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## **TYPES OF INDUSTRIAL WASTE AND METHODS OF THEIR RECYCLING**

### **ВИДЫ ПРОМЫШЛЕННЫХ ОТХОДОВ И СПОСОБЫ ИХ ПЕРЕРАБОТКИ**

**Сорокина К.С.**, студент **Sorokina K.S.**, student of master magistratury, ФГБОУ ВО courses, Voronezh State University of «Воронежский государственный Forestry and Technologies named after лесотехнический университет им. G. F. Morozov, Voronezh, Russia. Г.Ф. Морозова», Воронеж, Россия.

**Харченко Н.Н.**, д-р биол. наук, **Kharchenko N.N.**, Doctor of Biological заведующий кафедрой, ФГБОУ ВО Sciences, Head of the Department, «Воронежский государственный Voronezh State University of Forestry лесотехнический университет им. and Technologies named after Г.Ф. Морозова», Воронеж, Россия. G.F. Morozov, Voronezh, Russia.

**Маклакова Е.А.**, д-р филол. наук, **Maklakova E.A.**, Doctor of Philology, профессор, ФГБОУ ВО Professor, Voronezh State University of «Воронежский государственный Forestry and Technologies named after лесотехнический университет им. G. F. Morozov, Voronezh, Russia. Г.Ф. Морозова», Воронеж, Россия.

**Abstract:** The article considers the types of industrial waste by aggregate state and hazard classes, as well as modern methods of industrial waste management, in particular secondary recycling, recycling, recovery, incineration,

burial. The waste management system acquires the greatest efficiency with various combinations of their recycling methods.

**Keywords:** environmental protection, industrial activity, industrial waste, recycling, economic damage.

**Аннотация:** В статье рассмотрены виды отходов промышленной деятельности по агрегатному состоянию и классам опасности, а также современные способы обращения с промышленными отходами, в частности, вторичная переработка, рециклинг, рекуперация, сжигание, захоронение. Наибольшую эффективность система обращения с отходами приобретает при различных комбинациях методов их переработки.

**Ключевые слова:** охрана окружающей среды, промышленная деятельность, промышленные отходы, переработка, экономический ущерб.

The active development of industrial activity inevitably leads to the problem of waste disposal, since any production is directly related to the environment, and an increase in the volume of waste negatively affects the environmental situation. In turn, due to the competent processing of industrial waste, there are opportunities both to reduce their harmful effects on the environment and to completely eliminate it [1].

At the same time, the composition of waste and its hazardous properties are greatly changing over time. This is due to the increasing complexity of technological processes and the use of new types of raw materials, including artificially created ones. In modern industry waste has become heterogeneous, complex mixtures, the components of which have different properties [2].

According to their aggregate state, industrial waste is divided into solid, liquid and gaseous [1].

In addition, all waste has its own hazard class.

Class V – nonhazardous waste that does not harm either the environment or people (food remains, broken bricks, fragments of glassware and ceramics, etc.).

Class IV – low-hazard waste that does not pose a danger to humans, but poses a potential danger to the environment (construction debris, waste paper, impregnated wood waste, etc.).

Class III – a moderately hazardous waste that, if handled improperly, cause harm to the environment (cement mortar, paint and varnish residues, acetone, etc.).

Class II – highly hazardous waste that severely disrupts environmental systems when interacting with them (secondary petroleum raw materials, machine oils, batteries of various types and purposes, etc.).

Class I – an extremely hazardous waste that poses the greatest threat to the environment and human health (mercury thermometers, batteries, chemical waste, etc.) [3].

At the same time, the aggregate state and hazard class of industrial waste affect the ways of their temporary accumulation: class I waste is stored in sealed barrels and containers; class II waste is stored in plastic bags, closed boxes or barrels, metal containers; class III waste is stored in bags and containers of various types. For the storage of the remaining waste, hard platforms with containers installed on them are being containers [2].

In modern industry, the main methods of waste management are their burial, incineration, pyrolysis, gasification, composting, pressing with subsequent burial, separation and partial processing. At the same time, based on regional and sectoral needs, as et of different waste recycling methods can be used to reduce their formation and promote reuse and recycling in order to reduce the volume of waste intended for destruction and burial [2].

In particular, the waste management system should begin at the industrial enterprises themselves with a reduction in their toxicity and other harmful indicators, as well as a reduction in the total amount of waste through the use of technologies aimed at this, packages and end products.

At the second stage, waste is recycled (waste is returned to the technological process that led to its formation), which makes it possible to reuse previously used

raw materials and materials, significantly reduce the amount of production waste, as well as consumer waste transported to incinerators factories or landfills.

At the third stage, "recovery" is carried out, which consists in recycling waste in order to obtain energy from it or use it in other technological processes.

At the fourth stage, energy is extracted, in particular, by incineration of garbage, which reduces the amount of waste entering landfills and uses them to generate electricity, for which many incinerators are currently equipped with emission purification systems and special generators.

Finally, is carried out waste burial on polygons of non-recyclable waste, as well as non-combustible waste or waste that releases various toxic substances during combustion. Modern polygons are equipped in such a way that they are equipped with systems to combat environmental pollution and use methane generated during waste rotting for the production of thermal and electrical energy [2].

At the same time, the use of various combinations of waste treatment methods can increase the efficiency of the waste management system [2].

Besides, the assessment of economic damage from environmental pollution must be carried out taking into account the fact that the storage, destruction and burial of waste often lead to secondary pollution of the water and air environments, the level of which is most influenced by the volume and composition of waste, methods of their processing, as well as the composition and mass of substances entering the environment [4].

In this regard, the choice of methods and technologies for industrial waste disposal must be carried out taking into account many organizational, legal, environmental, economic and social factors, as well as regional peculiarities.

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