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У статті надан аналіз сучасних процесів відходоутворення, які потребують систематизації, направленої на їх зменшення ще на стадії розробки нових технологічних процесів та підвищення ефективності утилізації утворених відходів. Для вирішення таких питань необхідно акцентувати увагу на співвідношення усіх технологічних показників, пов'язаних з утворенням відходів, а також вивчити їх причинно-наступні зв'язки

Ключові слова: відходоутворення, металева стружка, рециклінг, утилізація, життєвий цикл відходів, мінімізація

В статье дан анализ современных процессов отходообразования, которые требуют систематизации, направленной на их уменьшение еще на стадии разработки новых технологических процессов и повышения эффективности утилизации образовавшихся отходов. Для решения таких вопросов необходимо акцентировать внимание на соотношении всех технологических показателей, связанных с образованием отходов, а также изучить их причинно-наследственные связи

Ключевые слова: отходообразование, металлическая стружка, рециклінг, утилізація, жизненный цикл отходов, минимизация

MODERN PROCESSES OF WASTE FORMATION AND ASPECTS OF THEIR MINIMAZING

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1. Introduction

Every year the consumption of metal, plastic, paper and cardboard products is growing and, along with this, the mountains of non-decomposable waste are rising, polluting the environment. In such conditions, the forecasting problem of its minimizing becomes urgent, aimed at expanding the reuse of resources, recycled materials, which reduces the cost of manufactured products.

Problems of waste formation during the manufacture of any product to a great extent depend on the energy value of all material flows involved in the production process. Objectives, used as impact energy processes of waste formation in real production systems, are largely distorted by the influence of subjective social relations. Many papers [1 – 7] considered some causes of waste formation, studied quantitative and qualitative regularities that allows using them as tools for operating the above issues with the aim of minimizing the sources of rise. However, it should be noted that theoretical aspects of the rise nature and coexistence with the environment are not disclosed.

2. Shavings waste as promising materials

Shaving is a common and non-deficient raw material for production of metal powders that can be used as catalysts in various chemical industries, printing, powder metallurgy, etc. [8 – 10].

For example, metal powder, used for metallic paints production and bronzing technology, can be obtained from shavings waste of nonferrous metals [11 – 14].

Due to rapidly discovering of defect in the structure of shaving with the help of appropriate technology, disintegration of this material can occur at relatively low additional cost of energy. Mechanical dispersion of shavings waste after the metal working is a promising method of manufacture of powders, allowing the return of some efficiency in the production of significant portion of metal. Among the alternatives, production of fine metal powders by means of mechanical grinding of shavings waste is a significant advantage because in this case the powder material corresponds to a metal or alloy from which shavings was derived.

The traditional way of recycling the shavings waste is melting. However, with this method of treatment about 30% of the metal, especially alloying elements, is irretrievably lost. It is expedient to convert metal shaving into powder by grinding. An important advantage of manufacturing the powder dispersing shavings is the ability to change the composition of material in the course of processing input auxiliary components by mechanical and chemical doping, including those which can not enter into material for powder based on other technologies [15].

Developing energy-saving technology allows obtaining new materials at lower costs. More rational utilization of shavings waste and re-use them in production allows for comprehensive measures aimed at reducing the costs of production.

Production using waste technologies is carried out mainly in the following areas:

1. Full use of raw materials with metals, for example, in the production of parts using powder metallurgy. However, this technology requires significant energy and labor costs in the preparation of raw powder materials and it is economically justified in the production of complex configuration. In this case, the additional costs for the preparation of raw materials in the form of powders are compensated by reducing the complexity in parts manufacturing by replacing many operations of machining with the sintering of powders in the form which allows not only forming a complex configuration of details, but also appropriate processing and ensuring the cleanliness of working surfaces of parts [16].

2. Use of wastes as secondary raw materials through its return to manufacturing in the form of impurities in the original product. However, many of the production volume of waste feedstock is limited by reduced quality of the final product.

3. Shredding waste particles and powders as fillers in the production of composite materials for the manufacture of different parts for domestic and commercial purposes [17 – 19].

The process of waste recycling in engineering and metalworking industries includes the selection of technology and technological equipment. One of the main factors which defines the efficiency and feasibility of metal waste recycling is the research of application areas made on their basis. The fact is that there is a certain list of technological ways to seal the metal waste:

- in the briquette press in cold state;
- in the briquette press in hot state;
- in the equipment of continuous compaction in conical matrix;
- rolling in the horizontal rolls;
- rolling on the compactor Hyuta(X'юра)

3. Features of low-waste technology

Causes of waste formation in production system are:

- energy loss caused by its scattering when converting;
- a lot of elements of raw materials and grade of its components, that do not represent vital interest to this technological process;
- the features of technology, the means of processing raw materials, technical support of the selected technologies.

Review of scientific and technical literature and analysis of developments, which showed that a large amount of waste and secondary materials, produced in the metallurgical and metalworking industries, require the development and implementation of effective utilization technologies. The most difficult for reprocessing raw material is polymetallic copper ore, difficult recyclable waste for purifying (galvanic, digestion and neutralization of metal and electroplating solutions) are mill cinder, fine disperse waste processed of various alloyed steels, alloys of titanium, zirconium etc.

Each type of waste mentioned above has its own features that should be taken into account in the development of recycling processes. All these features make direct recycling of such waste in the shaft melting furnace quite difficult, because melting processes are accompanied by heavy losses of expensive alloying elements such as chromium, tungsten, titanium, molybdenum and aluminum. The problem

of extracting metals from waste water is also extremely important. This can increase the sustainability of various industries and is highly beneficial from an economic point of view. Therefore, the problem of selecting rational technology of extraction and recovery of metals is certainly relevant.

Physical and chemical study of the influence of various technological factors on the process intensification and optimal ratios to obtain high performance is of great importance for the development of effective recycling technology. Primary information can be obtained at thermodynamic modeling equilibrium characteristics of distribution between phases, which have different software for calculation. Therefore, theoretical databases are of particular interest and are useful for the analysis of renewal processes of man-made waste.

During non-waste technology, manufacturing system is not just technology or production, but also the principle of operation of production. It efficiently uses all components of raw materials and energy in a closed loop (primary raw materials - production - consumption - secondary raw materials), that is inseparable part of forming the ecological balance in the biosphere [20 – 21].

There are many indicators that more or less affect the processes of waste formation. Some of them are obvious. Getting systematic studies must take into account each important indicator affecting the mechanism of this phenomenon. With the increase in production volume the volume of waste will also increase. This dependence is of disproportionate nature and excesses regulatory indicators for the intensification of individual processes come into systemic effects and addiction can be the nature of the curve acceleration and appropriate to the character function of saturation. An important role is played by randomness of the phenomena that can go into a chaotic process. To solve such issues one should pay attention to the value of all technological parameters, that are associated with the generation of waste, and analyze their cause and subsequent contacts.

3.1. Utilization and recycling –waste criteria for major

To date, there is a contradiction between the official interpretations of the terms “recycling” and “utilization”. For example, metal shavings can be processed by mechanical grinding technology, with changing its morphological characteristics, chemical composition, but remains almost the same, except related to mechanical-chemical alloying. Melting of metal shavings in metallurgy due to a change its physical state and returning the latter to manufacturing process of production of material with new chemical composition [22 – 25].

So the question is what is the fundamental difference? The organization of waste collection is the initial starting point for recycling and for utilization.

Gradually moving to the terms “product” and “material” we are starting to realize that recycling is more related to the use of waste after a process within a company and depends on the coefficient of use of the material in the production cycle.

If the manufacture of certain products by machining up to 85% of the metal becomes a waste, it is certainly appropriate to process them in new metal in furnace unit, which is always the balance of medium machine-building enterprise.

Recycling is associated with the time of finished product life cycle, from manufacturing to the end consumer and its physical properties.

Utilization and recycling process of waste formation criterions are defined and determined targeted at processing waste. In general, minimization of waste does not involve a simple application of these two terms. When minimizing the fastest realize any activity, which results in the reduction of waste, which appear in the manufacturing process. The end result is a specialized "business software" tool which is targeted optimization of material flow in production systems, rationalization of resources, creating conditions for improving the overall cultural production.

Methodology for waste minimizing is more than the best methods of saving materials, environmental protection and so on. One way is to minimize the prediction of causal-forthcoming relationships, providing a mechanism of waste formation during machining.

4. The use of metal waste in printing

Recently, the trend of using metallic inks at the time of encasement design and other promotional items has grown much and gained particular popularity among manufacturers. However, in today's development of printed products one should understand the real practical benefit from the use of metallic pigments in paints and as a result, a substantial extension of metal powders range to produce high quality printing products. Significant important economic and environmental lever in this case is the use of metallic pigments from shavings waste [26 – 29].

Metal powders can be used as catalysts in various chemical industries, printing, powder metallurgy, raw materials for which there are common and inexpensive metal shavings.

This advantage is of great economic importance because it allows not only effectively response to the needs of production, but also to regulate the cost of materials and manufacture according to the estimated price of goods.

One way of recycling metal shavings, as noted above, is its use in the printing industry as a pigment for inks that are widely used in the encasement production [30]. Usually glass, plastic, polymer film, various metals are used as unprinted material in the manufacture of encasement. The most important property of these materials is relatively small term life cycle (from production of encasement to removing after their consumption). Opening the life cycle of packaging material depends on the liquidity of primary products and measuring the time it takes to pack the main product.

In terms of costs, the above materials allow correlate the cost of encasement according to the value of the product. Specialists in the field of encasement manufacturing are well aware of the existence of a contradiction, which is that of packing materials initially focused on high cost mechanism, but unlike foundation products, the smaller they are - the better.

In general, the use of metallic pigments in the paint has not only esthetic function to attract the attention of consumers, but also to preserve the presentation of products.

Metalized coating makes packaging more durable, resistant to damage, protect from moisture and sunlight. Because of the growth in consumption, the international community is now faced the problem of the accumulation of waste. Among the available materials in landfills one can find bags, containers of all kinds of materials for wrapping, fixing, basic elements needed for transportation, protective materials, etc. Polymer components of such materials have very large term of decomposition, particularly in Ukraine the system was established for reprocessing waste, stored on our landfills for decades [31 – 33].

The main problem in terms of waste for this type of products is that the circumstances of the nature of this phenomenon are ideal for the implementation of previously planned mechanisms of waste formation. They laid the conditions, apriori, unfavorable to the environment. As a result, we have much quantity (both by weight and by nomenclature) of packing materials waste.

Even when it comes to recycling, metallic pigments in the paint have their advantages. Processing encasements is sufficiently profitable for the manufacturer not only from an environmental, but also from the economic point of view, because due to its durable enough resistance the pigment does not lose its main properties, so it can be reused in the manufacture of printing inks. This stability is ensured by the fact that the pigment is formed from metal shavings and due to its provisional processing and enhancement of dispersion medium of ink, it may well couple printing material and peel away, not damaging during processing [34].

Thus, we can conclude that the technical terminology needs for "audit" normative foundations of terms in the modern field of rather a chaotic interpretation. For example, the term "non-waste technology" exists theoretically and practically it is half-waste technology, which converts the last only in the case of a functional recycling.

Phase separation of material flood during the manufacturing process is crucial in understanding the nature of waste formation. The mechanism of this distribution depends on the objective phenomena inherent in the technology of useful product and ultimately characterizes the environmental sustainability of the whole system.

Sustainability of multi-technical systems can be assessed, for example, its relation to the separate production of resources of raw materials, finished products, waste, given that each of these flows in equal degree is a potential source of pollution in space-time coordinates.

5. Conclusions

Thus, the optimization of resources of waste formation in any production is one of the most significant problems in environmental management, in particular, in forecasting the dynamics of the resource base of industrial regions and cities. Given that the waste can be a significant portion of resources, this task becomes urgent.

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В статті описано алгоритм розроблення профілактичних заходів з охорони праці на державному рівні та відповідне науково-методичне забезпечення цього процесу, що дозволяє здійснити всі основні процедури розроблення й одержати необхідні заходи щодо створення безпечних і здорових умов праці на виробництві. Використання такого підходу на практиці сприятиме удосконаленню національної системи охорони праці

Ключові слова: розроблення, профілактичні заходи, охорона праці, системний аналіз, стратегічне планування

В статье описан алгоритм разработки профилактических мероприятий по охране работы на государственном уровне и соответствующее научно-методическое обеспечение этого процесса, которое позволяет осуществить все основные процедуры разработки и получить необходимые мероприятия по созданию безопасных и здоровых условий труда на производстве. Практическое использование такого подхода будет способствовать усовершенствованию национальной системы охраны труда

Ключевые слова: разработка, профилактические мероприятия, охрана труда, системный анализ, стратегическое планирование

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АЛГОРИТМ РОЗРОБЛЕННЯ ПРОФІЛАКТИЧНИХ ЗАХОДІВ З ОХОРОНИ ПРАЦІ НА ДЕРЖАВНОМУ РІВНІ

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1. Вступ

Створення безпечних та здорових умов праці на виробництві є невід'ємною частиною діяльності органів державної влади, представницьких організацій роботодавців та працюючих, які є соціальними партнерами в сфері охорони праці. Від їх реальної взаємодії, відповідальності за створення таких умов залежить стан охорони праці в країні, який визначається в першу чергу рівнем виробничого травматизму та професійної захворюваності.

Проте, не дивлячись на те, що протягом останніх десяти років в Україні спостерігається тенденція

до зниження цих показників, рівень травматизму залишається досить високим порівняно з більшістю розвинених країн світу. Так за даними Міжнародної організації праці (МОП) рівень смертельного травматизму в Україні перевищує показники таких країн, як Німеччина, Японія, Швеція, США, Велика Британія у 2-5 рази.

Основною причиною такого стану справ є незадовільний стан умов праці на виробництві. Понад 27% працівників працюють в умовах, що не відповідають санітарно-гігієнічним нормам. Спостерігається хронічна незабезпеченість працюючих основними видами засобів індивідуального захисту. Існуючий