

NEW INSULATION MATERIAL PRODUCED BY AUTO-TEXTILE WASTE RECYCLING – IZORETEX

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Summary: *The Construction Cluster „DUNDJER“, together with a large number of its members, is participating, as a leading partner, in a national project co-financed by the National Agency for Regional Development, named IZORETEX. IZORETEX is a project which aims to develop a new thermal and acoustic insulation building material based on the recycling of waste from the automotive industry, specifically auto-textile waste. IZORETEX is especially important insulation material for light building structures that require additional acoustic, thermal and vibration-isolation. It is estimated that this insulation product releases large producers of surplus textile waste, and create savings in the amount of more than € 100 million on the European scale. Currently, testings of this material are in progress that will hopefully confirm its thermal, acoustic and vibration performances. Construction Cluster „DUNDJER“ will ensure within its members the test production and marketing of this material in the region. Development and application of project results will be presented in this paper.*

Keywords: *industrial waste, textile waste, auto-textile waste, recycling of textile waste, building thermal insulation, acoustic building insulation, vibration insulation of mechanical structures, energy efficiency.*

1. INTRODUCTION

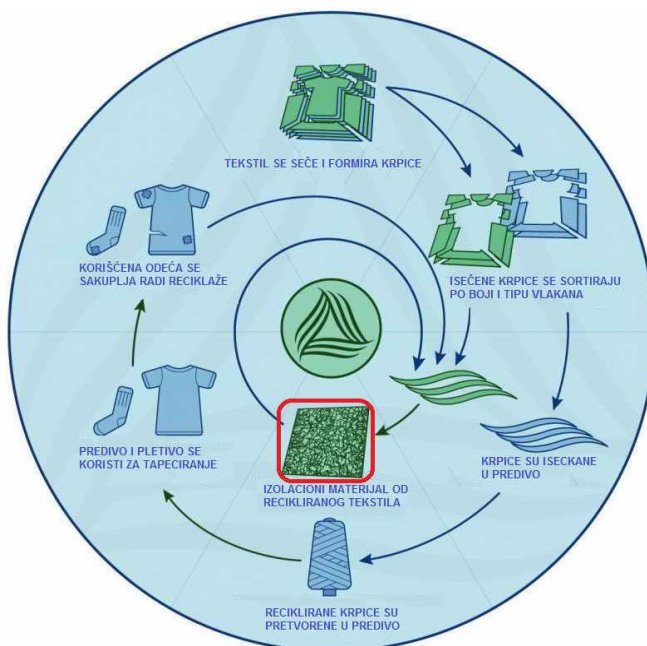
In the past more than 10 years, "dirty" textile industry has moved away from the EU to Serbia, mostly to southern Serbia. Despite the improvement in the employment rate and living standards, there are some environmental consequences due to the textile industrial waste and difficulties with its treating.

If the industrial waste is not recycled, it remains two standard way of treatment: either landfill or incineration, however, both are usually unsuitable or even prohibited by law. The first way should be avoided, due to the production of toxic gases and CO₂ emissions, and the other way because of the pollution of land and transfer of pollutants into the environment, especially in agricultural products, with the possibility to enter the

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human food chain. Fourth, the last and most expensive solution is to export waste to another country.



At us, however, there is still no rigorous control of resolving the issue of hazardous textile waste. Only in southeastern Serbia, there are thousands of tons of waste textile industry, with more or less, an unknown destination. Thereby textile waste that is treated with chlorine or other hazardous substances must not be disposed of in landfills. Sources of textile waste are: home textile of the population and industrial textile waste. At first it must be classified on final usable clothing, second hand type, and the other of which could be made final products as bags, mats, slippers, and similar products. As this production also creates a secondary textile waste, it is still used as a filler for pillows, taburettes, punching bag and leaves behind a tertiary textile waste.

There are, however, automotive textil, ie. textile waste generated in the automotive industry, which for this reason must have some properties that distinguish it from ordinary textile waste, like its resistance to fire. Why is this material interesting for construction industry?

New standards in the construction are dealing with the effects of climate change and reducing heat and cooling energy and consider this two issues as main at EU level. 10% of the world energy is used only for heating buildings, that makes a big concern for the citizens of Europe and the new EU legislation. Tough new EU Directive, together with the economic crisis in the construction sector, have set extremely high challenges in front of already weak companies in the construction sector, especially small and

medium-sized enterprises. Market needs and new opportunities for the survival of SMEs in the construction sector are in the research for competitive solutions for thermal and sound insulation of lightweight construction, the search for insulating materials that may be environmentally friendly, cheap and made of recycled materials.



The proposed project aims to bring to the market a new building insulation product, made from recycled textile industrial waste. It is called IZORETEX - a new low-cost thermally enhanced and "ready to use" composite insulation, which combines in a single product three main features: thermal insulating ability and outstanding air control sound and vibration resistance. Diversity concept will make this material adaptable for heating and cooling, allowing the product to be good at a variety of weather patterns and in different geographical markets only by adjusting their composition, size, density and thickness.

The experience in the recycling of waste textile industry in neighboring countries, led to the industrial production of a similar high quality insulation material. This accomplished technologies for environmental protection and economic treatment of textile waste, with some modifications may be transferred to our facilities in Southeastern Serbia. In this sense, Construction Cluster "Dunder", with several of its members, from Nis, who expressed willingness to invest in this venture, has the potential to begin auto recycling textile waste, in this part of Serbia, for the production of new ecological insulation material with high performances.



IZORETEX - granulate is an insulation material in the form of flakes of textile leftovers that remain from tailoring car cover after cutting shapes for seats and headrests. In this fabric are added additives, flame retardants, which will provide better durability and increased durability and protection from insects and parasites.



IZORETEX - granular, textile fiber insulation is applied by injecting in the wall holes. IZORETEX - granular insulation in the form of flakes is designed for holes and interstices of the walls, which resulted in the one piece isolation, without touching, heat and sound bridges, and therefore, as an insulating layer, it can evenly cover the pipe and the rest of the installation.

An important feature of IZORETEX granules, beside, of course, most important, such as heat and sound tightness, is its resistant to water vapor or moisture as the primary material of high quality polyester and polyurethane, which is used for seats and headrests for cars.



These materials are made according to a very high European and US automotive standards, which have been in this industry very rigorous concerning strict demands of low flammability... (cigarette smokers, the fire in the car). It also requires a high textile resistance to weather conditions: humidity, temperature, resistance to UV radiation.

Elasticity is another very important feature IZORETEX granules. Since the filling of cavities requires gentle pressure, the volume of material (similar to the action of the spring) remains compressed.

Activities that should be undertaken within the framework of this project, are oriented primarily to IZORETEX product design and specifications for the possibility of industrial production, as well as laboratory tests for a detailed investigation of the properties and capabilities of the insulation material.

Expected results from the recycling of industrial textile waste are primarily significant for the whole local community in terms of relieving utility companies from the burden of this type of waste, and thus reducing the pressure on landfill, and on the other side of the opening of the job opportunities for LON companies that have large waste, and unburden surplus wardrobe from the Red Cross points.

The ecological aspect is also in reducing environmental pollutants, such as the recent incident with the throwing of large quantities of textiles in Kragujevac.

DETAILED DESCRIPTION OF PROJECT ACTIVITIES

Principles of sorting and recycling of specific industrial textile waste in order to create new insulating materials:

1. Mapping and analysis of the largest manufacturers of non-hazardous industrial waste textile and problems with their storage and disposal.

2. Types of non-hazardous industrial waste textile, preservation and storage techniques, rules of managing this waste incineration, waste export, mandatory regulations (ISO 14001).
 3. Classification and typology of textile industrial waste in the trash with the possibility of recycling in construction insulation without additional production of secondary waste and other textile waste.
 4. Definition of choosing the best way of processing textile waste from the manufacture of automotive industry and headboard upholstery in cars (tearing, shredding or grinding) depending on the required fineness, density, thickness, and texture of the insulating material.
 5. Define the types of insulation materials depending on the choice of adhesives and grouts for filling before pressing: production technology, raw materials, design and product properties.
 6. Pressing the basic mass of the insulation material to different target density and dimensions.
 7. Test pilot production quantities of insulation materials with different characteristics.
 8. Plan for using and disseminating knowledge through a workshop and demonstration activities for the presentation of the insulating material of textile industrial waste.
 9. Promotion of exploitation, analysis of potential competition from the neighboring countries.
 10. Examination of characteristics such as resistance to moisture, air and water vapor permeability and mechanical strength of the product, which must be acceptable to other geographical destinations.
- Preliminary laboratory tests of thermal, acoustic and vibration isolation, as well as fire resistance and moisture resistance:
1. Numerical modeling of thermal properties of insulating materials
 2. Development of software for the support of the thermal model
 3. Laboratory testing thermal properties of materials
 4. Numerical modeling of the acoustic characteristics of the insulation material
 5. Development of software for the support of acoustic models
 6. Laboratory testing of acoustic characteristics of the material
 7. Numerical modeling of vibration characteristics of the insulation material
 8. Development of software to support the vibrational model
 9. Laboratory testing vibrational characteristics of the material
 10. Numerical modeling of heat resistant characteristics of the insulation material
 11. Development of software to support fire-resistant model
 12. Laboratory testing of fireproof material characteristics

LITERATURE

- [1] EN 15459 : Energy performance of buildings – Economic evaluation procedure for energy systems in buildings.
- [2] EN ISO 15686-5 : *Buildings and constructed assets — Service life planning - Part 5: Life cycle costing.*

- [3] EN ISO 15686-9 : *Buildings and constructed assets – Part 8 Reference service life and service life information.*
- [4] Eurostat, *Statistics in Focus*, 7/2010. *The EU-27 construction sector: from boom to gloom.*
- [5] EP and EC Directive EU 2000/53 regarding old cars recycling
- [6] World Insulation Report – Freedonia Group Inc, February 1, 2009 – Publ. ID: FG2703472.
- [7] Guidelines EP and EC 2008/98 on waste
- [8] EU and EC Directive 2003/10 on noise
- [9] *Upgrading the flexibility of buildings*, Rob P. Geraedts, CIB World Congress, April 2001.
- [10] Recommendation SIA 112/1, 2004: *Sustainable Building – Building Construction*; Swiss Society of Engineers and Architects.
- [11] *Six steps resulting in a flexibility index of the building.* Source: LEnSE: Methodology Development towards a Label for Environmental, Social, and Economic Buildings, Indicator: Increase Ease of Building Adaptability.

НОВИ ИЗОЛАЦИОНИ МАТЕРИЈАЛ ПРОИЗВЕДЕН РЕЦИКЛАЖОМ ТЕКСТИЛНОГ ОТПАДА АУТО ИНДУСТРИЈЕ – ИЗОРЕТЕКС

Rezime: *Gradjevinski klaster „DUNDJER“, zajedno sa većim brojem svojih članica, učestvuje na nacionalnom projektu sufinansiranom od strane Nacionalne agencije za regionalni razvoj. IZORETEX je projekat čiji je cilj da razvije jedan novi termički i akustički gradjevinski izolacioni materijal, baziran na reciklaži otpadaka od autoindustrije, konkretno autotekstilnog otpada. IZORETEX je posebno aktuelan izolacioni materijal za lake gradjevinske konstrukcije koje zahtevaju dodatnu akustičku, termo i vibro-izolaciju. Procena je da će ovaj izolacioni proizvod oslobađanjem velikih proizvođača od viška otpada, stvoriti uštede u iznosu od 100 miliona €. Trenutno su u u toku testiranja materijala koja treba da potvrde njegove toplotne, akustične i vibro performanse. Gradjevinski klaster „DUNDJER“ će unutar svojih članica obezbediti i probnu proizvodnju i plasman ovog materijala u regionu.*

Ključne reči: *industrijski otpad, tekstilni otpad, auto-tekstilni otpad, reciklaža tekstilnog otpada, toplotna izolacija zgrada, zvučna izolacija zgrada, vibro-izolacija, energetska efikasnost.*