



International Journal for Innovative Engineering and Management Research

A Peer Reviewed Open Access International Journal

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IJIEMR Transactions, online available on 29th Jan 2021. Link

[:http://www.ijiemr.org/downloads.php?vol=Volume-10&issue=ISSUE-01](http://www.ijiemr.org/downloads.php?vol=Volume-10&issue=ISSUE-01)

DOI: 10.48047/IJIEMR/V10/I01/54

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Volume 10, Issue 01, Pages: 274-276.

Paper Authors

Tursunov Shavkat Serabovich



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УДК 631.311.6

ANALYSIS OF EXISTING DESIGNS OF CRUSHERS FOR CRUSHING MUNICIPAL SOLID WASTE

Tursunov Shavkat Serabovich

Karshi Engineering and Economic Institute

E-mail. shavkat0006@mail.ru

Abstract: The article analyzes the types of collection and transportation of solid waste, as well as the influence of the type of collection on the design of the crusher. When crushing and recycling solid waste, useful components can be separated for later use.

Key words: mixed, solid waste, processing, organic waste, rotor, hammer.

Introduction. Solid household waste is a heterogeneous mixture of organic and inorganic components of a complex morphological composition (ferrous and non-ferrous metals, waste paper, textiles, glass, ceramics, plastics, food and vegetable waste, wood, stones, bones, leather, rubber, street estimates and an example).

Every year a city dweller produces 200-500 kg of solid household waste. Delay in the disposal and liquidation of solid household waste is unacceptable, as it can lead to serious pollution of cities.

Solid waste management includes disposal (transportation), processing at special plants, disposal, as well as the implementation of measures to reduce the amount of waste sent to special plants and disposal.

The process of reducing the size of an elastic-fragile body from the original (original) to 5 mm by the action of external forces is called crushing. [one]

Crushing processes are present in many sectors of the national economy, and each sector imposes its own specifics on the

processes themselves and on the design of the crushers used.

Crushers used for installation in factories that process household waste in large cities - crusher garbage, in addition to high productivity, must be able to process materials of different strength and other characteristics (bone, glass, plastic, rags, etc.).

The creation of crushers for processing household waste causes significant difficulties, since waste is a very diverse conglomerate in terms of physical and mechanical properties, containing fibrous inclusions (paper, wood, textiles, leather, rubber), fragile components (glass, stone, bones), plastic, ferrous and non-ferrous metals, etc.

Analysis of literature sources shows a strong influence of the physical and mechanical properties of solid household waste on the crushing technology, as well as on the design of the crusher.

Below is the average morphological composition of solid domestic waste arising in the city of Tashkent as a percentage of the total mass.

Table 1.1 - Morphological composition of solid domestic waste arising in the city of Tashkent

Table 1.1

Components of solid household waste	Percentage of total mass (%)	Note ¹
Waste paper	46.39	
Food waste	30.93	
Wood	4.12	
Metal	2.06	
Textile	3.09	
Plastic	5.15	
Glass	6.19	
Other	2.06	
Total	100	

Research carried out at the KD Panfilov Academy of Public Utilities (Russia) has shown that grinding solid household waste is the main operation that allows them to be prepared for reliable disposal and recycling.

One of the main operations in the processing of municipal solid waste is their crushing in various crushers (Figure 1.1)

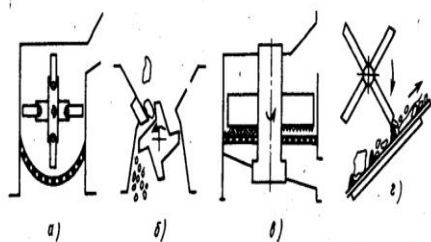


Figure 1.1. Schemes of crushers used in the processing of municipal solid waste

The most versatile qualities for processing solid household waste are hammer crushers (Figure 1.1, a), in which soft materials, such as food and plant waste,

as well as fragile materials - glass, bones, stones - are greatly crushed. Materials such as textiles, plastics, wood are crushed with hammers on a grate or sieve until they reach a size that allows them to fall through the holes.

In a roller - toothed crusher (Figure 1.1, b), the material is exposed to the teeth (knives) located on the discs, and is also intensively crushed. The size of the pieces of material obtained is approximately equal to the distance between the discs.

Grinding crusher - rasp (Figure 1.1, c) works on the principle of rubbing the material through a sieve. Above the screening surface there are rotating beams with grinding cams, crushing and pushing the waste through a metal sieve.

Knife beams (Figure 1.1, d) are used to scuttle and loosen compressed waste, break up clods moving on a belt equipped with spikes.

Machines of other designs are also used, as well as whole complex units (especially when processing scrap metal). Crushing of solid household waste is carried out, as a rule, in one stage.

Abroad, especially in the USA, Great Britain, and Italy, it is widely used to drain crushed household waste into the sewerage system directly at the place of their receipt, as well as in individual private apartments. According to experts, this is the most hygienic and fastest way to remove rapidly decaying solid waste.

According to the conditions of hydrotransport, the maximum particle size in the crushed material should not exceed 5-10 mm. Waste such as glass, metal cannot be crushed.

Crushers of Russian production for crushing household waste are a hammer

crusher and are designed for installation in canteens, restaurants, etc. The capacity of the DB-3B crusher is 0.3-0.6 t / h, the installed engine power is 22 kW, the number of hammers is 39, the size of the window loading hopper 300 × 290mm, crusher dimensions 1300 × 720 × 1145mm, weight 414 kg. Water consumption is 8-10 liters per 1 kg of waste. The main working body is a hammer, which is a rectangular plate 60 × 157 × 14 mm in size, made of 65G steel. The hammer has two mounting holes with a center-to-center distance of 97 mm, which allows the use of four working edges. [2]

The English company "Haig" manufactures crushers of the Dispozamatik series of 11 standard sizes for processing solid waste with a capacity of 80-400 kg / h, and crushers of the first four sizes with a power consumption of 0.55-1.1 kW and a capacity of 80-160 kg / h are intended for application in a city apartment or in the country. Other sizes of crushers are designed for larger objects.

The main working bodies of the crusher are a wheel with cutting knives and fixed armor. Powerful jets of water are fed directly into the teeth of the cutting tools and clean them and the entire crushing chamber from dirt, which increases the service life of the working tools.

Thus, the crushing of solid household waste is carried out in a stream of water, followed by the removal of the pulp into the sewer.

Specific power consumption for crushing in Haig crushers is 7-18 kWh/t. [3]

Conclusion: Analysis of studies devoted to the problem of MSW processing and the influence of the physical and mechanical properties of waste on the processing technology, as well as analysis of

existing designs of crushers allowed us to draw the following conclusions.

1. The main problem of solid household waste processing is their inseparable collection and high humidity.
2. Existing designs of crushers (hammer, rotary, etc.) have a relatively high efficiency for a specific single-component composition, and in the case of a multi-component composition, their efficiency drops sharply.
3. Any municipal solid waste treatment solution must be financially sustainable, technically feasible, socially, legally acceptable and environmentally friendly.

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