

Hazardous And Toxic Waste Processing (B3)

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ABSTRACT

Hazardous and Toxic Materials (B3) waste management is a crucial element in maintaining environmental balance and protecting human health. Derivatives from various industrial sectors, B3 waste requires management with the aim of reducing the risk of environmental pollution and complying with government regulations. The main obstacle in B3 waste management is the diversity of types of hazardous substances, which requires a careful approach and the application of appropriate technology. The role of government in regulating and supervising B3 waste management through strict policies and regulations is very important. Positive initiatives, such as providing incentives to companies that implement good B3 waste management practices, can encourage sustainability in the business environment. Public awareness of the dangers of B3 waste also plays a key role, expected to increase active participation in efforts to prevent and manage B3 waste. This study, using the Systematic Literature Review (SLR) method, identifies and analyzes literature related to B3 waste management, including Indonesian regulations governing procedures and technical requirements. These regulations stipulate thermal treatment methods with specific requirements for autoclaves, microwaves, radio frequency irradiation, and incinerators, including prohibitions on their use for certain types of waste. Treatment locations are also strictly regulated to ensure environmental and community protection. Thus, Indonesian regulations affirm a commitment to managing B3 waste with high standards, using safe, efficient, and environmentally friendly treatment methods, and promoting joint efforts towards a sustainable environment.

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INTRODUCTION

Hazardous and toxic waste management (B3) is a crucial aspect in efforts to maintain environmental balance and protect human health. Hazardous and toxic materials include chemical substances that can have serious negative impacts on the environment and living things. B3 waste can come from various industrial sectors, including the chemical, pharmaceutical, electronics, and other industries. B3 waste management has the main objective of reducing the risk of environmental pollution and public health, as well as complying with regulations set by the government.

One of the main challenges in B3 waste processing is the diversity of types of hazardous substances that must be addressed. Therefore, B3 waste processing requires a careful approach and appropriate technology. Choosing an environmentally friendly and efficient processing method is key to reducing its negative impacts. In addition, prevention needs to be carried out from the start by reducing the use of hazardous materials and implementing clean production practices to minimize the B3 waste produced.

In this context, the role of government is very important in regulating and supervising the management of B3 waste. Strict policies and regulations are needed to encourage industries to operate responsibly towards the environment. Providing incentives for companies that adopt good B3 waste management practices can be a positive stimulus in creating a sustainable business environment.

The importance of education and public awareness of the dangers of B3 waste should also not be ignored. By increasing public understanding of the negative impacts of B3 waste, it is hoped

that it can encourage active participation in efforts to prevent and manage B3 waste at the individual and community levels. Thus, B3 waste management is not only the responsibility of industry and government, but also a joint collaboration to protect the environment and the health of future generations.

METHOD

This study uses the Systematic Literature Review (SLR) method, which refers to a rigorous research approach used to collect and evaluate research related to a particular topic in a particular field or discipline (Xiao & Watson, 2019). This method is used to systematically identify and analyze related literature with the ultimate goal of advancing a deeper understanding of the chosen subject matter. The SLR process involves conducting a comprehensive investigation that encompasses multiple objectives, such as identifying, examining, evaluating, and interpreting all existing research in the domain of interest, with a specific focus on relevant research questions (Okoli & Schabram, 2015).

RESULTS AND DISCUSSION

Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number P.56/Menlhk-setjen/2015 Concerning Procedures and Technical Requirements for the Management of Hazardous and Toxic Waste from Health Service Facilities. B3 waste processing is a process to reduce and/or eliminate hazardous and/or toxic properties. In its implementation, processing of B3 waste from health service facilities can be carried out thermally using the following equipment:

- a. Gravity flow type and/or vacuum type autoclaves;
- b. Microwaves;
- c. Radio frequency irradiation; and/or
- d. Incinerator.

Thermal operation of equipment, namely autoclave

Vacuum type is performed at a temperature greater than or equal to:

- a. 121 OC and a pressure of 15 psi (fifteen pounds per square inch) for a minimum of 45 minutes
- b. 135 OC and pressure 31 psi for at least 30 minutes

Gravity flow type is carried out at temperatures greater than or equal to:

- a. 121OC and 15 psi pressure for at least 60 minutes
- b. 135 OC and pressure 31 psi with a time of at least 45 minutes
- c. 149 OC and pressure of 52 psi for at least 30 minutes

Autoclaves are prohibited from being used for B3 waste:

- a. Pathological
- b. Expired chemicals, spills or leftover packaging
- c. Radioactive
- d. Pharmacy
- e. Cytotoxic

Thermal operation of the equipment, namely microwaves, is carried out at a temperature of 100°C with a minimum residence time of 30 minutes.

Operation of microwave equipment is prohibited for Waste:

- a. Pathological;
- b. Expired chemicals, spills, or leftovers

- c. Radioactive;
- d. Pharmacy;
- e. Cytotoxic; and
- f. Medical devices that contain
- g. High heavy metals.

Thermal operation of equipment, namely radio frequency irradiation, is carried out at temperatures greater than 90 °C.

- a. Operation of radio frequency irradiation equipment is prohibited for use in waste:
- b. pathological;
- c. expired chemicals, spills, or leftover packaging;
- d. radioactive;
- e. pharmacy; and
- f. cytotoxic.

Requirements for B3 Waste Management equipment for B3 Waste Processing activities using incinerators must meet the following provisions:

- a. Combustion efficiency of at least 99.95%
- b. The temperature in the main combustion chamber is at least 800 OC
- c. The temperature in the second combustion chamber is at least 1,000 OC with a minimum residence time of 2 seconds;
- d. Have air pollution control equipment in the form of a wet scrubber or similar;
- e. The minimum chimney height is 14 m from the ground level or 1.5 times the highest building, if there is a building with a height of more than 14 m within a radius of 50 m from the incinerator;

Incinerators are prohibited from being used for B3 waste:

- a. Radioactive B3 waste
- b. B3 waste with explosive characteristics
- c. Mercury B3 waste

Table 1.Incinerator example



B3 Waste Processing Location Requirements

- a. Flood-free areas, not disaster-prone areas and can be engineered with technology for environmental protection and management;
- b. 30 meters away from:
 - 1. Public road/toll road
 - 2. Residential areas, commerce, hotels, restaurants, religious and educational facilities.

3. High tide lines of the sea, rivers, tidal areas, ponds, lakes, swamps, springs and wells of the population.
 4. Nature reserves, protected forests and other protected areas.
- c. Distance requirements do not apply to B3 waste processors in industrial areas.

CONCLUSION

Management of hazardous and toxic waste (B3) from health care facilities. B3 waste processing must follow a thermal process using equipment such as gravity flow or vacuum autoclaves, microwaves, radio frequency irradiation, or incinerators. Autoclaves have specific requirements, including a ban on their use for pathological B3 waste, expired chemicals, spills, leftover packaging, radioactive, pharmaceutical, and cytotoxic. The use of microwaves and radio frequency irradiation is also regulated by provisions involving the types of waste that are permitted and prohibited. Incinerator equipment must meet standards for combustion efficiency, main combustion chamber temperature, air pollution control, and certain locations that are free from flooding and not prone to disasters. Incinerators are prohibited for radioactive, explosive, and mercury B3 waste. All of these regulations emphasize the Indonesian government's commitment to ensuring that B3 waste management is carried out to high standards, involving safe, efficient, and environmentally friendly processing methods, and carefully placing processing locations to protect the environment and the community.

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