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ENERGY EFFICIENCY OF WASTE-TO-ENERGY POWER PLANTS

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The economic development of the most industrialized countries has entailed a gradual increase in waste production. Growing environmental and public health concerns, combined with the possibility of using these byproducts of ordinary life as a valuable energy resource, have led to a search for alternative methods of final disposal of waste.

Key words: waste to energy, municipal solid waste, power plant, incineration, recycling, efficiency.

Every year millions ton of waste is being thrown into landfills, that causes many environmental and human health problems. The Waste-To-Energy (WTE) incineration power plant could decrease significant amount of waste accumulation and reduce disease spread. In addition to that, it could also generate energy from multiple ways. Like generating electricity through turbines or using hot water produced during the process in communal services, like heating houses. During the incineration process biogas, biofuel or many other different syngas formulas could be generated in addition to electricity, and communal benefits. This is very cheap way to reduce waste accumulation process with getting significant amount of energy. This could help many industrialized countries with waste disposal problems.

The most industrialized countries' economic prosperity has resulted in a gradual increase in garbage output. Growing environmental and public health concerns, as well as the possibility of utilising these waste byproducts as a valuable energy resource, have prompted a quest for new trash disposal solutions. The advantages of incineration over landfilling include energy recovery and large reductions in waste mass and toxicity. Municipal solid waste (MSW) energy conversion in Waste-To-Energy (WTE) power plants is one of the key means of combined waste management in this environment; its potential is rising around the world, both in terms of the number of plants and the capacity expanded by government rules. Direct combustion on a moving grate to produce superheated steam that feeds a steam turbine in the Hirn's cycle is the primary technology for extracting energy from MSW. The total amount of energy recovered from MSW combustion varies based on the composition, mass flow rate, and lower calorific value of the MSW fed to the boiler, combustion technology and thermodynamic cycle parameters. A WTE power plant's thermodynamic efficiency is primarily governed by the following factors:

1) maximum steam cycle temperature, which is limited by well-known corrosion problems mainly affecting the high-temperature section;

2) due to the temperature limitations of superheated steam, a low evaporation pressure is needed to avoid a high liquid fraction at the steam turbine outlet;

3) typical modest capacity and mass flow rate of VTE power plants imply low isentropic efficiency of the steam turbine. Therefore, the thermodynamic efficiency of VTE power plants usually fluctuates in the range of 25 % ÷ 30 %.

Landfilling was the cheapest and easiest technique of final waste treatment among all MSW processing methods. Increasing environmental and public health concerns, as well as the potential to utilise these remnants of everyday life as a valuable energy resource, have prompted the quest for alternate final waste disposal techniques. In most Eu states, landfill is still the most common waste management option, with only a few exceptions (such as the Netherlands, Denmark, and Sweden) having a diverse range of final waste disposal options. Incineration as a waste management strategy varies widely by nation; the percentage of garbage burnt ranges from zero (in eastern countries) to nearly 50 %, with an average of 20 % in 2009. In comparison, nine states discard more than 80 % of their total MSW production. Germany, Austria, the Netherlands, Sweden, Denmark, and Belgium landfill less than 10% of their domestic waste.

Organic garbage, which is biodegradable and comes from plants or animals, such as food and kitchen waste, is separated from green waste, such as cut branches, and inorganic waste, which includes plastic, paper, glass, and metals. However, in terms of WtE incineration, MSW can be classified as "combustible" or "non-combustible. " Combustible garbage includes organic waste as well as other combustible waste such as paper, plastic, and textiles that have not been sorted as recyclable materials on-site. Ceramic dishes (cups, plates, flower pots, etc.), metals, glass (bottles, flower vases, mirrors, etc.), ashes, and other materials are examples of non-combustible garbage. Such non-combustible garbage must be separated from the waste to be burned at the source).

In general, a WTE power plant may include the following processes and sections:

- receiving incoming waste;.
- storage of waste and raw materials;.
- waste pretreatment (on-site or off-site if necessary);.
- loading waste into the technological process;.
- thermal treatment of waste;.
- energy regeneration (e. g., in a boiler) and conversion;.
- flue gas cleaning;.
- flue gas cleaning residue management (from flue gas cleaning);.
- flue gas venting;.
- emissions monitoring and control;.
- wastewater control and treatment (e. g., from site drainage, flue gas treatment, storage);.
- disposal and treatment of ash/ash (generated at the combustion stage);.
- residue dumping/removal of solid residue.

Waste collection and storage A garbage delivery area is where vehicles, trains, or containers arrive to deposit rubbish into a bin, generally after visual inspection and weighing.

Waste incineration is the oxidation of combustible elements found in waste. Waste is a very heterogeneous substance that mostly consists of organic stuff, minerals, metals, and water. Organic combustibles ignite after reaching the requisite ignition temperature and being exposed to oxygen. If the calorific value of the waste and the oxygen supply are sufficient, the combustion process occurs in the gas phase in a fraction of a second and energy is released at the same time. This has the potential to cause a thermal chain reaction and self-sustaining combustion. Other fuels are not required.

The flue gases must be subjected to a temperature of at least 850 °C for at least 2 seconds following the last injection of secondary air, according to modern requirements. As a result, the furnace must feature a combustion chamber or afterburning chamber that is elevated above the grate. The ultimate burning of the flue gases occurs in this chamber, and secondary combustion air is injected in the needed quantity and in such a way as to achieve maximum velocity.

When constructing a WtE incinerator, it is critical to evaluate the environmental impact of various air pollutants, particularly in terms of public knowledge and acceptability. Dust, acid gases, NO, dioxins, and mercury are examples of air pollutants that must be regulated. Filtration is used to remove air contaminants from flue gas using bag filters. Before the flue gas goes through the bag filter, an alkaline agent, such as lime powder or powdered activated carbon, is injected into it. Filtration removes the dust. Acidic gases like hydrochloric acid and sulfur dioxide are eliminated when they react with an alkaline substance. Dioxins and mercury are adsorbed and removed by powdered activated carbon. It is required to regularly measure the concentration of flue gases, dust, hydrochloric acid, and sulfur dioxide in order to manage them.

WTE plants generate around 14 million MWh of energy every year. Per metric ton of MSW, approximately 0. 55 MWh. The most recent WTE plants are much more energy efficient, with the AEB Amsterdam WTE producing more than 0. 7 MWh for metric ton. On average, the new WTE plants are expected to produce 0. 6 MWh per ton. As an example, a WTE plant processing 300,000 tons per year would generate 180,000 MWh. If the plant is built in or near a city with or plans to create a district heating system, the WTE can provide an additional 180,000 MWh of heat, if not more. This second benefit of WTE is extensively utilized in Denmark, where 28 WTE plants service a population of 5. 5 million. These facilities, which are nearly invariably located in or near residential areas, supply 30% of the country's district heating.

WTE plants use the least amount of coal, oil, natural gas, and other fossil fuels to generate electricity. One WTE facility in Huntsville, Alabama, for example, reduces the consumption of 200,000 barrels of oil each year. The mass burning of one ton of municipal solid trash saves one barrel or 0. 25 tons of coal. This guarantees that contaminants are released into the environment as little as possible. It also solves the problem of solid waste disposal and landfill, reducing the demand for more land. WTE plays an essential role in reducing landfill methane and CO_2 emissions, hence postponing the problem of global warming.

To examine the economic and environmental implications of MSW, a case study was undertaken at the Taman Beringin Landfill in Malaysia, evaluating alternative processes such as incineration, landfill gas recovery, and anaerobic digestion. The results demonstrated that incineration could provide 1,430 MWh/day of heat and 480 MWh/day of electricity from 1,000 tons of MSW per day.

List of literature

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ЭНЕРГЕТИЧЕСКАЯ ЭФФЕКТИВНОСТЬ ЭЛЕКТРОСТАНЦИЙ, ИСПОЛЬЗУЮЩИХ ОТХОДЫ

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Экономическое развитие большинства промышленно развитых стран повлекло за собой постепенное увеличение производства отходов. Растущая забота об окружающей среде и здоровье населения в сочетании с возможностью использования этих побочных продуктов обычной жизни в качестве ценного энергетического ресурса привели к поиску альтернативных методов окончательного удаления отходов.

Ключевые слова: отходы в энергию, твердые бытовые отходы, электростанция, сжигание, переработка, эффективность.

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ВЛИЯНИЕ ИЗМЕНЕНИЯ КЛИМАТА НА ЗДОРОВЬЕ НАСЕЛЕНИЯ И РЕКОМЕНДАЦИИ ПО АДАПТАЦИИ НАСЕЛЕНИЯ К ИЗМЕНЕНИЮ КЛИМАТА

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Статья посвящена актуальной на сегодняшний день проблеме влияния изменения климата на здоровье населения и даны рекомендации по адаптации населения к изменению климата. Довольно сложно определить точный ущерб, который наносит изменение климата здоровью человека и определить все факторы, негативно влияющие на его физическое состояние. В первую очередь, из-за изменения климата ухудшается качество окружающей среды.