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Treating and Sterilization of Medical Waste

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Abstract: Medical waste has a high importance in terms of its environmental impact, Hospitals in Sudanare required to control their discharge and therefore have started installing treatment plants. Performances of the treatment plants were evaluated by in situ inspections, and analysis.
The objective of this study was evaluation the treatment of medical waste by Hazard and operability study in Khartoum Breast Care Center that decrease the medical waste by Autoclave connected with shredder, It is found that the medical waste decrease from 8 Kg to 2 kg in these study.
Keywords: Medical Waste Treatment,Incineration.

I. INTRODUCTION

There are many ways and technologies available for treating medical waste. The technology utilized in the Ecodas equipment is a modified autoclave technology, whereby it uses steam sterilizationwiththe new feature of shredders in corporatedin theequipment.Themorerecent designs have incorporated vacuuming, continuous feeding, shredding, mixing, fragmenting, drying, and compaction. The examples of these advanced autoclaves are ECODAS, Hydroclave T_{150}.

Several factors and criteria should be considered by the health care facilities when consideringa non-incineration technique for medical waste treatment. The factors include : Regulatory acceptance. Through put capacity, Types of waste treated.Micro bialin activation fficacy, Environmental emissions and waste residues, Space requirements, Utility and other installation requirements,waste reduction,Occupational safety and health,Noise,Odor.Automation,Reliability,Level ofcommercialization,Background of the technology manufacturer,Cost,Community and staff acceptance
ECODAS autoclaves are installed in several places in France, mostly in individual medical facilities. Theyare also operatedas central unitsat some hospitals,suchas in Santesor Loos. ThesesystemsarealsooperatedinCyprus, Hungary,Poland,Russia,Spainandsomenon- EuropeancountriessuchasArgentina,Brazil, Mexico, Japan, Egypt, Lebanon, Guyana and Morocco.

Treatment And Disposal Methods:

There are a range of methods available in a hospital to treat and dispose of clinical and related wastes. The methods used depend on specific factors applicable to the institution, relevant legislation, and environmental aspects affecting the local community.

The bulk of waste falls into the category of general waste, much of which can be recycled or reused. With correct segregation, less than 5 per cent of the
waste is likely to be classified as clinical waste.

Acute Pain Management:

Information for consumer'sClinical waste must be managed by approved treatment methods. Once treated by a process acceptable to the relevant State or Territory authorities, it may be reclassified accordingly before recycling or disposal.

The waste treatment options currently available have various capabilities and limitations. As technology changes, health care establishments should evaluate treatment alternatives for their safety, effectiveness, environmental impact, costs, and compliance with relevant State or Territory licensing requirements.

Large volumes of liquids (such as 24-hour urine collections) should generally be disposed of into an appropriate sluice. Precautions must be taken to avoid the hazards of splashing. Empty disposable containers may be disposed of as general waste, whereas non-disposable containers must be rendered safe for the intended reuse.

Body fluids, particularly blood and fluids visibly contaminated with blood, should be treated with caution. Bulk blood and suctioned fluids may be disposed of into the sewer, but care should be taken to avoid splashing, which may cause health risks. A suitably experienced and trained person should carry out this

procedure. The disposal of large volumes of blood into the sewer is subject to approval from the local sewerage authority.

There are special circumstances when a known infected material requires extra precautions, such as specific handling procedures required before waste removal from a microbiological laboratory. Moreover, community expectations for responsible clinical waste management require treatment of the waste before landfill disposal. Pathogenic microbiological cultures transmissible by the aerosol route should be rendered sterile by an approved treatment method before they leave the control of laboratory personnel.

For special precautions regarding disposal pathways of waste from cases of viral haemorrhagic fever and other quarantinable diseases, eg Ebola or Lassa fever, refer to the relevant State or Territory legislation. In addition, details risk groupings of micro-organisms by type andSection 5 provides advice on degrees of hazard associated with various micro-organisms.

Treatment Option For Clinical Wastes Should:

- render sharps incapable of causing penetration injury and waste unrecognisable ,

achieve a significant volume reduction , result in residues being suitable for approved landfill disposal without ,harmful leaching to the environment, reduce the potential for the transmission of infection , be verifiable for the treated wastes , have automatic controls and built-in fail-safe mechanisms, have continuous automatic monitoring and recording, ensure that the waste cannot bypass the treatment process , meet occupational health and safety standards, have fail-safe alternative treatment and disposal in case of emergency, provide pre-treatment refrigerated storage facilities as licensed; and, where feasible, implement materials and energy recovery strategies and in the case of autoclaves, be tested at least annually to ensure that optimal performance is maintained.

Waste Treatment and Disposal Methods Currently Approved in Australia include:

- Autoclaving; Chemical Disinfection, Grinding/shredding (sodium hypochlorite), Grinding/shredding (hydrogen peroxide and lime), Landfill, Microwave; Regulated incineration; Encapsulation; and Sewerage (as determined by relevant authorities).

1- Autoclaving

Autoclaving involves the heating of infectious waste by steam under pressure. The effectiveness of autoclaving depends on the temperature, pressure, exposure time and the ability of steam to penetrate the container. Confirmation that the required temperature has been reached is imperative.

Noise emissions can be of concern with an autoclave and should be considered

2- Incineration

Incineration is a term used commonly to describe all systems of burning, although only one standard is considered to be effective. In these national guidelines 'incineration' is used to describe the process of combustion carried out in a multiple-chambered incinerator that has mechanisms for closely monitoring and controlling the combustion parameters.

Combustible waste can be incinerated provided that an appropriate incinerator is used. Incinerator residues can generally be disposed of in landfills. However, if the residues contain considerable heavy metal contaminants, the relevant State or Territory disposal codes of practice or legislation must be followed. Where incineration is used, the following issues should be addressed.

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II. MATERIAL AND METHODS

Methodology:

1.Loading: The contaminated was teisa utomatically loaded in to the upper chamber at the to pof the unit. It's takes approximately 5 minute.

2.Knife and Shredding: After the loading cover is sealed, the heavy- duty shred dercuts the material in to small lpieces and features a unique revers ingsystem to avoid jamming but knife before shredding cut it by uniform way. It's takes approximately 30 minute .

3.Heating: Saturated pressurized steam raises the temperature to138°C(280F),andthepressuresto 3.8 bar(55psi).And it's takes approximately 30 minute.

4. Sterilization: Thepressurized heated steam come sin to direct contact with the shredded material, 8 Log 10 redction of the infectious loadis achieved by maintaining 138°C/3.8bars. And it's takes approximately 12 minute

5. Cooling: Temperature is lowered to 80° Cbysprayingcool water on to the double Jacket of the treat ment vessel.

Simultaneously, theunit returns to ambient pressure. And it's takes approximately 12 minute

6.Draining: The steam is condensed to water and discharged with the cooling water to thesanitary sewersystem.And it's takes approximately 5 minute.

7.Vacuum: Theremainingresidualsteam isvented outthrougha vacuumpump.And it's takes approximately 30 minute.And it's takes approximately 5 minute.

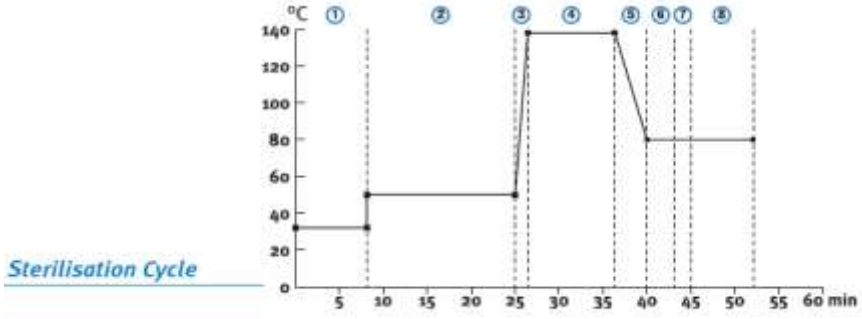
8.Unloading: Adigital signalin forms the operator that all safe operating conditionshave been met.

The conditionunlocks the unitand allows gravity unloading of the treated was teintoa container.

In this case study the workers must wear PPE(Personal Protective Equipment's) , Autoclave must located away from entrances and restaurant also the residue waste after treating must taketo the land field regularly.

There must found two workers as minimum in the Autoclave room which must be safe place work and follow the standards .for example:ventilation, extinguisher, Etc.

III. Experimental Results and Discussion:



T150 Sterilisation cycle

Note:

1. The type of this autoclave is T150, and voltage is 3 x 380 v, power is 8kw.
2. At loading the weight of waste is 8kg
   And in UN loading stag it be 7kg after drying by sun it be 3kg [approximately]
   Table(1.1): Hazard and Operability Study for Autoclave treatment Medical Waste in Khartoum Breast Care Center.

Code NO	Element	Deviation	Possible Causes	Consequence	Safe Guards	Action Required	Action Assigned to
T1	Temperature inside incinerator	More than 138 C.	1. Failure in valve. 2. Amount of steam so much.	1. Explosion. 2. Harm to build and persons. 3. Damage in incinerator	Make temperature control valve (TCV).	1. Put alarm to check temperature. 2. Decrease temperature. 3. Decrease amounts of steam.	Operator.
T2	Temperature inside incinerator	Less than 138 C.	1. Decrease of temperature . 2. Loss of temperature .	1. Most of waste is not sterilizing. 2. Increase amount of output waste. 3. Decrease the efficiency of incinerator	1. Make temperature control valve (TCV).	1. Put alarm to check temperature. 2. Increase temperature. 3. Increase amounts of steam.	Operator.
P3	Pressure inside incinerator	More than 3.8	1-Increase of pressure 2-Increase of amount of steam 3- Increase of temperature 4- Failure valve pressure	1. Explosion. 2. Harm to build and persons. Damage in incinerator tubes.	Make pressure control valve. (PCV).	1. Decrease off pressure. 2. Put alarm to check the pressure. 3. Controlled of the amount of steam so we controlled of temperature	Operator.
P4	Pressure inside incinerator	Less than 3.8	Decrease of pressure.	1. Pressure drop inside tubes. 2. Amount of	Make pressure control valve. (PCV).	1. Increase of pressure. Put alarm to check	

IV. CONCLUSION

Certain pollutants in Medical Waste are more important to target for pollution prevention than others, for this case studied it is found that the Medical Waste is decreased from 8 Kg to 2 kg in these study

V. RECOMMENDATIONS

- The job of incineration must be containing minimum two operators.
- The pipe of water must be connected with sup tank.
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