

SPECIFICATIONS OF WASTE MANAGEMENT PLANT

Waste management plant should be capable of treating 175 Kgs. of waste per hour. It should be capable of running for 24 hrs. X 365 days. Plant manufacturer should be European CE/ISO/USFDA certified.

AUTOCLAVE SPECIFICATIONS:

High vacuum/ High pressure, Computer controlled autoclave system to treat biomedical waste on-site.

1. DIMENSIONS: 4' dia X 9' long

Pressure Grade Carbon Steel

Number of bins: 3/load

Capacity/Cycle: 175 Kg. (Cycle Time: ~45 minutes)

Volume/Cycle: 66 ft³/1.87 m³ @95 Kg. /m³

2. VESSEL SPECIFICATIONS

Working Pressure: 75 PSIG

Opening Assembly: Single door/quick opening door/safety pin interlock

Loading Arrangement: Horizontal

Pressure Vent: Low Water Flow-Spray condenser

3. INSULATION

The exterior of the autoclave should be insulated with 2" of fiberglass, which should be covered with an aluminum jacket to protect the insulation, and to make sure the equipment can be kept clean.

4. PROCESS VALVES

Complete with the process valves including steam supply, pressure vent and safety relief. The steam inlet valve should be high-resolution pneumatic proportional valve for a smooth accurate control of steam pressure. For safety, the steam inlet valve should be a closed valve that closes in the event of any power loss.

5. AUTOCLAVE VESSEL DESIGN

The autoclave vessel should be designed, fabricated, tested and certified in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, for Unfired Pressure Vessels. The vessel should be designed for full vacuum. The sterilization unit should be formed and welded into a horizontal cylindrical pressure vessel with a hydraulic quick opening door. The vessel should include two rigid support saddles to facilitate a simple installation. The front face of the vessel should have a machine groove for the rigid high temperature seal gasket.

6. VACUUM SYSTEM.

Vacuum: 20-22" Hg.

Vacuum Capability: 20"-22" Hg.

Pre-vacuum: The pre-vacuum process should evacuate the autoclave 20"-22" Hg. This process will remove the air from the autoclave to provide a quick and efficient penetration of steam throughout the medical waste load.

Post-vacuum: The post-vacuum process should remove the excess steam from the vessel and expedite the steam purging process. This process will remove excess moisture from waste load resulting in a lighter/drier treated waste product for disposal. Moisture removal effectively controls nuisance odors.

7. STEAM CONDENSER (Low Water Flow Condenser – 20 mm Water Line Supply)

Independent steam condenser made of pressure-grade steel. The condenser shall have a section submerged in water to act as an absorbent to autoclave process steam whereby no process steam is released to atmosphere. Process steam should fully condense externally to the autoclave vessel. The steam condenser sub-assembly shall have the capacity to allow the autoclave chamber to vent from operating pressure to atmospheric condition within 4 minutes approx.

8. DOOR OPERATION, SEALING AND LOCKING MECHANISM

The door should be hinge mounted on the autoclave. Mounting arrangements is to provide full movement to a full open position. Preferred sealing system to utilize one-piece extruded material O-ring seal type. The door should have a positive lock type safety design as per the ASME requirements. The locking mechanism should have interlocking mechanism with the control system to prevent opening of the door while under pressure, and to prevent

pressurization when the door is unlocked. The door should have safety features like electric/mechanical interlock switch, PLC interlock, door safety handle interlock, visual site gauge for pressure monitor and analog dial pressure/temperature indicators.

9. MATERIAL HANDLING

Hydraulic Lift Table for loading/unloading. Autoclave tracks should be provided for the autoclave bins.

10. SYSTEM PIPING.

The autoclave system should completely pipe at the factory prior to shipment for simple installation. The system piping should consist of the following:

- Steam condenser piping – steam outlet piping direct to steam condenser. Steam is condensed by controlling water flow through the steam condenser with respect to steam pressure inside the vessel. The water flow control minimizes the consumption of water.
- Condensate Drain Trap – front - to maintain the vessel free of condensate.
- Vacuum Valve/Piping – autoclave should be hard piped to either steam ejector or vacuum pump for integrating vacuum system to vessel.
- Steam Inlet Valve/Strainer – Controlled steam inlet valve for smooth and accurate control of steam pressure inlet.

11. CONTROL SYSTEM/ PROCESS VALVES/ CONTROL PANEL & INSTRUMENTATION

The autoclave system should be controlled by “Super Micro” Programmable Logic Controller (PLC) with modem hookup capabilities for online support. The PLC should perform automatic sterilization control that includes pre-vacuum, pressurization/heat soak, vent and post-vacuum. The PLC should monitor pressure vessel conditions for providing safety interlock for door operation.

Should be capable of extensive data memory (over 8,000 Data Registers) for capturing real time operating parameters that should continuously monitor autoclave system performance. The PLC system should have the external data link integration capability for communication with other peripheral systems (PC, network, control systems, etc.).

Powerful features should include:

- Windows Programming - Use Ladder, List or SFC languages.

- Operator Interfaces – Flexible selection to match specific Customer application
- Extensive Program Memory – 8,000/16,000 steps
- Extensive Data Memory – 8000 Data Registers
- Enhanced Program Throughput – 80 nanoseconds/step
- Enhanced Process Control – Auto-Tuning, PID loop
- High-Speed Processing – 60KHz counters, 10ms timed & 50us hardware interrupts
- Embedded Motion Control – 20,000 Hz pulse train, Trapezoidal ramp instructions
- High Function Math – 32-bit floating point, Square Root, Trigonometry
- Year 2000 Compliant – Y2K Compliant, 4-digit year
- Real Time Clock/Date – For scheduling date and time stamping
- Flexible Configurations – From 16 to 256 I/O & extensive special function I/O capabilities
- Communications – Built-in 2nd port (RS-232/RS422/ RS485) & PLC-PLC networking
- Open Network Connectivity – Modules for Profibus DP, Profibus DP I/O, AS-I & CC Link

12. SYSTEM PROGRAMMING

PLC program application should have simple pushbutton entry pad allowing the authorized personnel to enter specific parameters including the following:

- Pre-Vacuum Set Point
- Pre-Vacuum Timer
- Sterilization Temperature/Pressure
- Sterilization Heat Soak Time
- Vent Time Set Control
- Post-Vacuum Set Point
- Post-Vacuum Timer

In addition to the above, should have specific alarms for triggering equipment shutdown and notifying the operator if temperature and/or pressure parameters are not satisfied.

13. CONTROL SYSTEM PRINTER (TRULINE CIRCULAR CHART RECORDER)

The control system printer should be capable of generating continuous data that provides the history of every autoclave cycle.

The printer should record and generate chart data that includes the following:

- Time and Date of every autoclave cycle.
- Cycle Start and Cycle End Time.
- Continuous Cycle Vacuum & Pressure
- Continuous Cycle Temperature

SHREDDER MACHINE SPECIFICATION

2.1 Shredder should be 2 shaft systems for homogenizing/shredding autoclaved medical waste.

Feed Material - General Autoclaved Medical Waste composed of plastic films, plastic containers, plastic tubing, cloth, glass, light gage steel medical sharps (scalpels, scissors, syringes, etc.)

Feed Method/Discharge

- Automatic Hydraulic Bin Tipper
- Discharge shredder material into discharge container/skiff/compactor
- Shred Particle Size Approx. 3/4" Wide X 3" Length and Smaller

Minimum Cutting Chamber - 23" x 40"

- Two hexagonal, counter rotating shafts
- Steel bulkhead walls at both ends of chamber to prevent migration of contaminants into bearings and seals

Knives

- Shaft center distance: 5 7/8"
- Number of knives: 30
- Knife width: 3/4"
- Knife diameter: 11.4"
- Number of teeth per knife: Two, Offset hex for quick materials capture
- Knife material: Heat-treated alloy steel
- Contoured cleaning fingers and hex bore spacers between knives

Drive System

- 20-30 HP gear reduced motor.

2.2 Overload Auto-Reversal Protection

Overload auto protection system should automatically reverse the drive whenever a current overload is detected.

2.3 Severe Shock Protection (SSP)

Should allow clutch (coupling) to slip in severe shock load situation to prevent sudden torque from being transmitted to drive train/shafts. This SSP effectively protects the shredder from a severe shock failure such as breaking a shaft.

2.4 Bearing/Seal Protection

Double seal arrangement with Labyrinth seal ahead of lip seal should be provided to prevent waste materials from migrating into the bearing/seal area.

2.5 Advanced Cutter Locking System

- ACLS preload assembly (no shaft threaded fasteners)
- Sequential bolt arrangement secured to shaft with a segmented locking ring.
- Sequential bolts are tightened to compress knives stack.

2.6 SUPPORT STAND

- 6" wide flange construction
- 60" discharge height
- Designed to clear customer's compactor/discharge container

2.7 FEED ASSIST HYDRAULIC RAM HOPPER

- Ram opening 33" x 66" approx.
- A - 36 Plate - Reinforced plate construction

2.8 AUTOMATIC HYDRAULIC TIPPER - TIP AUTOCLAVE BINS INTO SHREDDER

- Push button lift and tipping action on shredder control panel
- Automatic Hydraulic Operation
- NEMA 4 Enclosure/Keyed power switch
- Illuminated function/ indicating buttons for both operation
- Fused lockable disconnect
- All necessary fuses, contactors and thermal overloads
- Direct across the line starting

- Integral 120-volt, AC control circuit
- Programmable logic controller for shredder operation and monitoring
- Run time hour meter

2.9 HYDRAULIC CART TIPPER

- Two Stage Cylinder Configuration – heavy duty design
- Hydraulic Power Pack – 5 HP
- 1500 lbs. capacity
- Push button control lift and tipping action
- Designed to lift and correctly tip bins

START-UP/TESTING/TRAINING

Classroom and “hands-on” training sessions will be conducted by the *Manufacturer*. The training program will focus on:

1. Safe Operation
2. Compliance
3. System Maintenance.

The comprehensive training program will include the following:

- a) **SOP:** A standard operating procedure (SOP) will be developed specific for the facility’s operation. The SOP should address compliance with State medical waste treatment regulations. A copy of the SOP should be provided to each trainer.
- b) **Classroom Training:** Manufacturer will provide classroom training to AIIMS, Rishikesh personnel. After completion of classroom training, all trained personnel will execute the SOP training certification form.
- c) **Equipment Operation Training:** After completion of classroom SOP training, a comprehensive equipment operation and maintenance “Hands-on” training will be provided.
- d) **Manuals:**
 - i. A copy of SOP and Operation & Maintenance Manual will be provided to each trainee.
 - ii. Additionally, three copies each of SOP and Operation & Maintenance Manuals will be provided to AIIMS, Rishikesh office.
 - iii. The O&M manual should include complete installation drawings, parts/components properly identified and electrical/control wiring schematics.