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SUBSTANTIATION OF TECHNOLOGIES AND TECHNICAL MEANS FOR DISPOSAL OF MINING AND METALLURGICAL WASTE IN MINES

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The object of research is environmental and resource-saving technologies in underground mining of mineral deposits with the laying of the developed space. One of the most problematic places is the delivery of hardening filling mixtures to the place of their installation and the lack of components for their preparation. This increases the importance of managing the state of ore-bearing massifs and the preservation of the earth's surface.

The paper presents the main scientific and practical results of the substantiation of technologies and technical means for the disposal of mining and metallurgical production wastes into underground mined spaces (man-made voids) as components of hardening filling mixtures. Methods of theoretical generalizations are described using mathematical statistics, physical and mathematical modeling, with calculations and feasibility studies, laboratory and field experimental studies, industrial tests in operating enterprises. It is established that the use of vibration, mechanical and electroactivation of the components of the hardening filling mixture in mining enterprises leads to an increase in the activity of substandard materials by up to 10–40 % for each device. In particular, the enrichment of substandard inert materials at the vibrating screen GV-1.2/3.2 (Ukraine) increases the activity by 15–20 %. It is proved that the activation of binders (blast furnace granulated slag) in the DU-65 disintegrator (Disintegrator, Estonia) increases the activity of the binder by 20–25 %, with the output of the active class of fractions of 0.074 mm in size – by 55 % versus 40 % in ball mills. Vibration transport unit are recommended, which increase the activity of the solid components of the hardening filling mixture by 10–15 %, and electrodialysis apparatus for activating mixing water increase its activity by 30–40 %. It is shown that the use of vibration gravity transport systems ensures the filling of the filling mixture at a distance exceeding the height of the vertical stand by 15–20 times. A set of technical means is proposed for activating the components of hardening filling mixtures (binder, inert aggregate and electrochemically purified mine mixing water) during the manufacture and transportation of them to the installation site. This complex was introduced at such mining enterprises as:

– State Enterprise «Eastern Mining and Processing Plant» and Balaklava Mining Administration (Ukraine);

– Joint-Stock Company «Tselinnyi Mining and Chemical Combine» (Republic of Kazakhstan);

– Public Joint-Stock Company «Priargunsky Industrial Mining and Chemical Association» and Closed Joint-Stock Company «Uralzoloto» (Russian Federation) in other developed mining countries.

Keywords: underground mining, hardening mixture, pipeline transport, vibration, mechanical and electrical activation of components.

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PURIFICATION OF MINERALIZED WATERS FROM U(VI) COMPOUNDS USING BENTONITE/IRON OXIDE COMPOSITES

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The object of research is bentonite clays, the main rock-forming mineral of which is montmorillonite. This natural silicate exhibits sorption capacity for heavy metal ions due to its high cation exchange capacity and specific surface area. One of the most problematic uses of montmorillonite in sorption processes is the ability to swell in aqueous media. This greatly complicates the separation of the spent sorbent from purified water. To eliminate this drawback, granulation is most often used, followed by heat treatment. Moreover, various polymer compounds are used as a structure-forming agent. This technique leads to a significant decrease in the specific surface of bentonite clays, and, therefore, deterioration in their sorption properties. In the course of the study, the method of surface modification of montmorillonite iron oxide-hydroxide (ferrihydrite) is used. The resulting materials are distinguished by manufacturability and increased sorption ability with respect to uranium compounds. This is due to the fact that when treating the surface of bentonite clays with ferrihydrite, effective sorbents can be obtained that lose their ability to swell without heat treatment. The deposition of a layer of iron oxide compounds on the surface of montmorillonite led to a change in the parameters of the porous structure of the resulting composite. So, the specific surface of the modified sample is 250 m^2/g, which is significantly higher than that for the output mineral (89 m^2/g). At the same time, the average pore size increased 2.8 times. It has been shown that as a result of surface treatment of montmorillonite with ferrihydrite, the sorption capacity of materials for uranium compounds increases with an increase in the iron content on the surface: from 0.42 mg/g for the initial montmorillonite to 10.13 mg/g for the modified sample. It is found that the presence of competitive metals (As, Mn, Co, Cd, Cr) in mineralized waters in equimolar amounts does not lead to a significant change in the values of uranium adsorption on bentonite/iron oxide composites.

Keywords: water purification, sorption of uranium (VI), bentonite, montmorillonite, iron oxide hydroxides, saline water, heavy metals.

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FOOD PRODUCTION TECHNOLOGY

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DEVELOPMENT OF THE SAFETY MANAGEMENT SYSTEM DURING THE PRODUCTION OF FLOUR CONFECTIONERY

page 19–24

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The object of research is to manage the safety of developed flour confectionery products from organic raw materials – cakes, pastries and biscuits. There are many approaches to implementing a food safety management system. However, in practice it has been established that the food safety management system can't be borrowed from another enterprise and can't be unified. Each food product has its own characteristics of production, various hazardous factors that affect its safety, which necessitates the development of a safety management system for each group of food products separately. In addition, the study of aspects of the implementation of the food safety management system is a topical issue for enterprises according to legislation.

Based on the requirements of proper hygienic and production practices, the article presents the features of the development of prerequisite programs for the company that manufactures the developed flour confectionery. The prerequisite programs specify which opera-

tional records should be kept by the enterprise. Also, based on the 7 principles and 12 steps of the HACCP (Hazard Analysis and Critical Control Points) system, an algorithm for implementing a safety management system during the production of flour confectionery is developed. In particular, developed approaches to the formation of the HACCP group. It is proposed a unified block diagram of the production of flour confectionery, the main hazards in the production of flour confectionery and identified critical control points. It is proposed HACCP-plan for the production of developed flour confectionery, and proposed approaches to validation and HACCP system verification. The article presents the forms of magazines and checklists that can be maintained by the company in order to maintain the HACCP system. The research results enable the enterprises of the flour and confectionery industry to use the basic provisions. Thanks to the research presented in the article, food industry enterprises will be able to improve the safety of their products.

Keywords: flour confectionery, food safety management system, HACCP system, prerequisites.

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REPORTS ON RESEARCH PROJECTS

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ANALYSIS OF THE BIODIVERSITY AND SOCIO-ECONOMIC VALUES OF THE WETLANDS IN VIETNAM

page 25–31

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The object of research is biodiversity and humanistic ecology values of the wetlands and the negative impacts of the socio-economic development on wetland ecosystem. Practical solutions are proposed for the conservation, management and sustainable use of the wetland resources for the sustainable development of Vietnam. Vietnam's wetland area is about 12 million hectares, accounting for one third of the natural area. The wetland ecosystem in Vietnam contains a high level of biodiversity, contains various important ecological functions and values, directly affects people's livelihoods, and plays a major role in the country's socio-cultural life. Vietnam has 9 sites designated as Wetlands of International Importance (Ramsar Sites – The Wetlands of International Importance). However, some wetland areas are increasingly degraded in both quality and quantity of species due to over-exploitation and over-use. In this study, utilized various research methods including desk research, secondary analysis, and Participatory Rapid Appraisal (PRA), which is carried out to collect data from decision makers and community in Xuan Thuy National Park (Nam Dinh province) and in Tram Chim National Park (Dong Thap province). As a result of the research it is shown that the major challenges to wetlands in Vietnam include: unsustainable exploitation; imbalanced utilization and conservation of wetlands; lack of comprehensive wetlands data to meet the requirements of wetland management and sustainable development. The conservation and use of the wetland areas in Vietnam must be carried out on the principle of approaching the ecosystem, ensuring the maintenance of the entire structure, functions, ecological characteristics and biodiversity of the wetland areas. For which the authors recommend increasing the role and participation of the communities living in and around the wetland areas and stakeholders in the conservation and sustainable use of the wetlands. A fair and equitable benefit sharing mechanism is ensured based on equal rights and obligations among stakeholders in the use of wetland ecosystem services.

Keywords: Vietnam's wetland, wetland ecosystem, biodiversity, ecosystem conservation, wetland management.

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EVALUATION OF THE EFFECT OF INDUSTRIAL ENTERPRISES ON THE ENVIRONMENT AND EFFICIENCY EVALUATION OF ENVIRONMENTAL PROTECTION ON THE EXAMPLE OF «KHARKIV ELECTROMECHANICAL PLANT» SE (UKRAINE)

page 32–38

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The development of scientific and technological progress along with a general improvement in the quality of life of people has a powerful technogenic impact on the environment. To reduce the harmful effects on the environment, it is necessary to solve the issue of effective cleaning and regulation of emissions, calculation of maximum permissible emissions. Therefore, the object of research is the environmental impact of an industrial enterprise. One of the sources of environmental pollution is the enterprises of the engineering complex. Therefore, on the example of one of them, an environmental impact assessment is carried out – on the example of the State Enterprise Kharkiv Electromechanical Plant (Ukraine). And also proposals for the implementation of relevant environmental measures are developed.

As in most industrial enterprises, the State Enterprise Kharkiv Electromechanical Plant produces solid waste, contaminated storm drains and gaseous emissions into the atmosphere. Due to the fact that the enterprise is located within the city limits, relevant environmental protection requirements are presented to it. The economic activity of the enterprise is accompanied by the implementation of environmental safety requirements, the protection of public health, the planning of measures to protect the environment and the rational use of natural resources.

The impact of the enterprise of the State Enterprise Kharkiv Electromechanical Plant on the environment is evaluated. General characteristics are done for the area where the enterprise is located. The climatic and meteorological conditions of the territory are also analyzed and an assessment of the state of the environment is given. The work reveals sources of pollution of the technological process of production of the enterprise. It is shown that out of 131 emission sources, 20 sources are equipped with gas treatment plants. Analysis of the identified sources of the environment showed that it is neces-

sary to use gas treatment plants to clean emissions into the air, as well as the fact that emissions from the enterprise as a whole do not exceed permissible standards.

The conducted studies will be useful for the implementation of environmental measures at enterprises in various industries that are sources of emissions of potentially hazardous substances.

Keywords: industrial emissions, technogenic impact, treatment systems, environmental pollution, environment.

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SUBSTANTIATION OF THE USE OF THE ENRICHED FLOUR MADE FROM LEGUMES IN THE PRODUCTION OF SAUSAGES

page 39–41

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The object of research is boiled-smoked sausages made using flour from germinated soybean grains enriched with iodine and flour from germinated chickpea grains enriched with selenium. One of the problems of our time is the lack of intake of iodine and selenium in organically accessible forms along with food. In this regard, the development of new formulations that are carriers of organic forms of trace elements with organoleptic characteristics familiar to consumers is an important task.

The study found that it is advisable to use 10 % enriched legume flour in a ratio of 1:1, due to the reduction of raw meat in equal proportions, namely beef, pork and pork fat. With these ratios of prescription ingredients, a comprehensive quality score of 0.96 is achieved. In products manufactured according to the new recipe, the amount of protein increases from 13 to 24 % and the mass fraction of fat decreases from 45 to 35 % compared with the control. It is established that the use of enriched legume flour in the production of cooked smoked sausages affects the humidity of the finished products in the direction of its reduction from 48 to 39.9 %. Cooked smoked sausages made according to the developed recipe are enriched with iodine and selenium 25 and 26 μg, respectively. Thanks to the joint use of enriched legume flour when consuming 100 g of cooked smoked sausages, 6 to 36 % of the daily need for iodine and from 34.6 to 86 % of the daily need for selenium enter the human body.

Compared with similar known methods of enriching products with microelements, this provides such advantages as organoleptic indicators familiar to the consumer and the organic form of microelements, eliminates the possibility of overdose and accumulation in the body.

Keywords: legume flour, cooked smoked sausages, iodine deficiency, selenium deficiency, soybeans, chickpea grains.

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USE OF SEMI-FINISHED CHERRY-BEET PUREE IN TECHNOLOGY OF SWEET DISHES AND DESSERTS

page 42–44

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Sweet dishes and desserts are in high demand among consumers. However, these products usually have an unbalanced chemical composition, high caloric content, high fat and carbohydrate content, relatively low protein content and insufficient amount of biologically active substances. The source of natural biologically active substances (BAS) are purees, juices, extracts, decoctions of fruits, vegetables, cultivated and wild berries, medicinal herbs and more. Therefore, the current issue for this type of product is to improve the recipe of the existing range of sweet dishes through the use of natural plant components of high biological value. Thus, the object of research is the technology of health dessert based on semi-finished cherry-beetroot puree and its influence on the structural-mechanical, physico-chemical and organoleptic characteristics of finished products.

The work uses standard research methods in accordance with the requirements of regulatory documentation. The study of betanin content is carried out using spectrophotometric method. Antioxidant activity is determined by the bromine coulometric method. Organoleptic and physicochemical indicators of the finished dish are determined in accordance with DSTU 3718:2007 «Sweet foods, jellies, mousses, puddings, milk concentrates».

To enrich sweet dishes and desserts in the creation of health and functional foods, it is proposed to use a semi-finished puree, which includes cherry puree and beetroot puree (ratio 2:1). The possibility of improving the organoleptic, physicochemical and structural-mechanical parameters of finished products through the use of a composite combination of semi-finished cherry-beetroot puree and gelatin in the amount of 3 %. The technology of health dessert has been developed, its quality has been studied according to organoleptic and physicochemical parameters, content of biologically active and nutrients. The presence of a significant amount of biologically active substances that have antioxidant properties, provide health and preventive effect of dessert. The developed dessert is recommended for production in restaurants.

Keywords: sweet dishes, health product, semi-finished cherry-beetroot puree, biologically active substances, organoleptic indicators, physical and chemical indicators.

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