METAN Presents



ENVIRONMENTAL FRIENDLY AND ECONOMICAL HEALTHCARE WASTE MANAGEMENT PROJECT

Presented y By Dr. CEMAL KALDIRIMCI (www.metan.com.tr)

We would be pleased to be your partner to implement state of the art medical waste management and treatment solutions in your

country

What Healthcare Waste Management Aims at

To protect the PUBLIC and the ENVIRONMENT from exposure to DISEASE CAUSING AGENTS or HARM CAUSED by HAZARDOUS HEALTHCARE WASTES



Implementing waste management

Why hospital waste management?

- •Protection of the human health by reducing the exposure of patients and the public to harmful goods
- •Enhanced community relations by demonstrating a commitment to environmental protection (positive press coverage)
- •Avoidance of long term liability (Responsibility of the generator)
- •High efficient, low cost waste logistic and disposal
- •Increased employee morale, resulting from a healthier and safer work environment
- Longterm savings of disposal costs



- 1- MEASURES TAKEN DURING CONSTRUCTION
- 2- IMPLEMENT OF A PROPER IN-HOUSE
 HELTHCARE WASTE MANAGEMENT
 PRACTICING
- **3- EXTERNAL LOGISTICS**
- 4- FINAL DISPOSAL



SOURCES OF MEDICAL WASTE:

The primary sources of Bio-Medical Waste are

- Hospitals
- Diagnostic Centers
- Laboratories
- Blood Banks
- Nursing Homes
- Clinics
- Veterinary Hospitals % clinics
- Pharmacy shops
- Dialysis center



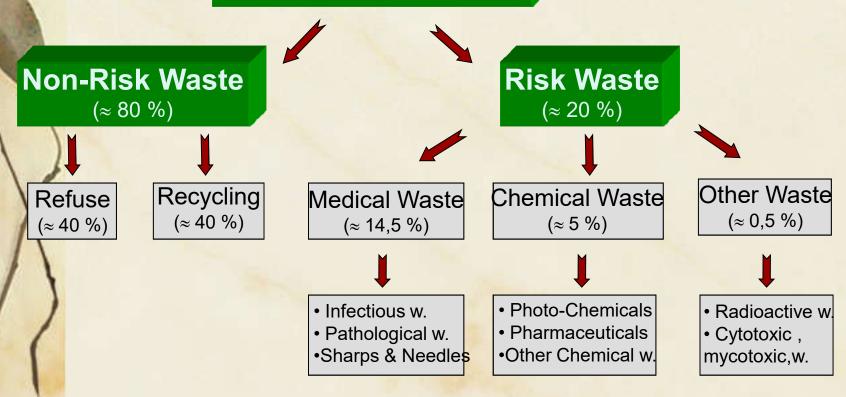
1- MEASURES TO BE TAKEN DURING CONSTRUCTION OF HOSPITAL

- Provisions for onsite segregation and storage of all recyclables as glasses, pallets, plasterboard, plastic, cardboard, textiles, etc.
- Provisions for internal logistics, storage and interim storage of hazardous waste streams
- Provisions for hard-core, agricultural waste (green waste) and general kitchen-like waste (for instance composting facilities)
- Provisions for establishing proper infection control
- Provisions for reducing waste generating materials
- Provisions for reducing the environmental impact to environment

IMPLEMENT OF A PROPER **IN-HOUSE HEALTHCARE-WASTE** MANAGEMENT PRACTICING

How Hospital Waste Generated from Medical Operations is Segregated

Healthcare Waste



Non-hazardous Medical Waste

Most of it (75-90%) is similar to domestic waste. This fraction referred to as healthcare general waste (HCGW) is made of paper, plastic packaging, food preparation, etc. that haven't been in contact with patients

Infectious Medical Waste

Infectious Medical Waste can be in form of bacterial, fungal, viral and parasitic organisms and cultured cells and is medical waste which is capable of producing an infectious disease.

Medical waste shall be considered capable of producing an infectious disease if

- (1) it has been, or is likely to have been, contaminated by an organism likely to be pathogenic to healthy humans,
- (2) if such organism is not routinely and freely available in the community, AND
- (3) such organism has a significant probability of being present in sufficient quantities and with sufficient virulence to transmit disease

Definition of Hazardous Medical waste

Discarded biologic product, such as blood or tissues, removed from operating rooms, morgues, laboratories, or other medical facilities. The term may also be applied to bedding, bandages, syringes, and similar materials that have been used in treating patients, and body parts used in research Simply, any waste-regardless of whether it is potentially infectious-generated as a result of Patient (man/animal) diagnosis and treatment.

More simple, anything (can't be disinfected) that comes in contact with the blood or body fluid.

Examples of hazardous wastes from non-medical operations

- Used oil, hydraulic fluid, diesel fuel, or jet fuel;
- Soil contaminated with toxic or hazardous polluhydraulic fluid, diesel fuel, or jet fuel);
- resins, roofing cement, adhesives, machinery lubricants, and caulk;
 Cleanup materials (such as rags) contaminated with the items listed above;
- Drums and containers that once contained the items listed above;
- Computer monitors and televisions with cathode ray tubes; Gypsum drywall (due to sulfate); rescent bulbs, broken mercury switches, batteries, or thermostats); and
- Other items that may have inseparable hazardous constituents. tants (e.g., soil contaminated with used oil, Waste paints, varnish, solvents, sealers, thinners, Waste carpeting (due to formaldehyde contents); Lead-based paint, lead flashing, or lead solder;
- Mercury-containing demolition wastes (e.g., fluorescent bulbs, broken mercury switches, batteries, or thermostats);
- Other items that may have inseparable hazardous constituents.

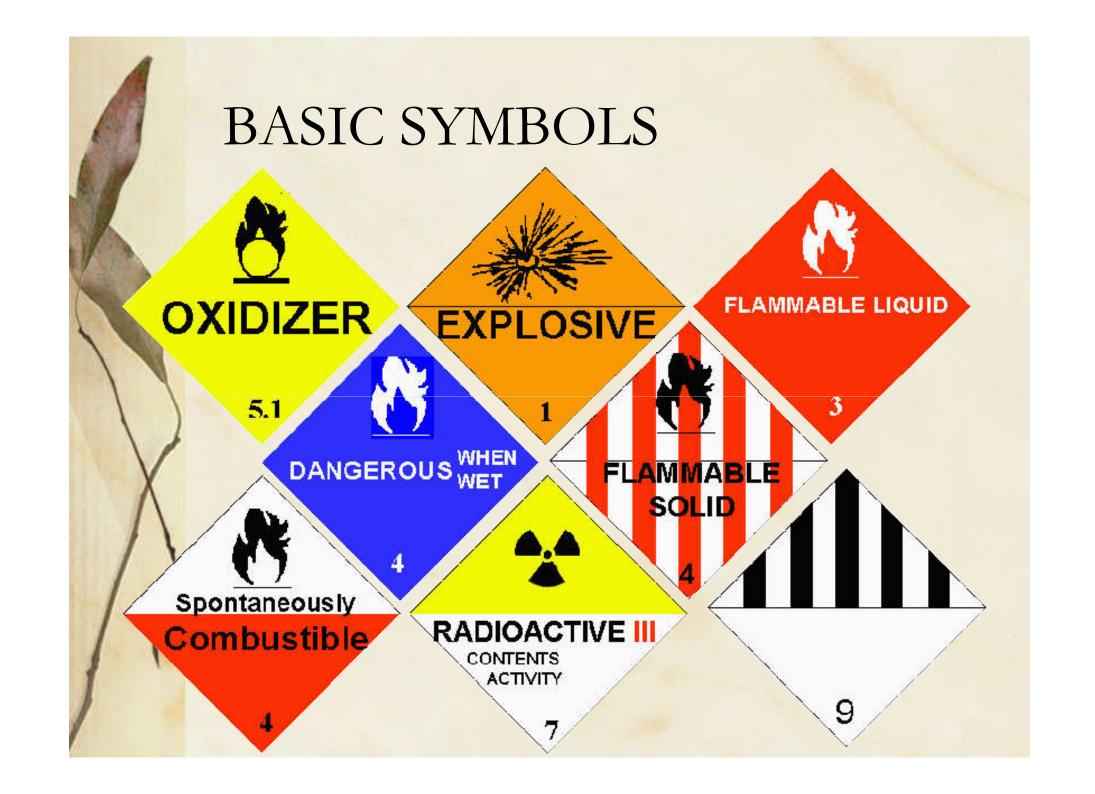


Table 2.3 Examples of health-care waste from different sources

Major sources (hospitals and medical centres)

	Sharps	Infectious and pathological waste	Chemical, pharmaceutical and cytotoxic waste	Non-hazardous or ger
Medical ward	Hypodermic needles, intravenous set needles, broken vials and ampoules	Dressings, bandages, gauze and cotton contaminated with blood or body fluids; gloves and masks contaminated with blood or body fluids	Broken thermometers and blood- pressure gauges, spilt medicines, spent disinfectants	Packaging, food scraps empty saline bottles, n non-bloody intravenou
Operating theatre	Needles, intravenous sets, scalpels, blades, saws	Blood and other body fluids; suction canisters; gowns, gloves, masks, gauze and other waste contaminated with blood and body fluids; tissues, organs, fetuses, body parts	Spent disinfectants Waste anaesthetic gases	Packaging; uncontamir masks, hats and shoe c
Laboratory	Needles, broken glass, Petri dishes, slides and cover slips, broken pipettes	Blood and body fluids, microbiological cultures and stocks, tissue, infected animal carcasses, tubes and containers contaminated with blood or body fluids	Fixatives; formalin; xylene, toluene, methanol, methylene chloride and other solvents; broken lab thermometers	Packaging, paper, plast
Pharmacy store	11 2		Expired drugs, spilt drugs	Packaging, paper, emp
Radiology			Silver, fixing and developing solutions; acetic acid; glutaraldehyde	Packaging, paper
Chemotherapy	Needles and syringes		Bulk chemotherapeutic waste; vials, gloves and other material contaminated with cytotoxic agents; contaminated excreta and urine	Packaging, paper
Vaccination campaigns	Needles and syringes		Bulk vaccine waste, vials, gloves	Packaging
Environmental services	Broken glass		Disinfectants (glutaraldehyde, phenols, etc.), cleaners, spilt mercury, pesticides	Packaging, flowers, new cardboard, plastic and and plant waste
Engineering			Cleaning solvents, oils, lubricants, thinners, asbestos, broken mercury devices, batteries	Packaging, constructio wood, metal
Food services				Food scraps; plastic, me

MAIN STEPS OF IN-HOUSE MEDICAL WASTE MANAGEMENT

The management of waste must be consistent from the point of generation («cradle») to the point of final disposal («grave»).

The path between these two points can be segmented schematically into eight steps.

- 1. Waste minimization
- 2. HCW generation
- 3. Segregation and containerization
- 4. Intermediate storage (in the HCF)
- 5. Internal transport (in the HCF)
- 6. Centralized storage (in the HCF)
- 7. External transport
- 8. Treatment and final disposal





Segregation

At the hospital the staff to separate hazardous waste from domestic waste by company providing different bag colors.

Packaging and handling

Proper packing of waste according to it's nature (liquid, tissue, sharp object, etc..)

By providing different waste containers (bags, boxes, etc, ...)

Interim storage of infectious waste

Safe storage & transportation of hospital waste

To avoid risks for the public by spillages, etc. infectious waste must be transported under consideration of the potential dangers by the waste. For this, a transport in special containers is necessary.

Example:

Use of 770 I UN proved containers

Proved for the UN waste class 6.2 –

Bio hazardous waste of class I, II and III
(Low to medium infectious waste =

Typical hospital waste)



Transport of hazardous waste

External Transportation:

Periodically or on request, the governmental licensed disposal company comes and takes the waste to the biomedical cell.

The hazardous waste must be transported according to the applicable laws.

The carrier must endorse the receive of the quantity and quality of the waste and will be responsible for the waste after signing.





Transport of hazardous waste

External Transportation:

Periodically or on request, the governmental licensed disposal company comes and takes the waste to the biomedical cell.

The hazardous waste must be transported according to the applicable laws.

The carrier must endorse the receive of the quantity and quality of the waste and will be responsible for the waste after signing.





How to dispose Healthcare Waste,

Depending on the different waste streams

Treatment and Disposal of the hospital waste

Today, international available main treatment methods for infectious, hospital waste:

Relatively old & conventional methods:

- Land filling
- Incineration

Alternative and More Environmental Friendly &

- **Economic Methods:**
- Chemical disinfection
- •Steam disinfection/sterilization

Landfilling of healthcare waste

Recommended Operation:

- Special cassette for biomedical waste secured by fence and guard
- Unloading of the waste from the transportation container direct in the shovel of the wheel loader
 - Bedding of the waste in the special cassette by the wheel loader
- Covering of the infectious waste every evening with a 0,15 m 0,20 m thick soil layer
 - If necessary, first covering with gypsum
 - After one layer is filled, stabilization of the layer with 0,5 m of construction waste

Way of working: Incineration

By incineration, hospital waste and the pathogen agents are oxidized. State of the art incinerators are two chamber systems equipped with a two stage flue gas treatment and a CEM-System.

While in the first chamber the waste is pyrolsed at a temperature of 300 – 500°C, in the second chamber the pyrolysis gas is treated at a temperature of 800 – 1200°C.

The Existing Europeam Incinerating
Directives Require the Implementation
of Very Strict Emission Control and
Monitoring (Directive 2000/76/EC)



Healthcare waste incinerator, Hoval,





Alternative Methods for Medical Waste Disposal

STERILIZATION

WHICH ONE TO CHOOSE

ON-SITE

or

OFF-SITE

TREATMENT

METAN



Reasons for preferring OFF-SITE STERILIZATION Central Treatment Plants

- More economic total investment cost (compared to the opposite solution of on-site installations at each hospital) for the entire region where the plant is serving
- More economic operating costs compared to the opposite solution of on-site installations at each hospital)
- So, cheaper solution in cost-concerned countries
- Easier to control by governmental or private authorities
- Possibility of Recovery of Recylable material from central treatment plants
- Business oppurtunity for operating private companies or municipalities

METAN

Medical Waste Sterilizers in Two main Categories from our solution partner

- Post-shredding kind of medical waste sterilizers (Conventional autoclave type)
- Pre-shredding kind of medical waste sterilizers, Vertical

STANDARD Medical Waste Sterilization MODELS • POST-SHREDDING KIND

- 10—125 kg/h
- 200-250 kg/h
- 500-600 kg/h
- PRE-SHREDDING KIND
- 100 125 kg/h
- 200 250 kg/h
- 400 450 kg/h

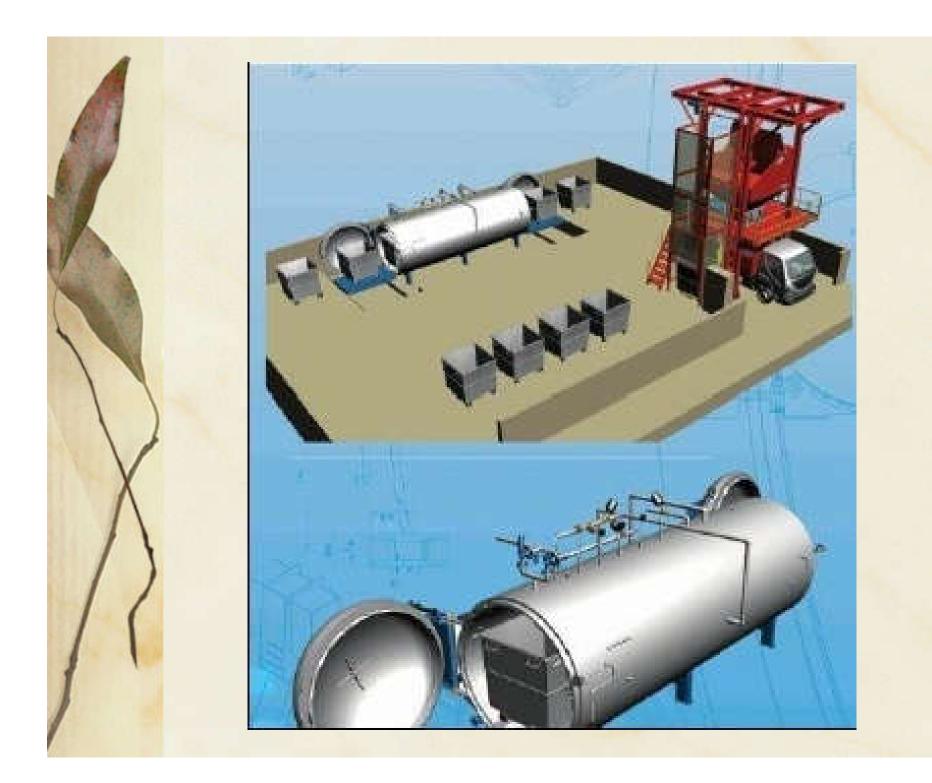
METAN

Typical vertical pre-shredder kind of sterilizer









FINALLY ENTIRELY NEW CONCEPT HAS BECOME A TRUTH RECYCLING OF STERILE MEDICAL WASTE

PYROLYSIS TO PRODUCE OIL AND CARBON BLACK

TYPICAL COMPOSITION AND CHARACTERISTICS OF INFECTIOUS WASTE

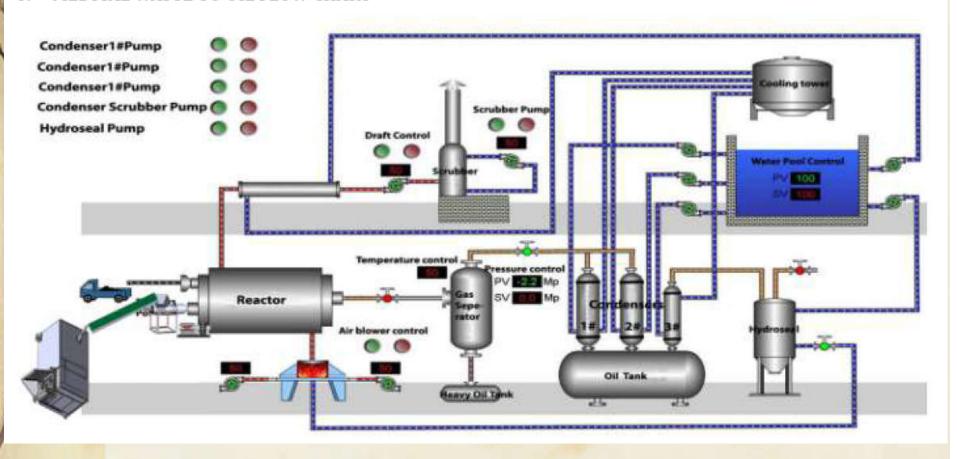
^		
Com	posit	ion:
	20211	

Cellulosic Material (paper & cloth)	50 - 70%
Plastics	20 - 60%
Glassware	10 - 20%
Fluids	1 - 10%
Sharps	1 - 2%
Typical Characteristics:	
Moisture	8.5-17% by weight
Incombustibles	8% by weight
Heating Value	7,500 BTU/lb

METAN

Flow Chart of Pyrolysis Plant

8. MEDICAL WASTE TO OIL FLOW CHART



PROJECT PROPOSAL

- TRAINING
- PRACTICING HCWM
- STORAGE
- •INTERNAL & EXTERNAL LOGISTICS
- •STERILIZATION for infectious waste, preferably off-site for Iraq (or on-site)
- INCINERATION for hazardous waste
- PYROLYSIS for sterile waste



MAIN STAGES OF THE PROJECT DEVELOPMENT OF IN-HOUSE HCWM PRACTICING

- I. HCWM TRAINING: BASIC
- II. FURNISHING THE HOSPITALS WITH PROPER WASTE MANAGEMENT EQUIPMENT, INSTRUMENTS AND REAGENTS
- III. PREPARING THE INTERNAL WASTE MANAGEMENT GUIDELINES AND DIRECTIVES
- IV. ASSIGNING AND DELEGATING THE RESPONSIBLE STAFF
- IV. PRACTICING THE PROPER WASTE MANAGEMENT GUIDELINES
- V. DESIGNING AND INSTALLING THE INTERIM WASTE STORAGE ROOMS
- VI: DESIGNING AND INSTALLING IN-HOUSE WASTE STORAGE ROOMS AND PREAPRING FOR EXTERNAL LOGISTICS

BASIC TRAINING, 5 DAYS

- A) HAZARDOUS WASTE
- THE FOLLOWING STEPS WILL BE IMPLEMENTED
- 1. AWARENESS AND UNDERSTANDING THE CURRENT SITUATION
- 2. WASTE MINIMIZATION
- 3. WASTE SORTING

NON-HAZARDOUS

RECYCLABLES

HAZARDOUS

BIO-MEDICAL (INFECTIOUS, SHARP AND

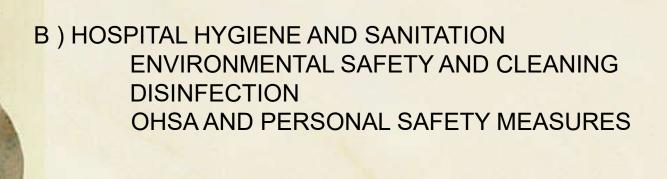
NEEDLES)

PATHOLOGIC

CHEMICAL

RADIOACTIVE

- 4. CONTAINERIZATION
- 5. LABELING
- 5. INTERIM STORAGE AND IN-HOUSE TRANSPORT FOR DIFFERENT WASTE STREAMS



C) WASTE WATER MANAGEMENT
WATER SANITATION
MEASURES FOR WASTE WATER SAFETY AND PURIFICATION

SETTING UP EXTERNAL LOGISTICS In case of Off-Site Central Treatment Method is preferered

A) FOR BIO-MEDICAL WASTE

With specially designed compartment, refrigerated and with safety measures

Lift for container placement

Poprtable scale for waste weighing

Radiation detector for radioactivity check



Figure 7.14 Example of a vehicle used for transporting health-care waste in the United Kingdom



B) FOR CHEMICAL NATURE HAZARDOUS WASTE

With specially designed compartment, refrigerated and with safety measures
Lift for container placement

Poprtable scale for waste weighing

Radiation detector for radioactivity check



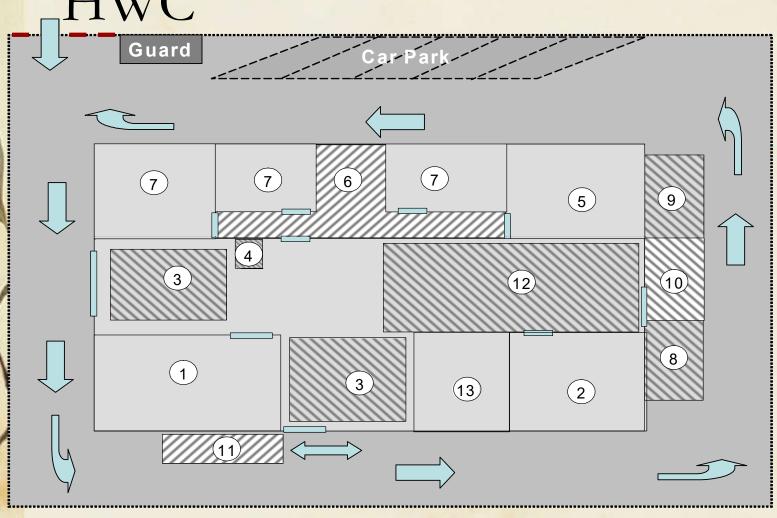
STERILIZATION PLANT FOR BIO-MEDICAL WASTE

BASIC MODALITIES IN THE STERILIZATION PLANT

- •MEDICAL WASTE STERILIZER, 1000-1500 kg/h CAPACITY MEDICAL WASTE STERILIZER
- •STEAM GENERATOR
- WATER SOFTENING UNIT
- •PLATFORM SCALE
- •TILTER FOR WASTE FEEDING TO THE STERILIZER
- •SHREDDER FOR STERILE MEDICAL WASTE
- •LIFT FOR STERILE WASTE FEEDING TO SHREDDER
- **•**CONTAINER WASH UNIT, AUTOMATIC
- •TRUCK WASHING, CLEANING, DISENFECTING FACILITY
- •TROLLEYS AND CONTAINERS
- LABORATORY
- •HOUSING FOR THE ABOVE UNITS AND MODALITIES
- REFRIGERATED WASTE STORAGE ROOM
- CLEAN CONTAINER STORAGE AREA
- •HYGIENIC, TECHNICAL, SOCIAL ROOMS AND OFFICES
- •SAFETY MEASURES FOR FIRE, ENVIRONMENTAL SAFETY, PERSONAL SAFETY AND HYGIENE
- POWER DISTRIBUTION SYSTEM
- EMERGENCY POWER SUPPLIES (SOLAR OR/AND GENERATOR)
- •STERILE WASTE STORAGE AREA
- DISCHARGED WATER STORAGE AND SETTLING AREA
- MISCELLANEOUS

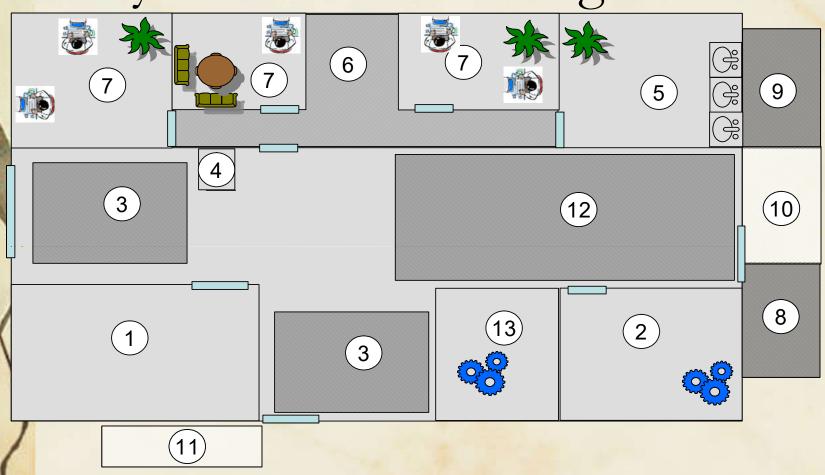


General lay-out and logistics -



- 1 Refrigerated storage 2 Energy/Water Supply, 3 Delivery Zone 4 Scale/Scanning Zone 5 Social rooms
- 6 Entrance Zone 7 Office, Adminis. 8 Container Washing Plant 9 Interim Storage 1 Pick Up Zone
- 1 Hollow Container 2 Store/Treatment Photo chemicals 3 Autoclave

Lay-out of the Building



- 1 Refrigerated storage 2 Energy/Water Supply, 3 Delivery Zone 4 Scale/Scanning Zone 5 Social rooms
- 6 Entrance Zone 7 Office, Adminis. 8 Container Washing Plant 9 Interim Storage 10 Pick Up Zone
- 11 Hollow Container 2 Store/Treatment Photo chemicals 3 Autoclave

Post-shredding kind

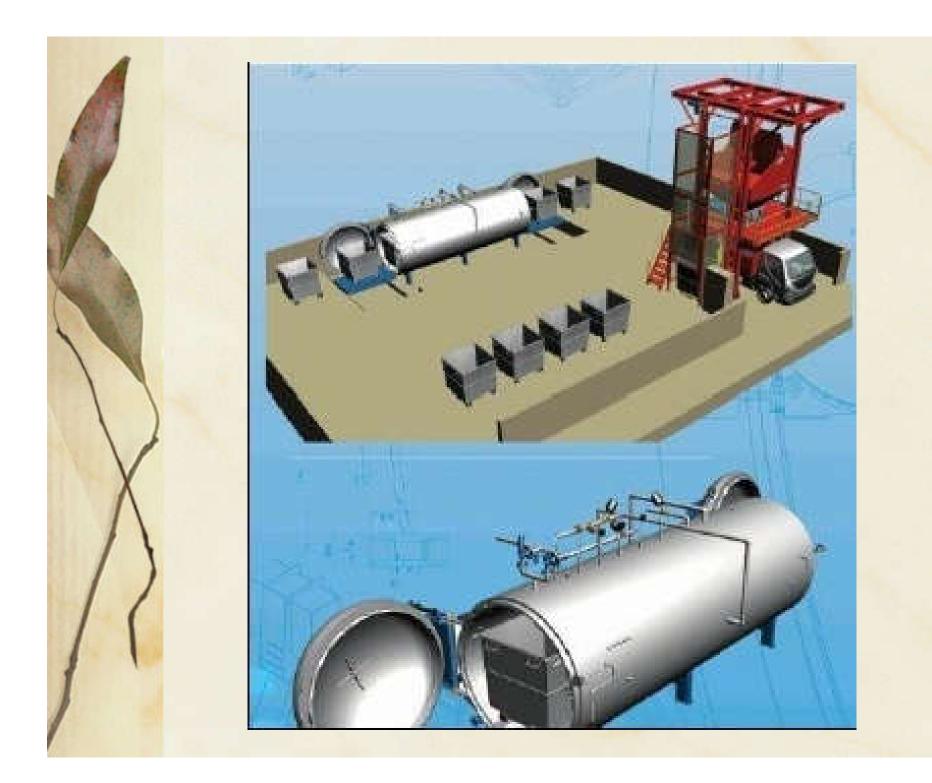








METAN



HAZARDOUS WASTE DISPOSAL STATE OF THE ART ENVIRONMENTAL FRIENDLY INCINERATOR

from one of our solution partners



INCINERATOR FOR HAZARDOUS WASTE, off-site 500 kg / h capacity

A) INCINERATOR

1.01. Automatic Loading Unit

1.02. Primary Combustion System @1000 C -

Rotary Kiln

1.03. Secondary Combustion Chamber @1100C for

2sec

1.04. Ash Removal Conveyor

1.05 Main Stack

1.06. Control Panel

B) EMISSION CONTROL SYSTEM, Flue Gas Treatment System

2.01. Heat Exchanger

2.02. Dry Scrubber - Activated Carbon Dosage

System

2.03. Dry Scrubber - Chemical Dosage Unit

2.04. Dry Scrubber - Bag Filter

2.05. Wet Scrubber2.06. ID Fan

BASIC MODALITIES IN THE INSINERATING PLANT

INCINERATOR

As one of the systems above (The above prices are net buying prices)

HOUSING:

Industrial plant specifications, may be steel construction, laminated sandwich panel side walls and roof,

25 x 30 x 10 m (width x length x height) indoor

 $10 \times 30 \text{ m} + 20 \times 20 \text{ m} (\text{w} \times \text{l}) \text{ outdoor}$

Indoor: Incinerator, operation control room, office, hygiene rooms, laboratory, technical room

Outdoor: fuel tank, waste un-loading area, truck wash area, truck parking area, ask storage area,

Waste storage containers room, hazardous waste storage rooms, Scale for waste weighing

To be detailed alter upon acceptance of the incinerator offer

Requires architectural works and relevant expenses

Laboratory and technical room:

A chemical analysis laboratory with the below equipment (minimum) is required to be set up and operated:

- Flash point determination device
- Automatic bomb calorimeter
- Muffle furnace
- Laboratory oven
- Balance
- Moisture balance
- Basic laboratory apparatus and glassware



Waste transport trucks :

Qty. 2-3-4

With hazardous waste transport compartments, air conditioned, lift and scale

Waste storage containers & ash storage containers.

Galvanized steel waste bins

Qty. 200 -500 of 0.4 m3 capacity

• Fire fighting, first aid, hygiene equipment and reagents for the plant safety: (depends on the local directives, regulations and laws)

Truck wash and container wash unit:

Varies from manual to automatic:

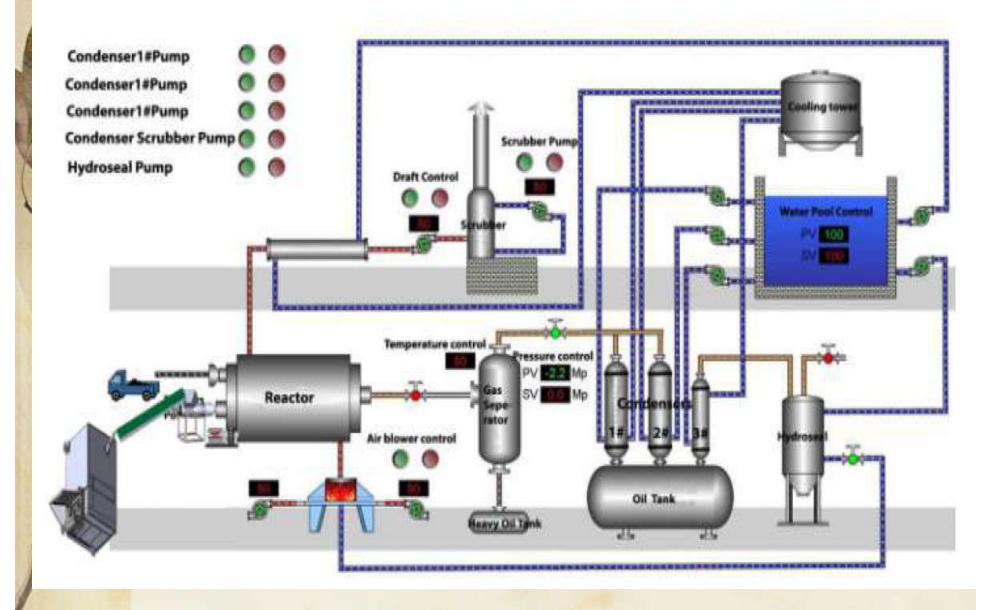
1 DESIGN CONSIDERATIONS	1
2 HAZARDOUS WASTE INCINERATION SYSTEM	
2.1 AUTOMATIC WASTE LOADING UNIT	4
2.2 MAIN COMBUSTION CHAMBER	
2.2.1 Refractory Material	
2.2.2 Thermocouple	- 2
2.2.3 Ash Removal Unit	
2.3 POST COMBUSTION CHAMBER	
2.3.1 Refractory Material	
2.3.2 Thermocouple	
2.4 HEAT EXCHANGER	
2.5 FLUE GAS TREATMENT SYSTEM - OPTIONAL	
2.5.1 DRY SCRUBBER	
2.5.1.1 REACTOR	
2.5.1.2 BAG FILTER	
2.5.2 WET SCRUBBER	
2.6 ID FAN - OPTIONAL	
2.7 MAIN STACK	
2.8 PLC & CONTROL SYSTEM	



1 DESIGN CONSIDERATIONS

Waste to be treated	Hazardous Waste	
Type of the System	Rotary Kiln	
Hourly Capacity of the system	500 kg/hr	
Duration of Operation	10-24 hrs/day	
Fuel Type	Diesel	
Calorific Value of the Waste	3500 kcal/kg	
Treatment System Units	Automatic Loading Unit	
	Primary Combustion Chamber	
	3. Secondary Combustion Chamber	
	4. Heat Exchanger - Optional	
	5. Flue Gas Treatment Unit - Optional	
	i. Dry Scrubber	
	ii. Wet Scrubber	
	6. ID Fan - Optional	
	7. Main Stack	
	8. Automatic Control Unit	
Temperature of Primary Chamber	1000 °C	
Temperature of Secondary Chamber	1100 °C	
Country of Origin	Turkey	
Customs Tariff Code	8417.80.10.00.00	

8. MEDICAL WASTE TO OIL FLOW CHART





What Metan Co. Ltd. may offer you:

- Consultancy in entire healthcare waste management chain, from in-house medical waste management practicing in hospitals to final disposal
- Project preparation and implementation
- Waste logistics training
- Plant operation training
- Green Hospital projects preparation and implementation

METAN





green thanks



We are ready to help our friends to develop the current medical waste management practicing and implement a state of the art system

METAN

GREEN ENVIRONMENT & HEALTH SERVICES INDUSTRY & TRADE Co. Ltd.

- Address: Emek Mahallesi 29. Sokak No: 38
 Cankaya-Ankara-TURKEY
- Tel: +90 (312) 212 1281
- Fax: +90 (312) 215 6069
- E-mail:cemal@metan.com.tr
- Web:www.metan.com.tr
- Contact: Dr. Cemal Kaldirimci +90(532) 454 90 77
- Chemical Engineer, Managing Director