medio di vapore	2.5 L/oiolo ±5%	
	Circuito ad aria compressa	6 bar	
	Emissioni in atmosfera batteria filtrante	Assenza di sostanze inquinanti	
	Scarichi in fogna	Non presenti	
	Emissioni sonore	< 70 dB(A) @ 1m	
	Dimensioni impianto	1170L x 710P x 600H (cm)	
	Peso configurazione standard	23.000 kg ±5%	
	aratteristiche trattamento	50 min. circa	
	Volume camera di sterilizzazione	1.300 IL	Conforme alla 2014/68/LIE
	Arianta starilizzanta	Venore esturo	Controlling and Extended C
	Tamparatium (propaging	1859C / 8 hos	
	All and a second	Non information	
	Abbatumento canca	Non interiore a 10*	
t0 kg/h	Riduzione volumi rifiuti	> 80%	
P-N-PE: 50 H	g Riduzione peso rifiuti	> 30%	
	Umidità rifiuto sterilizzato	15%	
clo ::5%			
ciclo ±5%	lote di applicazione		
bero 44 kW			
0.45%	Tipo di processo	Continuo	
0.1076	Tipo di carico	Ribaltatore automatico	
	Bietema di ecarico rifiuto eterifizzato	Automatico gestito de PLC	
di sostanzi	Sistema di scanco miuto sternizzato	Automatico gestito da PLC	
enti	ripo di controllo	PLC - monitor 19	
A) @ 1m	Tipo di report fine ciclo	Stampa su scontrino	
710P x 60	Servizi aggiuntivi di serie	Telecontrollo e Telegestione	
*5%	Aspetto estemo	Impiento a vista	
	Aspeno esterilo	implanto a vista	
1	Conduzione dell'impianto	N. 1 operatore	
1	Requisiti dell'operatore	Corso di formazione per la co	nduzione dell'impianto
irca iaturo (*) 3 bar tore a <u>En</u>) Se non diversamente comunicato in fase di ordine, tutte l nissioni in atmosfera G.V. gas METANO	le macchine richiedono alimentazio NOx < 150 mg/kWh @3% di	one elettrica 3+N/400V/50Hz. O2 con Tambiente=20°C
re automatic ico gestito da	20 a PLC		
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u scontrino			
alle a Tais	netions		
ono e Teles	laenoue		
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i anoro			
formazione	per la conduzione dell'impianto		
a richiadono a	limentazione elettrica 3+N/400V/50Hz.		
	000 F 00 T 11 - 000		

The technical reports are available on our website at www.ecosyst.it



OVERALL DIMENSIONS





OVERALL DIMENSIONS









The images show the measurements of ECOSYST[®] SERIES **150-S, 250-S e 500-S**























PHOTOS OF THE TECHNOLOGY





CONTACT DETAILS



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Media such as videos, animations, brochures and technical reports as well as all documentation is available on our website: www.ecosyst.it

