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Facultatea de Inginerie

NORTH UNIVERSITY CENTRE OF BAIA MARE
Faculty of Engineering

BULETIN ŞTIINŢIFIC
AL CENTRULUI UNIVERSITAR NORD DIN BAIA MARE

SERIA D

Exploatări Miniere

Prepararea Substanţelor Minerale Utile

Metalurgie Neferoasă

Geologie şi Ingineria Mediului

Volumul XXXIX Nr. 1

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STUDIES AND RESEARCH ON THE TECHNOLOGY OF OBTAINING A Y7 TYPE METAL BOX

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Abstract: *The manufacture of metal products is an important segment of modern industry, in which technological processes must be carefully designed and controlled to ensure the quality and functionality of the final product. Technologies such as stamping, bending, crimping and painting play an essential role in obtaining metal components that meet current technical and aesthetic requirements. This paper aims to analyze the development and manufacturing process of a Y7 type metal product, addressing both theoretical aspects and practical applications.*

Keywords: *bending, crimping, painting*

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MANAGEMENT CONSIDERATIONS FOR THE INTEGRATION OF BIM, GIS, SHM AND LEAN MANUFACTURING IN CONSTRUCTION MODULATION

DIANA MINODORA POP[1], CORINA MICHAELA RĂDULESCU[1,3]
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Abstract

In a recent statistic published by the World Green Building Council (WorldGBC) it is estimated that in the next 75 years around 2 billion homes should be built in the world to satisfy the need, which would mean around 75,000 per day being made available. The modular realization of the constructions would facilitate this approach, as it would decrease the unit price on the one hand, but also the execution time on the other hand. An important contribution in this endeavor would be the organization of the activity including in the logistic scheme the entire process from the feasibility study to the post-execution structural monitoring of the new technologies, part IT, part instrumental and organizational, such as BIM (Building Information Modeling), GIS (Geographic Information System), SHM (Structural Health Monitoring) and Lean Manufacturing, in a combination that would generate organizational and technological models adaptable to each case. This paper deals with this topic by trying to propose a cumulative approach, since each of the mentioned technologies can play a role, it being important to determine where, when and how much and how the benefits given by each of them can be complemented.

Keywords: BIM (Building Information Modeling), GIS (Geographic Information System), SHM (Structural Health Monitoring), Lean Manufacturing, Construction modulation.

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RECYCLING OF POLYETHYLENE FILM WASTE THROUGH EXTRUSION–REGRANULATION FOR ENVIRONMENTAL BENEFITS AND CIRCULAR ECONOMY PERSPECTIVES IN MARAMUREȘ COUNTY, ROMANIA

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Abstract: *This study investigates the recycling of polyethylene (PE) films through an extrusion–regranulation process, with a focus on technological upgrading and its contribution to the circular economy in Maramureș County, Romania. A case study was conducted at S.C. Remat Maramureș S.A., the leading regional waste recycling facility, analyzing both post-consumer and post-industrial PE waste streams. The technological upgrade, consisting of a laser filtration system combined with photovoltaic renewable energy input, was compared with the conventional screen changer process. Results indicate a significant performance improvement, with the recycling yield increasing from 78.10% to 96.10% and the profit margin rising from 5.40% to 27.80%. Beyond the economic benefits, the modernized system contributes to resource efficiency, reduced CO_2 emissions, and alignment with the European Union's circular plastics targets. The findings highlight that investing in advanced recycling technologies and renewable energy integration can transform traditionally low-margin recycling operations into sustainable, competitive, and environmentally responsible processes.*

Keywords: polyethylene films, plastic waste, extrusion–regranulation, circular economy, recycling efficiency, sustainability

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SUSTAINABILITY OF THE TOURISTIC AND SCIENTIFIC POTENTIAL OF THE PULSATING MINERAL SPRING FROM POIANA BOTIZEI, MARAMUREȘ

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Abstract: *The pulsating spring in Poiana Botizei represents a rare and valuable hydrogeological phenomenon, with significant scientific and touristic potential. Research data on its mineral chemical composition—both current (year 2025) and historical (from the literature of 1970 and 1977)—reveal an iron-rich water (4.95 mg/L Fe^{++}), naturally carbonated (1650 mg/L CO_2), highly mineralized (4082.6 mg/L), and containing elevated concentrations of essential elements for the human body, such as calcium (400 mg/L Ca^{++}), magnesium (71 mg/L Mg^{++}), and potassium (130 mg/L K^{+}). The results obtained in 2025 represent the most up-to-date data on this natural mineral resource. Moreover, the mineral spring has preserved its distinctive characteristics (the pulsating discharge behavior caused by its gas content and, broadly, its chemical composition), which have defined it since it was last studied 48 years ago (in 1977).The recent analyses also highlight the absence of nitrites in the samples and a high electrical conductivity value, which indicates a wide spectrum of dissociated ions in the mineral water. Hydrogeological studies and chemical analyses highlight the complexity and uniqueness of this spring and further emphasize the importance of its conservation and valorization in the context of developing balneary, curative, and ecological tourism in the Țara Lăpușului region.*

Keywords: mineral pulsating springs, balneary tourism, sustainable tourism development, curative water

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STUDIES ON THE DETERMINATION OF PHYSICO-CHEMICAL PARAMETERS OF WATER FROM THE PIȘĂTOAREA WATERFALL

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Abstract: *This paper presents studies conducted to determine several physico-chemical parameters of a water sample collected from the Pișătoarea Waterfall, Maramureș County, Romania. The pH level was found to be 8.23 at 18.6°C, measured using a HI98130Tester Combo, while total water hardness was determined with a Total Hardness Photometer, yielding a value of 297 mg/L $CaCO_3$, equivalent to 26.60°dH (German degrees). The iron ion content in the analyzed water sample was 0.011 mg/L; phosphate ions were measured at 0.10 mg/L PO_4^{3-}, phosphorus at 0.03 mg/L P, and phosphorus pentoxide at 0.08 mg/L P_2O_5. The nitric nitrogen content was 0.1 mg/L NO_3^--N, corresponding to a nitrate ion concentration of 0.3 mg/L NO_3^-. The concentration of calcium ions was 49 mg/L (Ca^{2+}), and that of magnesium ions was 22 mg/L (Mg^{2+}), both essential minerals for the human body. The sodium molybdate content was 0.1 mg/L Na_2MoO_4; molybdenum plays an important role in protein metabolism and enzymatic reactions in the body, aiding in the elimination of waste. Copper and zinc concentrations were determined to be 0.23 mg/L Cu and 0.07 mg/L Zn, respectively. The Pișătoarea Waterfall is located at the foot of the village of PrelucaVeche. The analysis of these parameters was carried out to characterize the quality of the water originating from this waterfall.*

Keywords: *water hardness, photometric analysis, minerals, waterfall, ions, physico-chemical analysis.*

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STUDY OF TECHNIQUES FOR THE PREPARATION OF STEEL WIRE IN THE WIREDRAWING PROCESS

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Abstract: *The paper presents research on wire preparation operations before and during the wiredrawing process. Before wiredrawing it is necessary that oxides, dust particles and other impurities are carefully removed. The wires must be straightened in several stages. Another necessary operation, before the wiredrawing operation, is the sharpening of the anterior head of the wire. This operation is necessary in order to pass one end of the wire through the hole of the draw-plate.*

Keywords: *plastic deformation, slip lines theory*

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COMPROMISING SMART AGRICULTURE THROUGH THE IRRESPONSIBLE ABANDONMENT OF POLYMETALLIC MINING IN MARAMUREȘ COUNTY

BUD ADINA[1,3], CUROȘ ANDREI[2], BUD IOAN[1,3], DELINSCHI DANIELA[1,3]

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Abstract: *The paper aims to integrate the environmental impact issues generated by the abandonment of mining activity in Maramureș County, in the context of the concept of smart agriculture. Healthy food obtained through smart agriculture that seeks to optimize the production of organic products in a system contaminated with heavy metals is a paradox. The paper highlights the sources of contamination, even if they are integrated into protected areas or in their proximity. All of this contradicts good practices in the field of engineering and agriculture. The field study and laboratory analyses confirm the risk to public health. The article also presents a series of solutions to remedy the problems.*

Keywords: *Smart Agriculture, Soil Quality, Mining Drainage, Heavy Metals, Contaminated Soil, Maramures County, Abandoning Mining.*

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CONSIDERATIONS ON THE MANAGEMENT OF WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE) IN THE ADMINISTRATIVE-TERRITORIAL UNIT OF ȘOMCUTA MARE, MARAMUREȘ COUNTY, ROMANIA

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Abstract: *This study investigates the current state of Waste Electrical and Electronic Equipment (WEEE) management in the Administrative-Territorial Unit (ATU) of Somcuta Mare, Maramureș County, Romania, with a particular focus on public perception and attitude. The analysis reveals significant shortcomings in the local collection infrastructure, accompanied by low levels of public awareness and education regarding separate WEEE collection. Despite the inadequate selective collection rate, survey data indicate a predominantly positive attitude among residents toward the extended use of electrical and electronic equipment (95.3%) and a preference for repair over disposal (63.8%). Furthermore, a considerable share of respondents recognize the environmental and community benefits of separate collection (45.9%) and express a strong willingness to engage in such practices in the future (94.9%). These findings underscore the urgent need to enhance the local WEEE management system by implementing improved strategies and policies, strengthening infrastructure, and intensifying public information and education efforts.*

Keywords: *WEEE, waste management, separate collection, education*

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STUDIES ON THE INFLUENCE OF THE QUENCHING MEDIUM ON THE 7175 ALLOY MICROSTRUCTURE

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Abstract: *This paper presents studies conducted to evaluate the influence of the quenching medium on the microstructure of 7xxx series alloys, specifically the 7175 alloy. The comparative study focuses on two different cooling media, glycol solution and deionized water, using samples from the same material to allow for a detailed assessment of each medium's effects on the final properties of the alloy. It was observed that variations in the temperature and composition of the quenching bath significantly influence the alloy's microcrystalline structure, leading to differences in phase homogenization and in the formation of precipitates characteristic of quench hardening.*

Keywords*: 7175 alloy, microstructure, glycol solution, hardening*

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STRUCTURAL HEALTH MONITORING BASED ON SENSOR TECHNOLOGIES OF BRIDGE BEHAVIOR, STEEL STRUCTURAL ELEMENT CASE STUDY

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***Abstract**: The structural monitoring of constructions, known under the current name Structural Health Monitoring (SHM), has recently experienced an unprecedented development, due to the design of constructions with increasingly special characteristics. The involvement of increasingly more efficient and cheaper sensory methods also contributes to this development process. But until normality is reached, in the opinion of the authors, the monitoring for the structures (bridges with different structural parameters, very high structures, etc.) in continuous mode, throughout the duration of the activity, is still necessary. The paper approaches the monitoring of a bridge with exceptional design features, sensorially monitored with the aim of establishing the behavioral response to the influence of annual temperature variations, the study focusing on the behavioral analysis of a steel resistance element.*

***Keywords**: Sensors, Structural Health Monitoring, Bridge, cause–effect relationship, Steel structural element, temperature variations.*

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IMPROVING THE FERTILITY AND QUALITY OF AGRICULTURAL SOILS THROUGH FARMYARD MANURE APPLICATION

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Abstract: *This study examines a common agricultural practice in rural areas, where local farmers face climatic challenges that contribute to soil degradation and reduced crop productivity. The effects of applying natural organic amendments—such as animal manure, organic compost, and livestock waste—either alone or in combination with chemical fertilizers, were evaluated. Results from greenhouse trials using bovine manure demonstrated a 28% increase in soil organic matter, along with gains of 55% in nitrogen, 21% in phosphorus, and 30% in potassium. Application of farmyard manure increased soil organic matter from 5.75% in unfertilized soil—already indicative of fertility but inadequate for sufficient nitrogen supply—to 7.9% after fertilization. Monitoring the soil's response to fertilization is essential, as changes in soil acidity can impair nutrient uptake and disrupt the NPK balance.*
Keywords: *farmyard manure application, organic fertilizers, NPK deficiencies, soil degradation*

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LOSS OF AN IMPORTANT RESOURCE - SOIL, DUE TO THE LACK OF HYDROTECHNICAL DEVELOPMENTS IN THE HYDROGRAPHIC NETWORK CONTAMINATED WITH HEAVY METALS

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Abstract: *The paper presents the environmental impact of the loss or compromise of uncontaminated soils by their entrainment by rivers contaminated with heavy metals. The cause of this phenomenon is the entrainment of polymetallic sulfides and acidic waters in the hydrographic network in which hydrotechnical works are lacking. The consequence of the lack of these works is the modification of the water course, the loss of agricultural areas and the contamination of alluvium that will be transported over long distances, which will subsequently compromise the quality of new soils and the reduction of the biocapacity of endangered areas. The case study refers to the Lăpuș River and the Someș River, into which heavy metals are drained from the mining perimeters on the Ilba, Băiuț, Țibleș alignment.*

Keywords: *contaminated soils, soil erosion, hydrotechnical developments, heavy metals, biocapacity*

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MONITORING THE AIR QUALITY USING REMOTE SENSING – USE CASE EASTEN PART OF BAIA MARE CITY INDUSTRIAL PARK AREA

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Abstract: *Atmospheric dust poses significant public health risks, contributing to respiratory and cardiovascular diseases, reduced air quality, and increased hospital admissions during high-concentration events. The Copernicus programme provides a comprehensive framework for monitoring dust dynamics and assessing related health impacts. Through the Copernicus Atmosphere Monitoring Service (CAMS), satellite observations are integrated with advanced numerical models to generate near-real-time analyses and forecasts of dust concentration, aerosol optical depth, and particle size distribution—parameters closely linked to human exposure and health outcomes. Sentinel-3 radiometric data and Sentinel-5P atmospheric composition measurements enable detailed detection of dust plumes and quantification of fine particulate matter (PM10 and PM2.5), supporting early identification of hazardous events. These datasets feed into public health advisories, air-quality indices, and early-warning systems, allowing authorities to mitigate exposure risks, especially for vulnerable populations such as children, the elderly, and individuals with chronic respiratory conditions. Furthermore, long-term Copernicus dust records enhance epidemiological studies by enabling correlations between dust intrusions and health indicators across regions. Overall, Copernicus delivers essential, high-resolution, and operationally reliable dust products that strengthen health-focused environmental monitoring and contribute to evidence-based public health decision-making.*

Keywords*: Copernicus; CAMS; Sentinel satellites; atmospheric dust; aerosol optical depth (AOD); PM10; PM2.5; dust intrusion; air quality; health impacts; respiratory diseases; early-warning systems; environmental monitoring.*

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