Methods for environmentally safe disposal of solid waste

D.X.Yakibova
B.U.Davletova
D.D.Jumaboyeva
Almalyk State Technical Institute

Abstract: This article scientifically analyzes modern methods of environmentally friendly disposal of solid waste. In particular, technologies such as waste processing (recycling), composting, incineration, storage in sanitary landfills, as well as pyrolysis and gasification are considered. Their advantages and disadvantages, environmental impact, and energy efficiency are also highlighted. The article analyzes the current state of the waste management system in Uzbekistan, identifies existing problems and ways to overcome them. Based on the results of the study, it is justified that it is important to apply an integrated approach to waste management, introduce innovative technologies, and increase environmental culture.

Keywords: solid waste, disposal, recycling, composting, incineration, ecology, waste management, pyrolysis, gasification

Introduction

In the current globalization environment, as a result of the acceleration of urbanization processes, the increase in industrial production, and changes in consumer culture, the amount of solid waste is increasing year by year. Today, the issue of waste management is not only an environmental problem, but also a socio-economic problem. Improper storage and disposal of solid waste leads to pollution of soil, groundwater, and atmospheric air.

In this context, one of the urgent tasks is to scientifically study and implement environmentally friendly waste disposal methods.

Purpose and objectives of the study The purpose of this article is to analyze modern methods for environmentally safe disposal of solid waste.

Let’s look at the tasks.

1. Clarification of the concept and classification of solid waste;
2. Analyze the advantages and disadvantages of disposal methods;
3. Assess the state of waste management in Uzbekistan;
4. Show the prospects for the application of innovative technologies.

Solid waste is material objects generated as a result of human activity that have become unusable for current needs and require special processing or disposal. The main types of waste are:

Household waste is waste generated by the population (food waste, plastic, paper, glass); Industrial waste is generated during the production process; Construction waste is generated during the demolition and construction of buildings; Agricultural waste is organic residues, plant and animal products; Hazardous waste is chemical, medical and radioactive substances.

Environmental impact of solid waste Uncontrolled disposal of solid waste leads to the following negative consequences: soil structure deterioration; groundwater pollution; release of harmful gases into the atmosphere (methane, dioxins); risk to human health (infection and toxic effects). Therefore, it is important to utilize waste through scientifically based methods.

Environmentally friendly disposal methods Recycling Recycling refers to the processing of waste into secondary raw materials. This method is important for saving resources and protecting

natural resources. According to scientific studies, recycling can reduce energy consumption by 30-70%.

Composting is the process of biological decomposition of organic waste using microorganisms. The result is an organic fertilizer rich in humus.

The composting process includes the following steps: collection of organic materials; decomposition under aerobic conditions; application of the finished product.

Incineration (burning) Incineration is a method of reducing the volume of waste by burning it at high temperatures. This process also has the potential to generate energy. However, it can release harmful substances into the atmosphere; it is expensive. Therefore, modern filtration systems must be used.

Sanitary landfills Modern landfills must meet environmental requirements: waterproofing layer, filtrate collection system, gas control.

Pyrolysis and gasification These technologies allow the production of synthesis gas and liquid fuel by decomposing waste at high temperatures in an oxygen-free environment.

If we consider the advantages, 1) there is less environmental risk; 2) there is higher energy efficiency; 3) there is a reduction in the volume of waste. Innovative approaches In recent years, the following innovations have been used in waste management: “Smart” waste sorting systems; plasma utilization technologies; waste-to-energy (WTE); the concept of a circular economy. The state of waste management in Uzbekistan Reforms are being implemented in the field of waste management in Uzbekistan. The waste collection and transportation system is being improved; the number of recycling enterprises is increasing; environmental culture is being raised among the population. However, there are also problems: insufficient sorting infrastructure; low recycling rate; high need for investments.

Scientific analysis and discussionAnalysis shows that the effectiveness of the waste management system depends on an integrated approach. That is: sorting waste at source; developing recycling; introducing energy conversion technologies. This can minimize environmental risks.

Conclusion

Environmentally safe disposal of solid waste is one of the important factors for ensuring sustainable development today. The results of the study show that the effectiveness of the waste management system directly depends on the level of technologies used, the institutional approach and the environmental culture of the population.

Scientific analysis has shown that waste should not only be disposed of, but also be re-considered as an economic resource. In particular, recycling and composting methods allow for the rational use of natural resources, while advanced technologies such as pyrolysis and gasification allow for the conversion of waste into an energy source. At the same time, incineration and landfilling methods can only be effective and safe if they are carried out under strict environmental control.

The study found that the waste management system in Uzbekistan is at a developmental stage, but there are some systemic problems. In particular, the insufficient development of waste sorting infrastructure, low recycling rates, and the lack of widespread implementation of innovative technologies are considered to be urgent problems in this area.

References

1. Дадаходжаев, А. Т., Мураткулов, О. К., Фузайлова, Ф. Н., Гуро, В. П., Бобомуродова, М. С., & Якибова, Д. Х. (2023). ИССЛЕДОВАНИЕ ПЕРЕРАБОТКИ ОТРАБОТАННЫХ МЕДЬ-, ЦИНК-, ВАНАДИЙ-СОДЕРЖАЩИХ КАТАЛИЗАТОРОВ. Universum: технические науки, (6-3 (111)), 31-35.

2. Mamatova, S., Kurbanov, M., Kodirov, A., Davronova, G., Safarova, M., Bozorova, L., ... & Abdullayev, B. (2025). Obtaining a new type of polymer materials based on recycled polyethylene waste, sulfur, and melamine. Applied Chemical Engineering, 8(4), 1-9.

3. Дадаходжаев, А. Т., Маннанов, У. В., & Эшмухамедов, М. А. (2024). Нефтегазовая промышленность Узбекистана.

4. Askarxodjayev, Y. M. (2026). The “transition period” syndrome in the educational system of Uzbekistan in the late 1920s: the dialectics of ideological obligation and economic pragmatism. Academic Journal of Science, Technology and Education, 2(3), 49-52.

5. Askarxodjayev, Y. (2025). “MAORIF VA O‘QUTG‘UCHI” JURNALI “MEHNAT MAKTABI NIMA DEMAK?” MAQOLASIDA O‘ZBEKISTON SSRDA AMALIY TA’LIM G‘OYASINING DASTLABKI NAZARIY ASOSLARI (1925-YIL, 1-SONI MISOLIDA). Ижтимоий-гуманитар фанларнинг долзарб муаммолари Актуальные проблемы социально-гуманитарных наук Actual Problems of Humanities and Social Sciences., 5(10s), 98-105.

6. Adilov, T. T., Israilova, X. M., Uzohkov, I. E., Axtamov, M. X., & Raxmatullayeva, X. I. (2021). Food security: National food market strategy. Academicia: An International Multidisciplinary Research Journal, 11(2), 619-626.

7. Самадов, А. У., & Носиров, Н. И. (2021). Изучение минералогический состав хвостов Чадакской зиф. EDITOR COORDINATOR, 665.

8. Karimkulov, K. M., Uzohkov, I. E., & Sarikulov, M. K. (2021). Studying The Classification And Quality Of Food. The American Journal of Agriculture and Biomedical Engineering, 3(03), 32-38.

9. Sarikulov, M. X., Uzoqov, I. E., & Lapasova, Z. K. Q. (2022). Oliy ta’lim muassasalarida yosh kadrlarni sifatli inklyuzif o’qitishni rivojlantirish va yetuk kadrlarni tayyorlash. Science and Education, 3(6), 784-788.

10. Karimkulov, K. M., & Abdurakhmanova, A. J. (2023). OZIQ-OVQAT MAHSULOTLARINI SIFATINI ANIQLASH VA TASNIFLASH. Journal of Chemistry of Goods and Traditional Medicine, 2(5), 14-27.

11. Uzoqov, I. E., Lapasova, Z. K., & Jabborxonova, G. A. K. (2022). Oziq-ovqat mahsulotining xavfsizligi: muammolar va yechimlar. Science and Education, 3(7), 41-52.

12. Uzoqov, I. E., & AJabborxonova, G. (2022). IQLIM O'ZGARISHINI OLDINI OLISH VA IQTISODIY SAMARADORLIKGA ERISHISH. In Archive of Conferences (pp. 164-170).

13. Каримкулов, К. К., Адилов, Т. Т., Узоков, И. Е., Исраилова, Х. М., & Рискулов, Х. А. (2020). ТАУАРЛАРДЫ ЖІКТЕУ ЖӘНЕ ЖАҚСАРТУ. МӘСЕЛЕЛЕРІ. Уральский научный вестник, 2(1), 50-62.

14. Каримкулов, К. М., Узаков, И. Э., & Сарикулов, М. Х. (2022). Роль технологии искусственного интеллекта в повышении эффективности таможенного контроля. Science and Education, 3(4), 163-169.

15. Karimkulov, K. M., Uzohkov, I. E., & Sarikulov, M. K. (2020). Food security in Uzbekistan: Problems and solutions. South Asian Journal of Marketing & Management Research, 10(11), 115-123.

16. Сарикулов, М. Х., Узаков, И. Э., Ирисов, И. Ш. У., & Сулхонов, Д. А. У. (2023). Калорийность и химический состав куриного яйца. Science and Education, 4(6), 46-53.

17. Рискулов, Х. А., Адилов, Т. Т., & Узоков, И. Э. (2022). Перспектива развития туризма в Узбекистане. Science and Education, 3(7), 334-339.