

TECHNIKA OCHRANY PROSTREDIA

TOP 2023

PROCEEDINGS OF ABSTRACTS



November 15-16, 2023
Grand Hotel Starý Smokovec, Slovakia



27th Year of International Scientific Conference

PROCEEDINGS OF ABSTRACTS

**November 15-16, 2023
Grand Hotel Starý Smokovec, Slovakia**

Website: <https://top2023.elfa.sk/>

ISBN: 979-80-8086-286-2

Proceedings editor: : Lubomir Soos, Miroslav Badida, Stefan Fejedelem

COMMITTEES

Scientific Committee

Dr.h.c. prof. Ing. Eubomír Šooš, PhD., Slovak University of Technology, Slovakia (Committee Chair)
Dr.h.c. mult. prof. Ing. Miroslav Badida, PhD., Technical University of Košice, Slovakia (Committee Co-Chair)
prof. PharmDr. Ján Kyselovič, CSc., Slovak Centre of Scientific and Technical Information, Slovakia
Ing. Alexander Matušek, Association of Automotive Industry of Slovak Republic, Slovakia
prof. Ing. Dušan Petráš, PhD., Association of Slovak Scientific and Technical Societies, Slovakia
doc. Ing. Jiří Hlinka, PhD, Brno University of Technology, Czech Republic
prof. Ing. Pavol Ochotnický, PhD., University of Economics in Bratislava, Slovakia
prof. Ing. Rudolf Sivák, PhD., University of Economics in Bratislava, Slovakia
Assoc. Prof. Dr. Çağrı Olgun, Kastamonu University, Turkey
prof. Ing. Tomáš Havlík, Dr.Sc., Technical University of Košice, Slovakia
prof. Ing. Jozef Krilek, PhD., Technical University of Košice, Slovakia
prof. Ing. Jozef Jandačka, PhD., University of Žilina, Slovakia
Ing. Róbert Szabó, PhD., Slovak University of Technology, Slovakia
prof. Dr. habil. Ing. Hubert Debski, University of Lublin, Poland
prof. Dr. habil. Ing. Beata Kowalska, University of Lublin, Poland
prof. Dr. habil. Bayoumi Hamuda Hosam, Óbuda University in Budapest, Hungary
prof. Dipl. Ing. Dr. Eberhard Schmidt, University of Wuppertal, Germany
prof. Ing. Mirjana Miloradov, PhD., University of Novi Sad, Republic of Serbia
prof.i.R. Dipl. Ing. Dr. Mikuláš Luptáčík, University of Vienna, Austria
Prof. Dr. Ing. Dr.h.c. Bernd Friedrich, IME Metallurgische Prozesstechnik und Metallrecycling, Germany
Ing. Alois Studenic, EUCS Ingenieurbüro GmbH, Austria
Prof. DSc. Stanislav Legutko PhD. MSc. Eng., Poznan University of Technology, Poland
doc. Ing. Jaroslav Katolický, PhD., Brno University of Technology, Czech Republic
Ing. Ján Pribula, Association of Automotive Industry of Slovak Republic, Slovakia
prof. Ing. Dagmar Juchelková, PhD., VSB - Technical University of Ostrava, Czech Republic

Organizing Committee

doc. Ing. Lýdia Sobotová, PhD., Technical University of Košice, Slovakia (Committee Chair)
doc. Ing. Iveta Čáčková, PhD., Slovak University of Technology, Slovakia (Committee Co-Chair)
Mgr. Andrea Putalová, Slovak Centre of Scientific and Technical Information, Slovakia
Ing. Tibor Dzuro, PhD., Technical University of Košice, Slovakia
Ing. Štefan Fejedelem, elfa, ltd., Košice, Slovakia
doc. Ing. Eudovít Kolláth, PhD., Slovak University of Technology, Slovakia
Ing. Lucia Ploskuňáková, Slovak University of Technology, Slovakia
Ing. Miroslav Horvát, PhD., Slovak University of Technology, Slovakia

TABLE OF CONTENTS

COMMITTEES	4
TABLE OF CONTENTS	5
EVALUATION OF SELECTED PROBLEM WASTE FROM THE AUTOMOBILE INDUSTRY INTO SOUND INSULATION PRODUCTS	8
BADIDA Miroslav, SOBOTOVÁ Lýdia, MORAVEC Marek, DZURO Tibor, PIŇOSOVÁ Miriama, PÁSTOR Kristián	
POSSIBILITIES OF RECYCLING MOLDS FOR ALUMINUM CASTING IN THE AUTOMOTIVE INDUSTRY	9
BREZINOVÁ Janette, DŽUPON Miroslav, BREZINA Jakub, SOBOTOVÁ Lýdia	
FIRE PROPERTIES OF NEW WOODEN COMPOSITES CONTAINING WASTE PLASTIC FROM AUTOMOBILES	10
ČABALOVÁ Iveta, DARABOŠOVÁ Anna, ZACHAR Martin, KRILEK Jozef, MANCEL Vladimír, OSVALDOVÁ Mária, RÉH Roman	
TECHNICAL PREPARATION OF THE EXPERIMENTAL DETERMINATION OF TOOL WEAR FOR THE WIPER MODULE OF THE GLASS PROCESSING LINE	11
ČAČKO Viliam, ŠOOŠ Ľubomír, ČAČKOVÁ Iveta, CHLEBO Ondrej, BÁBICS Jozef	
ENERGY UTILIZATION OF PLASTIC WASTE: EMISSION IMPACT	12
ČAJOVÁ KANTOVÁ Nikola, NOSEK Radovan, ČAJA Alexander, BACKA Alexander	
USE OF MECHANICAL OSCILLATION IN LAMINATED GLASS RECYCLING	13
CHLEBO Ondrej, ŠOOŠ Ľubomír, ČAČKO Viliam	
IDENTIFICATION OF WASTE PROBLEMS WITH THE USE OF QUALITY TOOLS	14
CIECIŇSKA Barbara, MAJKA Aleksandra, SOBOTOVÁ Lýdia	
CHEMICAL RECYCLING OF PLASTIC WASTE	15
FILČÁK Maroš	
TREATMENT OF DISCARDED CAR BATTERIES: PAST, PRESENT, FUTURE	16
HAVLIK Tomáš	
ANALYSIS OF THE CAR SEAT WASTE AND THE POSSIBILITIES OF ENERGY RECOVERY	17
HOLUBČÍK Michal, JANDAČKA Jozef, KLAČKO Andrej, PATSCH Marek, PILÁT Peter, CIBULA Róbert	
WASTEWATER AS A SOURCE OF THERMAL ENERGY	18
HRNČÁROVÁ Lucia, PERÁČKOVÁ Jana	

ASSESSMENT OF THE ENVIRONMENTAL IMPACTS OF WOOD PLASTIC COMPOSITES	19
HYBSKÁ Helena, SAMEŠOVÁ Dagmar, MORDÁČOVÁ Martina, GREGUŠOVÁ Mária, MAŠKOVIČOVÁ Paulína	
CONTRIBUTION TO THE SEPARATION OF BIOLOGICAL WASTE	20
KOLLÁTH Ľudovít, PATHÓ Ján	
THE USE OF WJM TECHNOLOGY IN HAZARDOUS AREAS FOR DECONTAMINATION AND SUBSEQUENT RECYCLING OF MATERIALS	21
KRAJNÝ Zdenko, ČAČKOVÁ Iveta, ŠOOŠ Ľubomír	
INNOVATIONS IN TECHNICAL SYSTEMS	23
KUZNETSOV Yuriy, SHEVCHENKO Aleksandr, URCHYSHYN Oksana	
MODELLING OF TECHNOLOGICAL MIX CHANGES IN AUTOMOTIVE INDUSTRY OF THE SLOVAK REPUBLIC FOR SELECTED SOCIO-ECONOMIC AND ECOLOGICAL INDICATORS	24
LÁBAJ Martin, MAJZLÍKOVÁ Erika, OCHOTNÍCKY Pavol	
TRENDS, DETERMINANTS OF THE SALE OF ELECTRIC CARS IN THE EU AND THEIR POTENTIAL FOR THE CIRCULAR ECONOMY OF THE SLOVAK AUTOMOTIVE INDUSTRY	25
OCHOTNICKÝ Pavol	
DISPOZAL OF SLUDGE FROM THE AUTOMOTIVE INDUSTRY IN POWER PLANTS.....	26
PILÁT Peter, PATSCH Marek	
PLASMA ELECTROLYTE TECHNOLOGY AND ITS ENVIRONMENTAL CHARACTERISTICS	27
POKUSOVÁ Marcela, MORÁVEK Ivan, GABRIŠOVÁ Zuzana, LACH Ján, ŠOOŠ Ľubomír	
IN-MOULD TECHNOLOGY – ENVIRONMENTAL ALTERNATIVE TO PRODUCE THE NODULAR CAST IRON	28
POKUSOVÁ Marcela, PRIBULOVÁ Alena, BRUSILOVÁ Alena, FUTÁŠ Peter, GABRIŠOVÁ Zuzana	
DIGITAL PLATFORM „SmartWaste“ – A TOOL FOR SUSTAINABLE WASTE MANAGEMENT	29
POKUSOVÁ Marcela, ŠOOŠ Ľubomír	
METHODS FOR ASSESMENT OF MONOCRYSTALLINE SI PHOTOVOLTAIC PANELS LIFECYCLE.....	30
RUBANENKO Olena, BELIK Milan	

TOOLS FOR SUPPORTING ELECTROMOBILITY IN THE SLOVAK REPUBLIC	31
SIVÁK Rudolf	
POSSIBILITIES OF VALORIZATION OF RECYCLED TEXTILES AS THERMAL INSULATION MATERIAL.....	32
SOBOTOVÁ Lýdia, BADIDA Miroslav, DZURO Tibor	
DEVELOPMENT OF NEW 3D PRODUCTS MADE FROM FOAM WASTE	33
ŠOOŠ Ľubomír	
HAZARDOUS WASTE ON CONSTRUCTION SITES IN SERBIA: THE BACKGROUND AND CONTROL MEASURES.....	34
ŠUNJEVIĆ Miljan, TOŠIĆ Nikolina, VOJINOVIĆ MILORADOV Mirjana	
RECYCLING OF HYDRODEHALOGENATION CATALYST USED FOR DETOXIFICATION OF HALOGENATED AROMATIC CONTAMINANTS BASED ON CIRCULAR ECONOMY PRINCIPLES	35
WEIDLICH Tomáš, HEGEDÜS Michal, KAMENICKÁ Barbora	
VIBRATION AND NOISE OF MACHINERY COMPONENTS AT THE END OF THEIR LIFETIME	36
ŽIARAN Stanislav, ŠOOŠ Ľubomír, CHLEBO Ondrej	
AUTHOR INDEX	37



EVALUATION OF SELECTED PROBLEM WASTE FROM THE AUTOMOBILE INDUSTRY INTO SOUND INSULATION PRODUCTS

BADIDA Miroslav*

SOBOTOVÁ Lýdia, MORAVEC Marek, DZURO Tibor, PIŇOSOVÁ Miriama,
PÁSTOR Kristián

ABSTRACT

The contribution focuses on the specification of problem components (materials) of vehicles after their end-of-life. The emphasis is placed on the research of acoustic descriptors of selected problematic materials from the point of view of their possible valorization (in compact or loose form). For the purposes of the measurements themselves, it was necessary to develop and subsequently manufacture suitable preparations and equipment enabling the required measurements to be performed. The development and production of such a specific preparation and device enabling the required measurements of acoustic descriptors to be performed primarily freely or respectively under a certain pressure of loose materials and the methodology proposed by the authors for measuring the acoustic descriptors of loose materials. The presented preparation and equipment enabling the required measurements are the intellectual property of the authors recognized by the Industrial Property Office in Banská Bystrica. The paper presents the results of experimental measurements performed using regression and correlation analysis. The attention of the authors of the article is also devoted to the prediction of the use of bulk materials in sound insulation products applicable in practice.



POSSIBILITIES OF RECYCLING MOLDS FOR ALUMINUM CASTING IN THE AUTOMOTIVE INDUSTRY

BREZINOVÁ Janette*

DŽUPON Miroslav, BREZINA Jakub, SOBOTOVÁ Lýdia

ABSTRACT

The article presents the results of research aimed at increasing the technological life of molds intended for high-pressure casting of aluminum alloys. The damaged functional parts of the molds were renovated using laser welding technology. Stochastic pit textures were applied to the renovated surfaces using low-energy laser radiation. Research in the field of surface topography modification of shaped parts of molds was aimed at obtaining information about the interaction of separation agents (lubricants) used for the treatment of shaped parts of molds with modified surface topography. A nanostructured PVD duplex NaCrO₄ coating was applied to the coating. Interaction tests of SafetyLube 7815 release agent with a laser textured surface in "random" mode were performed. The conditions of the run-in phase of the new or of the renovated shaped part of the mold were approximately obtained by repeated heating to a temperature of 250°C (the temperature of the shaped part of the mold when casting aluminum alloys under high pressure) and repeated spraying with SafetyLube 7815 release agent.



FIRE PROPERTIES OF NEW WOODEN COMPOSITES CONTAINING WASTE PLASTIC FROM AUTOMOBILES

ČABALOVÁ Iveta

DARABOŠOVÁ Anna, ZACHAR Martin, KRILEK Jozef, MANCEL Vladimír,
OSVALDOVÁ Mária, RÉH Roman

ABSTRACT

Wood-plastic composites are materials that are made from wood and synthetic polymers and have a number of advantages, such as high weather resistance and long life. The aim of this work was to evaluate the influence of plastic filler, waste from cars (painted, unpainted bumpers, fuel tanks) on selected fire-technical properties of wood-plastic composites. From the fire-technical properties, the ignition temperature, mass burning rate and calorific value were evaluated according to valid standards. The results show that the ignition temperature and the average time to initiation of the composites ranged from 260 s to 308 s and the average temperature from 432.98°C to 442.71°C. In the case of PB containing unpainted bumpers and fuel tanks, the time to initiation decreased proportionally with increasing filler concentration. The calorific value and ash content increased proportionally with the increasing amount of added plastic filler. Considering the results of the research, it is necessary to take into account their fire resistance and to increase it, apply protective means incorporated either inside the material or on its surface.

*Iveta Čabalová, doc., Ing., PhD., methodology, task coordination, Anna Darabošová, Ing., experiments, Department of Chemistry and Chemical Technologies, Faculty of Wood Sciences and Technology, Technical University in Zvolen, T.G. Masaryka 24, 96001 Zvolen; Martin Zachar, doc., Ing., PhD., methodology, results analysis, Department of Fire Protection and Safety, Faculty of Wood Sciences and Technology, Technical University in Zvolen, T.G. Masaryka 24, 96001 Zvolen; Jozef Krilek, prof., Ing., PhD., methodology, Vladimír Mancel, Ing., experiments, Department of Environmental and Forestry Machinery, Faculty of Technology, Študentská 26, 96001 Zvolen; Mária Osvaldová, Ing., experiments, Department of Economics, Management and Business, Faculty of Wood Sciences and Technology, Technical University in Zvolen, T.G. Masaryka 24, 96001 Zvolen



TECHNICAL PREPARATION OF THE EXPERIMENTAL DETERMINATION OF TOOL WEAR FOR THE WIPER MODULE OF THE GLASS PROCESSING LINE

ČAČKO Viliam*

ŠOOŠ Ľubomír, ČAČKOVÁ Iveta , CHLEBO Ondrej, BÁBICS Jozef

ABSTRACT

The development of a processing line for decomposite bonded glass is currently at a stage where more detailed experimental research is required. The glued glass processing line is of modular construction and consists of a breaking module, a vibrating module and a wiping module. In this paper, we specifically analyse the possible experimental investigation of the tool wear of the wiper module. The hypothesis of the present wear research is based on the change of the surface finish of the materials of the cutting inserts or tools themselves. The basis for the analysis of the experiment is the assumption that the tools of the wiper module are made of the same material. In the experiment, we will change the surface treatment of the inserts, in three designs, the first group of inserts will be without surface treatment, the second group will have PVD coating, and the third group of inserts will be specially treated using electrolytic-plasma technology. However, this particular paper does not deal substantively with the investigation of the wear of the wiper plates, but prioritises the analysis of the possibilities of the most appropriate investigation in the context of the changing surface treatment of the wiper plates for the recycling of bonded glass. With the result of the already concrete research on the wear of the plates, the best material for the wiper tools should be selected.



ENERGY UTILIZATION OF PLASTIC WASTE: EMISSION IMPACT

ČAJOVÁ KANTOVÁ Nikola*

NOSEK Radovan*, ČAJA Alexander*, BACKA Alexander*

ABSTRACT

Plastic waste still increases and burdens our environment. A huge burden was during the COVID-19 pandemic when face masks were used to slow down this disease. However, many used face masks often ended up in landfills or even entered the ocean. It is still important to search for ways to effectively dispose of these masks as well as other plastic inseparable waste with their further utilization. This article deals with the energy utilization of face masks in wood pellets. These pellets were formed from 10%, 20% and 50% of the content of face masks. Further, they were combusted, while emission parameters were investigated. Finally, the concentration of individual emissions was compared with the concentration obtained during the combustion of pure wood pellets. Based on the results, it can be summarized that the high presence of face masks in wood pellets negatively impacts the emission production mainly particulate matter. Therefore, it would be suitable to add only a small amount of face masks as an additive up to 10% which does not significantly affect emissions of particulate matter.

Funding: This publication has been produced with the support of VEGA 1/0150/22: Energy utilization of produced waste in connection with the COVID-19 pandemic through pellets as an alternative fuel and VEGA 1/0633/23: Optimization of the flow preventing the spread of COVID-19 and other viruses and bacteria to the patient.

*Ing., PhD., Čajová Kantová Nikola, University of Žilina, Research Centre, Univerzitná 1, 010 26 Žilina, Slovakia, nikola.cajovakantova@uniza.sk

prof., Ing., PhD., Nosek Radovan, University of Žilina, Department of Power Engineering, Univerzitná 1, 010 26 Žilina, Slovakia, radovan.nosek@fstroj.uniza.sk

Ing., PhD., Čaja Alexander, University of Žilina, Department of Power Engineering, Univerzitná 1, 010 26 Žilina, Slovakia, alexander.caja@fstroj.uniza.sk

Ing., Backa Alexander, University of Žilina, Department of Power Engineering, Univerzitná 1, 010 26 Žilina, Slovakia, alexander.backa@fstroj.uniza.sk



USE OF MECHANICAL OSCILLATION IN LAMINATED GLASS RECYCLING

CHLEBO Ondrej

ŠOOŠ Ľubomír, ČAČKO Viliam

ABSTRACT

Nowadays, various composite structures are popularly used. It is also due to their properties in the form of good shaping and a high stiffness-to-weight ratio. However, their main disadvantage is recyclability. For example, in the case of laminated glasses, in order to reuse the glass, it is necessary to remove the plastic film, which would degrade the glass during reprocessing. In the Sjf STU laboratory, a prototype of a special module is being developed for the mechanical separation of individual laminated glass materials by crushing fragile glass due to vibration. The initial version of the device uses vibrating motors that move the jaw as an energy source. This design concept turned out to be not very suitable, but it is sufficient to verify the principle and experimentally obtain data on the required time, intensity and speed of the movement. The article deals with the influence of the speed of material movement and the intensity of vibrations on the overall recycling process.



IDENTIFICATION OF WASTE PROBLEMS WITH THE USE OF QUALITY TOOLS

CIECIŃSKA Barbara*

MAJKA Aleksandra, SOBOTOVÁ Lýdia

ABSTRACT

Environmental management deals with reducing the negative impact of production on the environment. Identification of negative factors can sometimes be difficult due to low awareness of plant employees, lack of motivation, inadequate work organization or ineffective management. The article presents an example of the application of tools known from quality management to support environmental management in a selected machinery enterprise. An employee survey, E-FMEA and 5Whys were proposed for identifying various problems related to production nuisance, and waste nuisance in particular. The effectiveness of teamwork, the joint pursuit of the goal of minimizing waste, including hazardous waste, was pointed out. The 5S method was discussed as a way to organize workstations and facilitate continuous improvement in the context of waste.



CHEMICAL RECYCLING OF PLASTIC WASTE

FILČÁK Maroš *

ABSTRACT

Plastics do have proven benefits during their use phase – for example preservation of food loss in packaging applications, lightweight construction of vehicles, and building insulation. Plastic waste has become a major global challenge. Globally, around 250 million metric tons of plastic waste are generated each year. Only around 20 percent of this plastic is recycled, thus keeping the material in circulation. Therefore, more plastic waste should be recycled overall.

The key pillar in this regard is our ChemCycling® project. Our partnerships focus on the pyrolysis technology which turns plastic waste or end-of-life tires into a secondary raw material called pyrolysis oil. We feed the oil into BASF's Verbund production at the beginning of the value chain, thereby saving fossil resources. By using a third-party audited mass balance approach, the share of recycled feedstock is attributed to products manufactured in the Verbund. These mass balanced Ccycled® products are independently certified and have the same properties as conventional products. Customers can therefore further process them in the same way and use them in demanding applications.



TREATMENT OF DISCARDED CAR BATTERIES: PAST, PRESENT, FUTURE

HAVLIK Tomáš*

ABSTRACT

Currently, low-carbon technologies are being promoted in all areas of human activity. In the automotive segment, this has also been reflected in the pursuit of a worldwide application of electromobility, where electric motors are used as drive units. These are currently powered by lithium-ion traction batteries (LiA). LiA do not have an infinite lifespan and therefore with the advent of electromobility comes the question of their processing at the end of their life. Therefore, the management of discarded traction LiA is becoming a significant challenge for the waste industry. These are potentially very hazardous waste, but on the other hand they are a source of very important materials that need to be recycled due to their cost and scarcity. It is a significant fact that some components, such as cobalt, graphite, lithium, contained in LiA are among the critical raw materials for the European Union. LiA recycling is an important route to extract these critical raw materials, but on the other hand, it is a complicated and demanding process, as it is a complex composite material and its nature, as well as electrical and chemical properties, pose a serious risk to safety and health.



ANALYSIS OF THE CAR SEAT WASTE AND THE POSSIBILITIES OF ENERGY RECOVERY

HOLUBČÍK Michal*

JANDAČKA Jozef, KLAČKO Andrej, PATSCH Marek, PILÁT Peter, CIBULA Róbert

ABSTRACT

The article presents a complex analysis including elemental and chemical analyze of car seat materials. Through advanced analytical techniques (TGA, CHN, calorific value), the elemental composition and chemical properties of these materials are thoroughly investigated. The results provide valuable information about the characteristics of the material, which help to understand its potential impact on the environment. This research underscores the importance of in-depth analysis in increasing material efficiency, product life, and overall environmental responsibility in car seat manufacturing and use. The findings contribute to knowledge for policy makers, practitioners and researchers promoting circular economy principles in the automotive industry. In conclusion, the chemical and elemental analysis of car seat materials offers important insights for understanding composition, and environmental implications. This knowledge informs other possibilities of energy utilization of waste from car seats.



WASTEWATER AS A SOURCE OF THERMAL ENERGY

HRNČÁROVÁ Lucia*

PERÁČKOVÁ Jana*

ABSTRACT

The energy crisis in the world is increasingly forcing us to consume less energy, not only for environmental reasons, but also because of the ever-rising energy prices that have peaked in recent years. Reducing energy consumption in buildings is now being done by improving the thermal performance of buildings, replacing window structures and designing renewable energy sources. However, there is great potential in the waste water that is discharged daily in large quantities into the sewers. In the case of a suitable technical solution, waste heat from waste water can be efficiently used for hot water preparation, heating and cooling.



ASSESSMENT OF THE ENVIRONMENTAL IMPACTS OF WOOD PLASTIC COMPOSITES

HYBSKÁ Helena¹

**SAMEŠOVÁ² Dagmar , MORDÁČOVÁ³ Martina, GREGUŠOVÁ⁴ Mária,
MAŠKOVIČOVÁ⁵ Paulína**

ABSTRACT

The best ways to limit the release of plastics, and consequently nanoplastics, into the environment are their reduction, reuse, and primarily recycling. Due to the wide usage of chipboards in both indoors and outdoors, recycling plastic waste from the automotive industry as a substitute for wood in chipboards (DTDs) is one of the current methods of their utilization. This article addresses the assessment of the impacts of wood-plastic composites on aquatic and terrestrial environments. Nine chipboard samples were tested, manufactured with 10%, 15% and 20% proportion of ground granulate from painted and unpainted bumpers and fuel tanks, from which the aqueous leachates were prepared. The pH and COD were determined in the aquatic leachates. The effect of the aqueous leachates from the wood-plastic composites samples was monitored by ecotoxicological tests with the test organisms *Lemna minor*, *Daphnia magna* and *Sinapis alba*. The results confirmed that an increased content of plastic waste in chipboard leads to a decrease in the content of organic matter in the aqueous leachates in comparison to chipboard without wood replacement.

1 Helena Hybská, doc. Ing, PhD., Associate Professor, Technical University in Zvolen 2 Dagmar Samešová, prof. Ing., PhD., Professor, Technical University in Zvolen 3 Martina Mordáčová, Ing. PhD., Assistant professor, Technical University in Zvolen 4 Mária Gregušová, Ing., Student PhD, Technical University in Zvolen 5 Paulína Maškovičová, Ing., Graduated student, Technical University in Zvolen



CONTRIBUTION TO THE SEPARATION OF BIOLOGICAL WASTE

KOLLÁTH Ľudovít¹

PATHÓ Ján²

ABSTRACT

The paper deals with the issue of separation in particular:

- restaurant, hotel and kitchen waste,
- biodegradable waste in the food industry (packaged and unpackaged, fresh, canned, bottled, chilled and frozen...etc.),
- biodegradable waste from shops and wholesalers, including vegetables, fruit, bakery, dairy, smokehouse and other products (packaged and unpackaged in all forms),
- biodegradable municipal waste from public spaces and households
- mixed municipal waste, etc.

A new line for wet (dust-free) mechanical separation of these wastes is also described.

¹ Slovak University of Technology in Bratislava, e-mail: ludovit.kollath@stuba.sk

² Agrovaria, s. r. o., Štúrovo, e-mail: office@agrovaria.sk

TECHNIKA OCHRANY PROSTREDIA

TOP 2023

THE USE OF WJM TECHNOLOGY IN HAZARDOUS AREAS FOR DECONTAMINATION AND SUBSEQUENT RECYCLING OF MATERIALS

KRAJNÝ Zdenko

ČAČKOVÁ Iveta*, ŠOOŠ Ľubomír

ABSTRACT

The possibility to perform standard high pressure water jet operations (cutting, cleaned) is now possible even in hazardous and explosive environments. The technology therefore offer a "golden" opportunity in these areas. High pressure water jet technology is considered a 3rd millennium technology due to its unique and specific advantages (cool cutting, ecological, effective, and versatile). It is also advantageously used for decontamination and subsequent recycling of materials in refineries or nuclear power plants and similar hazardous environments.



Fig.: External cleaning of crude oil exchangers

ACKNOWLEDGMENTS

The published results were created with the support of the KEGA 030STU-4/2022 project entitled RORESA - Application of augmented reality in the educational process of machine tools and production systems, supported by the Minister of Education, Science, Research and Sports

of the Slovak Republic and by the Ministry of Education, Science, Research and Sport of the Slovak Republic under the Contract - University and industrial research and education platform of a recycling company (UNIVNET).



INNOVATIONS IN TECHNICAL SYSTEMS

KUZNETSOV Yuriy*

SHEVCHENKO Aleksandr*, URCHYSHYN Oksana*

ABSTRACT

In accordance with modern world trends in the field of higher education, technical creativity and a creative approach are gaining more and more importance as a system-forming factor of an effective educational process. Ensuring the proper level of study of modern methods of finding new technical solutions for the creation of new objects of technology in some places requires making fundamental changes in the educational process of domestic institutions of higher technical education. At the same time, such approaches are useful both for achieving the practical orientation of engineering education and for providing optimal conditions for the research activities of students of various levels.



MODELLING OF TECHNOLOGICAL MIX CHANGES IN AUTOMOTIVE INDUSTRY OF THE SLOVAK REPUBLIC FOR SELECTED SOCIO-ECONOMIC AND ECOLOGICAL INDICATORS

LÁBAJ Martin*

MAJZLÍKOVÁ Erika, OCHOTNÍCKY Pavol

ABSTRACT

The paper is focused on adaptation of the IMPACTECH_CZ model for the Slovak economy and review modelling scenarios for the development of the energy mix and technology changes in the automotive industry. It contains a proposal for forecasts of GDP development, employment and impacts on CO₂ emissions.

The IMPACTECH_CZ model (<https://impactech.fss.muni.cz>) was developed as an assessment tool socio-economic and greenhouse gas emissions impacts due to changes in energy mix of the Czech Republic. The software works with data from the input-output database EXIOBASE v3.6 (Stadler et al., 2021), available on <https://zenodo.org/record/4588235#.YTYWvi4zaUk>.

It shall supplement these data with detailed information on employment and greenhouse gas emissions under sectors in the electricity sector. It also adds detailed information on the impacts of capital investments; which, in view of the expected need to adapt energy infrastructure, will be the energy transition play an important role. The model allows you to integrate forecasts future development of selected technologies. This tool is suitable for short to medium term analyses (horizon 5-10 years), taking into account the model's ability to integrate selected long-term trends (technology development), but also model limitations given by the methodology used. Learn more about model logic is provided by Černý et al. (2020).



**TRENDS, DETERMINANTS OF THE SALE OF ELECTRIC CARS IN THE EU
AND THEIR POTENTIAL FOR THE CIRCULAR ECONOMY
OF THE SLOVAK AUTOMOTIVE INDUSTRY**

OCHOTNICKÝ Pavol*

ABSTRACT

The sale of electric cars in the countries of the European Union shows significant differences in terms of dynamics, but also in terms of differences in the share of electric cars in the total fleet of passenger cars in individual member states. Despite the common European policy of transition to less emission-intensive car drives, the economic performance of countries, as well as other determinants, turn out to be the key drivers of differences in the sales of electric cars within individual countries. In the light of these findings, the contribution presents the trend and alternative scenarios of the sale of passenger cars in the Slovak Republic until 2030, depending on the strategy and removal of barriers to the development of electric mobility in Slovakia. The paper also presents an estimate of the potential of future flows of materials, especially critical ones from the processing of electric cars in the end-of-life phase in Slovakia.



DISPOZAL OF SLUDGE FROM THE AUTOMOTIVE INDUSTRY IN POWER PLANTS

PILÁT Peter*

PATSCH Marek*

ABSTRACT

During technological processes in the automotive industry, several types of sludge are produced, which are problematic to dispose of using classic methods, and some types of sludge are classified as hazardous waste, which complicates their disposal. In this post, we are dealing with how it is possible to dispose of sludge in conventional energy facilities such as municipal waste incinerators or cement plants, in which after the heat treatment of this waste, a residue remains that is no longer dangerous and can be disposed of in the usual way at a normal landfill. or is used in the production of cement in cement plants. The article presents the results of chromatographic analysis, C-H-N-O-S analysis and results from measurements of sample moisture and heat of combustion from individual sludges, as they were taken directly in the production of the automobile plant.



PLASMA ELECTROLYTE TECHNOLOGY AND ITS ENVIRONMENTAL CHARACTERISTICS

Pokusová Marcela*

Morávek Ivan, Gabrišová Zuzana, Lach Ján, Šooš Ľubomír

ABSTRAKT

The plasma-electrolytic technology for surface treatment of metal products is based on the physical phenomena occurring on a treated surface in an electrolyte under the influence of a direct-current voltage higher than 100 V, when an ionised vapour-gas blanket forms around the treated object. The electrolyte is based on the low-concentrated harmless solution of various salts. There is the avoidance of the use of acids, caustics, and toxicants. To be cheap and environmentally friendly, the solution components are only common desirable components of the industrial fertilizers based on sulphates, chlorides, and nitrates. The low-cost electrolytic solutions of concentration 2+6% for stainless steels and low carbon steels have been developed. They are prepared by dissolving the granulate in the water with no extra demand on its quality. In the spent solution, iron is bound in the form of $\text{Fe}(\text{OH})_3$, chromium mainly in the form of Cr_2O_3 , and only very little part can be found in the form of CrO_3 (0.03 mg/dm^3). Both solutions are suitable not only for polishing, but also for surface clearing and degreasing. Plasma-electrolytic process can remove all surface contaminants; therefore, it can be utilized for surface cleaning of metal parts of any contaminants including grease and oil films, oxides and various remains of old inorganic and organic coatings. A two-step process is recommended for very impure objects. The first tub-unit is used for cleaning away impurities and the second one is used for polishing. In this way, the polishing bath can be protected from quick impurifying.

ACKNOWLEDGMENTS

The authors appreciate the financial support provided by the SRDA (projects APVV-22-0580, APVV-19-0559) and the project of UNIVNET Association 0201/004/20.

*prof. Ing. Marcela Pokusová, CSc., Ing. Ivan Morávek, PhD., doc. Ing. Zuzana Gabrišová, PhD., Ing. Ján Lach, Dr.h.c. prof. Ing. Ľubomír Šooš, PhD., Strojnícka fakulta STU v Bratislave



IN-MOULD TECHNOLOGY – ENVIRONMENTAL ALTERNATIVE TO PRODUCE THE NODULAR CAST IRON

Pokusová Marcela*

Pribulová Alena, Brusilová Alena, Futáš Peter, Zuzana Gabrišová

ABSTRAKT

Nodular cast irons, especially ADI, offer many properties for designers due to their proven success in the automotive industry. To produce the nodular cast iron the in-mould technology can be used for its flexibility, low capitals, and the favourable environmental characteristic. Today's ductile iron production is based on the application of a nodularizing master alloy of FeSiMg containing 5–15 wt.% of Mg. The magnesium is volatile and extremely reactive at liquid iron treatment temperatures and the in-mould technology can minimise fume, ensure economic and consistent recovery of magnesium since the metallurgical processing of a melt takes place in the special reaction chamber that is incorporated into the gating system in a mould. This method can reduce the consumption of nodularizing alloys to less than 1/3 of the amount required to process the molten metal using the most ladle treatment methods. When the modern second-generation moulding sands based on a synthetic resin binding system are applied, which have a reduced cooling capacity, it is possible to shift the minimal possible thickness of the casting's wall to the range of approximately 2 mm. In addition, introducing the moulding sand reclamation can eliminate the generation of hazardous waste and save the non-renewable raw material resources.

ACKNOWLEDGMENTS

The authors appreciate the financial support provided by the SRDA (projects APVV-22-0580, APVV-19-0559, APVV-16-0485), the project VEGA 1/0002/22, and the project of UNIVNET Association 0201/004/20.

*prof. Ing. Marcela Pokusová, CSc., doc. Ing. Alena Brusilová, PhD., doc. Ing. Zuzana Gabrišová, PhD., Strojnícka fakulta STU v Bratislave
prof. Ing. Alena Pribulová, CSc., doc. Ing. Peter Futáš, PhD., Fakulta materiálov, metalurgie a recyklácie, Technická univerzita v Košiciach



DIGITAL PLATFORM „SmartWaste“ – A TOOL FOR SUSTAINABLE WASTE MANAGEMENT

Pokusová Marcela*

Šooš Ľubomír

ABSTRAKT

The paper deals with the open digital cloud platform “SmartWaste” intended for sustainable waste management. It is designed for communication between the entities involved in the automotive value chain to provide them with up-to-date and transparent qualitative and quantitative information on the various aspects and factors acting in the waste management system in conjunction with the digital transformation of Industry 4.0 and the circular economy (Industry 5.0). It considers the EU requirements for modern waste management - recycling society, life cycle thinking, extended producer responsibility, using waste as a resource, waste hierarchy, end-of-waste, and circular economy, which will be reflected in the specific data structure. The main aims of "SmartWaste" are to collect information about the waste treatment technologies in operations, to carry out research in the field of material and energy recovery of difficult-to-process waste which cannot be treated by conventional technologies, to reduce the consumption of primary raw materials and energy resources, and to minimize environment burden e.g. by landfilling. The platform will create conditions for the development of new business models having a synergistic effect in the field of research and development of new green and innovative technologies for waste treatment.

ACKNOWLEDGMENTS

The authors appreciate the financial support provided by the Slovak Research and Development Agency (projects No. APVV-22-0580, APVV-19-0559, APVV-16-0485), VEGA 1/0265/21, and the project UNIVNET Association 0201/004/20.

*prof. Ing. Marcela Pokusová, CSc., Dr.h.c. prof. Ing. Ľubomír Šooš, PhD., Strojnícka fakulta STU v Bratislave; prof. Ing. Alena Pribulová, PhD., Fakulta materiálov, metalurgie a recyklácie, Technická univerzita Košice



METHODS FOR ASSESMENT OF MONOCRYSTALLINE SI PHOTOVOLTAIC PANELS LIFECYCLE

RUBANENKO Olena*

BELIK Milan*

ABSTRACT

The paper deals with assesment methods helping to decide the lifecycle phase of monocrystalline Si photovoltaic panels and future actions economically reliable for the panels. The proposed methodology should propose either discomissioning and recycling or consequent operation of the panels with continuing power generation. Depending on the age, manufacturing technology and operating conditions, particular panels show various degrees of degradation. This degradation affects power generation and basic electric features of the panel. Because the panels are usually wired into serial strings, every panel affects the operation of all other panels in the string. Dismounting, raw material decomposition and recycling stands against continuing operation of degraded panel with decreased power generation. This makes possible to decide the proper level of degradation to replace or remove particular panel from the string and thus maximize economical benefits from aged or aging panels.

* Olena Rubanenko, Dr.Tech.Sc., Ph.D., Vinnytsia National Technical University, Ukraine, olenarubanenko@ukr.net, Milan Belik, Ing., Ph.D., University of West Bohemia, Czech Republic, belik4@fel.zcu.cz



TOOLS FOR SUPPORTING ELECTROMOBILITY IN THE SLOVAK REPUBLIC

SIVÁK Rudolf*

ABSTRACT

The paper provides an overview of tools for supporting electromobility in Slovakia since their inception in 2015. Currently, state support does not go towards the purchase of electric cars, or plug-in hybrids, but strengthening the charging infrastructure. "Action Plan 2.0" was adopted in 2023 as part of the Recovery and Resilience Plan of the Slovak Republic. Planned investments are divided into 3 instruments: building a national network of ultra-fast charging stations, subsidies for the establishment of charging stations for cities and municipalities, as well as for business entities. The aim of the contribution is to specify the factors that would contribute to increasing the motivation to switch to electromobility in the business environment. The problem with the introduction of emission-free vehicles into company fleets is their higher purchase price. Electric cars have their own specifics, which the current legislation, accounting and tax regulations do not sufficiently take into account. An example of a measure that helps to solve a temporary higher tax and levy burden is a graded coefficient for calculating the basis of a non-financial benefit according to the environmental impact of the vehicle.



POSSIBILITIES OF VALORIZATION OF RECYCLED TEXTILES AS THERMAL INSULATION MATERIAL

SOBOTOVÁ Lýdia*

BADIDA Miroslav, DZURO Tibor

ABSTRACT

The contribution focuses on the possibilities of valorisation of selected components (materials) from vehicles after their useful life. The research was focused on the possibility and method of textile recycling as well as the evaluation of thermal insulation properties from available recycled materials from the interior of cars. For the purposes of the measurements themselves, there was proposed a method of storing loose textile parts from the car as well as chemically treated textile waste by bonding in the form of boards enabling the required measurements and thermal imaging devices, based on 2 measurement principles. The paper presents the results of the experimental measurements. The attention of the authors of the contribution is also devoted to the prediction of the use of loose materials from textiles as well as textile boards for the thermal room - insulating products applicable in practice.



DEVELOPMENT OF NEW 3D PRODUCTS MADE FROM FOAM WASTE

ŠOOŠ Lubomír*

ABSTRACT

During the recovery of waste from old vehicles, various waste streams are created. Most waste can be recovered with more or less success. Among those problematic wastes is plasticine. It has a large volume, low weight, and currently there is no high-efficiency technology for the recovery of this waste and the production of new products.

The aim of the submitted contribution is research, development and design of the production of new 3D products made from foam waste. In the introductory part, the contribution contains an analysis of the amount of plastic waste generated in the automotive industry. It describes the current state of management of the mentioned waste, the possibilities of its use in the production of new products. The core of the contribution is the design of 3D product production technology and the first experimental tests for the design of new products.



HAZARDOUS WASTE ON CONSTRUCTION SITES IN SERBIA: THE BACKGROUND AND CONTROL MEASURES

Miljan Šunjević *

Nikolina Tošić, Mirjana Vojinović Miloradov

ABSTRACT

The construction industry defines a global development invoking accompanying environmental challenges, notably in the generation and management of hazardous waste. The paper explores the background of hazardous waste on construction sites, defining the diverse sources and types of waste produced during construction activities. The environmental and human health risks associated with inadequate waste management emphasize the need for better control measures on construction sites.

The study presents a comprehensive analysis of existing regulations, guidelines, and construction practices aimed at controlling hazardous waste on construction sites. Based on case studies, empirical and experimental data, the research evaluates the efficacy of current control measures and identifies gaps in the implementation. The analysis discusses the economic implications of adopting advanced control measures, considering the potential cost savings and long-term benefits for construction projects. Sustainable waste management in the Serbian construction industry is determined by the role of stakeholders, regulatory bodies, construction companies, but not environmental organizations.

The research provides an inclusive overview of the background of hazardous waste on construction sites in Serbia, defining the efficiency of the existing control measures and areas needing improvement. The findings aim to guide policymakers, industry professionals, and researchers in developing and implementing effective measures to mitigate the environmental impact of hazardous waste generated by construction activities.

Keywords: Hazardous waste, construction sites, mitigation



**RECYCLING OF HYDRODEHALOGENATION CATALYST USED
FOR DETOXIFICATION OF HALOGENATED AROMATIC CONTAMINANTS BASED
ON CIRCULAR ECONOMY PRINCIPLES**

WEIDLICH Tomáš*

HEGEDÜS Michal*, KAMENICKÁ Barbora*

ABSTRACT

The presentation deals with the application and facile recycling of commercially available Al-Ni alloy highly effective for the destruction of halogenated recalcitrant aromatic compounds from contaminated aqueous streams. The described destruction of non-biodegradable halogenated aromatic contaminants is based on reductive dehalogenation accompanied by formation of completely dehalogenated biodegradable products even at room temperature and ambient pressure. Mentioned Al-Ni alloy is converted to Raney nickel and soluble aluminate salts during dehalogenation process. Inactivated Raney nickel is efficiently recycled using mechanical activation by milling with Al powder with subsequent thermal processing. The Al-Ni based hydrodehalogenation reaction was applied to the samples of real wastewater showing high efficiency for chlorinated benzenes removal. The recyclable Raney Al-Ni alloy provides an alternative to less efficient bimetallic couples or costly precious metal-based hydrodehalogenation catalysts.

* Tomáš Weidlich, doc. Ing. Ph.D., akademický pracovník na Ústavu environmentálního a chemického inženýrství, Fakulty chemicko-technologické, Univerzity Pardubice, Studentská 95, 532 10 Pardubice, ČR.
Michal Hegedüs, Mgr. Ph.D., výzkumný pracovník, Synthon, s.r.o., Brněnská 32, 678 01 Blansko, ČR.
Barbora Kamenická, Ing. Ph.D., vědecký pracovník na Ústavu environmentálního a chemického inženýrství, Fakulty chemicko-technologické, Univerzity Pardubice, Studentská 95, 532 10 Pardubice, ČR.



VIBRATION AND NOISE OF MACHINERY COMPONENTS AT THE END OF THEIR LIFETIME

ŽIARAN Stanislav¹

ŠOOŠ Ľubomír², CHLEBO Ondrej³

ABSTRACT

The end of the lifetime cycle of machinery, vehicles, outdated technology and processing conditions of components, or the use of unsuitable materials contribute to their increase in vibration and noise, as well as to the increase in recycling and non-recycling waste. The article deals with determining the operating condition of machinery and its components by processing trend characteristics through measuring mechanical vibration and noise, which determine the end of the lifetime cycle of machine components. It focuses mainly on the area of spinning headstocks and proposes a methodology for permanent monitoring of the dynamic behaviour of the bearings of spinning units. The elaborate the methodology for monitoring bearings leads to an increase in the service lifetime of machinery components and to the creation of a more pleasant environment in terms of decreasing the noise load of employees. It analyses the causes and frequency distribution of vibration and noise as well as their decibel values.

¹ Stanislav Žiaran, prof. Ing. PhD. researcher, Faculty of Engineering, STU in Bratislava, Slovakia, stanislav.ziaran@stuba.sk

² Ľubomír Šooš, Dr.h.c. prof. Ing. PhD. dean, Mechanical Engineering Faculty of STU in Bratislava

³ Ondrej Chlebo, Ing. PhD. researcher, Faculty of Engineering, STU in Bratislava

AUTHOR INDEX

B

BÁBICS Jozef	11
BACKA Alexander	12
BADIDA Miroslav	8,32
BELIK Milan	30
BREZINA Jakub	9
BREZINOVÁ Janette	9
BRUSILOVÁ Alena	28

C

ČABALOVÁ Iveta	10
ČAČKO Viliam	11,13
ČAČKOVÁ Iveta	11,21
ČAJA Alexander	12
ČAJOVÁ KANTOVÁ Nikola	12
CHLEBO Ondrej	11,13,36
CIBULA Róbert	17
CIECIŇSKA Barbara	14

D

DARABOŠOVÁ Anna	10
DŽUPON Miroslav	9
DZURO Tibor	8,32

F

FILČÁK Maroš	15
FUTÁŠ Peter	28

G

GABRIŠOVÁ Zuzana	27,28
GREGUŠOVÁ Mária	19

H

HAVLIK Tomáš	16
HEGEDŮS Michal	35
HOLUBČÍK Michal	17
HRNČÁROVÁ Lucia	18
HYBSKÁ Helena	19

J

JANDAČKA Jozef	17
----------------------	----

K

KAMENICKÁ Barbora	35
-------------------------	----

KLAČKO Andrej	17
KOLLÁTH Ľudovít	20
KRAJNÝ Zdenko	21
KRILEK Jozef	10
KUZNETSOV Yuriy	23

L

LÁBAJ Martin	24
LACH Ján	27

M

MAJKA Aleksandra	14
MAJZLÍKOVÁ Erika	24
MANCEL Vladimír	10
MAŠKOVIČOVÁ Paulína	19
MORAVEC Marek	8
MORÁVEK Ivan	27
MORDÁČOVÁ Martina	19

N

NOSEK Radovan	12
---------------------	----

O

OCHOTNICKÝ Pavol	24,25
OSVALDOVÁ Mária	10

P

PÁSTOR Kristián	8
PATHÓ Ján	20
PATSCH Marek	17,26
PERÁČKOVÁ Jana	18
PILÁT Peter	17,26
PIŇOSOVÁ Miriama	8
POKUSOVÁ Marcela	27,28,29
PRIBULOVÁ Alena	28

R

RÉH Roman	10
RUBANENKO Olena	30

S

SAMEŠOVÁ Dagmar	19
SHEVCHENKO Aleksandr	23
SIVÁK Rudolf	31

SOBOTOVÁ Lýdia 8,9,14,32
ŠOOŠ Ľubomír 11,13,21,27,29,33,36
ŠUNJEVIĆ Miljan 34

T

TOŠIĆ Nikolina 34

U

URCHYSHYN Oksana 23

V

VOJINOVIĆ MILORADOV Mirjana 34

W

WEIDLICH Tomáš 35

Z

ZACHAR Martin 10

ŽIARAN Stanislav 36

MAGAZÍN

MOBILITA / STROJE / TECHNOLOGIE / EKOLÓGIA



Kontakt

Odborná periodická publikácia

Ministerstvo kultúry SR: EV 3053/09, EV 137/23/EPP

Národná agentúra ISSN: ISSN 2644-6839



- Inžinierske konštrukcie a dopravné stavby
- Ekologické, pozemné a vodné stavby
- Verejná a osobná doprava
- Stavebníctvo, energetika, digitalizácia
- Výskum, inovácie technológií a materiálov
- Rozvoj infraštruktúry v regiónoch Slovenska

Rubriky

MOBILITA-DOPRAVA-LOGISTIKA

STROJE A MECHANIZÁCIA

PROJEKTY A KONŠTRUKCIE

IT TECHNOLOGIE

DIAGNOSTIKA

BEZPEČNOSTNÉ SYSTÉMY

MATERIÁLY A TECHNOLOGIE

VÝSKUM A VÝVOJ

FÓRUM

UNIVERZITY A FAKULTY

KONFERENCIE A VÝSTAVY

VZDELÁVANIE

AKTUALITY

EKOLÓGIA

GEOTECHNIKA

REGIÓNY SLOVENSKA



ekomagazin.sk

Organizer



SLOVENSKÁ TECHNICKÁ
UNIVERZITA V BRATISLAVE
STROJNÍCKA FAKULTA

Co-organizers



Media Partners



ISBN 978-80-8086-286-2

