POLYTECHNIC UNIVERSITY OF TIRANA
FACULTY OF MECHANICAL ENGINEERING
TEXTILE AND FASHION DEPARTMENT

BOOK OF PROCEEDINGS

6th INTERNATIONAL TEXTILE CONFERENCE

Tirana, ALBANIA
November 20th, 2014

6th International Textile Conference

November 20th, 2014, Tirana, ALBANIA

BOOK OF PROCEEDINGS

Organized by
Polytechnic University of Tirana
Faculty of Mechanical Engineering
Department of Textile and Fashion

Department of Textile and Fashion

Head of Department: Prof. Dr. Genti GUXHO

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PREFACE

The Textile and Fashion Department at the Mechanical Engineering Faculty, Polytechnic University of Tirana (PUT) since 2004 every two years organizes the textile conference with the participation of the professors/lectors of the Department of Textile and Fashion, other departments at PUT, University of Tirana and foreign universities with similar research areas in textile technology and textile materials.
The Department of Textile and Fashion in PUT is full member of AUTEX since 2008.
The mission of AUTEX (Association of Universities for Textiles) is to facilitate cooperation among members in research and teaching in textile field at the top level. Full members and associates members are consolidated reputable universities in higher education and research in the field of textile. AUTEX was established in 1994. Currently there are 34 members from 28 countries. PUT, Department of Textile and Fashion is accepted as full member in June 2008. The current president is Prof. C. Dominique Adolphe, Université de Haute Alsace, France.

The First Conference of Textile Tirana *was organized in July 2004. At the first conference that coinciding with the 20th anniversary of the Textile Department at the Faculty of Mechanical Engineering there were presented 12 papers. (Proceedings book, Scientific Library FIM)*

The Second Textile Conference in Tirana *was organized in July 2006. At this conference there were presented 12 papers. (Proceedings book, Scientific Library FIM).*

The Third International Conference of Textile in Tirana *was organized on November 20, 2008 in the framework of FP6 "RETEXRESALB", in which the Department of Textile and Fashion was the coordinator. The primary objective of conference was technology transfer. There were presented 14 papers. (Proceedings Book ISBN 978-99956-16-27-4).*

The Fourth International Conference of Textile in Tirana *was organized on November 19, 2010. At this conference there were presented 26 papers. (Proceedings book, Scientific Library FIM).*

The Fifth International Conference of Textile in Tirana *was organized on December 7, 2012 at this conference there were presented 20 papers. (Proceedings book, Scientific Library FIM).*

In ***the Sixth International Conference of Textile in Tirana,*** *November 20, 2014 organized by the Department of Textile and Fashion in PUT, the participants will be from:*

ALBANIA
Polytechnic University of Tirana
Faculty of Mechanical Engineering,
Department of Textile and Fashion
Department of Production and Management
Faculty of Mathematical Engineering and Physical Engineering
Department of Mathematical Engineering
Faculty of electric Engeneering
Department of Electrotechnics
Department of Automation Industry
University of Tirana
Faculty of Natural Sciences
Department of Industrial Chemistry
Faculty of Economy
Ministry of Education and Sports, National Agency for Examinations,
Department of admissions and matriculation
Department of database and systems
Albanian Institute for the Research and Education in Information Technology (ISSETI)

CROATIA
University of Zagreb, Zagreb
Faculty of textile technology, Department of Clothing technology

ENGLAND
London College of Fashion, University of the Arts London

FRANCE
University of Haute Alsace
Laboratory of Mechanical and Physical Textiles

MACEDONIA
University of Saint Cyril and Methodius
Faculty of Technology and Metallurgy
University Goce Delčev
Faculty of Technology, Štip

TURKEY
Anadolu University, Faculty of Architecture and Design
Department of Fashion Design Eskisehir
Ege University
Textile Engineering Department, Izmir

TOPICS OF THE CONFERENCE

Garment Manufacturing

Textile Testing and quality control

Textile Processing

Biopolymers and Biotechnology

Comfort and Wellbeing

Developments in Textile Machinery

E-activities and E-commerce

Ecology and Environment in Textile Production

Fibre Physics and Textile Mechanics

Finishing, Dyeing and Treatment

Medical Textiles

Modelling and Simulation

Nanotextiles

Smart and Interactive Textiles

Supply Chain Management and Logistics

Technical and Protective Textiles

Textile Design and Fashion

Textile Education

APPLICATION OF APPAREL CUTTING WASTE AS INSULATION MATERIAL

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Keywords: apparel cutting waste, thermal conductivity, thermal insulation

Abstract

Thermal insulation materials for buildings provide thermal energy cost savings; hence much attention is directed towards improving their performances and construction of new ones. Inorganic fibrous materials - stone and glass wool and organic foamy materials- expanded and extruded polystyrene are dominant on the European market. However, the EU priorities of creating products with improved ecological footprint have led towards research for developing new insulation materials. Evaluation of the performance of insulation materials is a multi-criteria problem, which has to be carried out with respect to: physical properties, health and environmental protection, applicability as building elements and their cost. Recycled textile waste has already found commercial application as insulation material but so far only waste that is easy to open down to fibers has been used. This paper proposes an alternative solution of a new textile structure that will be used for thermal insulation of buildings' internal walls in order to prevent the loss of a valuable resource, pre-consumer apparel cutting waste. The designed textile structure is composed of polyester fabric apparel cutting waste which is shredded, rather than opened. Thermal conductivity – λ (W/mK) of the textile structure was measured with the Heat flow meter FOX600 instrument. The main goal was to determine the thermal insulation of the structure compared to the standard insulation structures, as well as textile insulating structures in form of fibers. The results of the 10 samples showed thermal conductivity coefficient (λ=0,052-0,060 W/mK), comparable to the values of standard insulation materials (λ=0,030-0,045 W/mK) and the values of insulation materials made from recycled textile fibers (λ=0,039-0,041 W/mK). In addition to the economic benefits, production of this kind of insulation material will have an ecologic benefit by decreasing environmental pollution arising from polyester apparel cutting waste.

1. Introduction

Insulating materials are the most powerful tool for the designer and the constructor to achieve high energy efficiency in buildings. Economy and reducing energy consumption is a major potential resource, in recent years were made remarkable progress on the improving the performance to thermal insulation materials, concurrently with the development of methods for measuring thermal parameters. Inorganic fibrous materials - stone and glass wool and organic foamy materials- expanded and extruded polystyrene are dominant on the European market. However, the EU priorities of creating products with improved ecological footprint have led towards research for developing new insulation materials. Nowadays, a significant number of modern insulation materials can be met in European market; they are characterized by their very low thermal conductivity factor and good overall performance in terms of physical properties. Evaluation of the performance of insulation materials is a multi-criteria problem, which has to be carried out with respect to: physical properties, health and environmental protection, applicability as building elements and their cost [1, 2].

Textile waste integrates the group of reusable materials that can be included in the building construction and which have different possibilities of application. These textile wastes may have origin in the textile industry or may simply result from clothes that are no longer used. Recycled textile waste has already found commercial application as insulation material but so far only waste that is easy to open down to fibers has been used [3].

The assessment of insulation materials is an issue which needs to be analyzed from different aspects: the physical properties of the material, their effect on people and the environment, installation difficulty and price. However, the most important property of every insulation material is the coefficient of thermal conductivity -λ (W/mK). Most of typical thermal-insulation materials have a coefficient of thermal conductivity λ=0,030–0,045 (W/mK) [4].

This paper proposes an alternative solution of a new textile structure that will be used for thermal insulation of buildings' internal walls in order to prevent the loss of a valuable resource, pre-consumer apparel cutting waste.

2. Experimental part

The designed textile structure is composed of polyester fabric apparel cutting waste which is shredded, rather than opened. Polyester fabrics of various mass and structure were used as materials for the insulation structures. The structural characteristics of fabric A differ greatly from those of fabrics C and D. Fabric D differs from A and C because of its raw material content, as it contains 5% Lycra® fibers. The polyester fabric was shredded using a cutting machine with rotational knives.

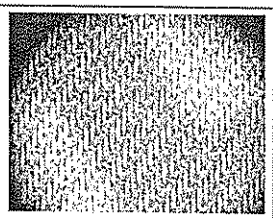
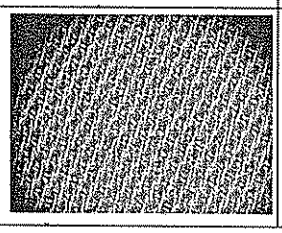
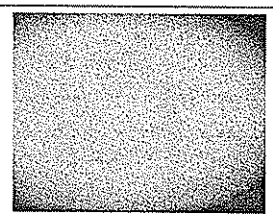
Sample B with row material content (%) 70/25/5 PES/cotton/Lycra® obtained from knitted polyester fabric by mechanical recycling in partly fibrous form was used for comparison. Casing made of 100% polypropylene was filled with these materials.10 samples for research were made from these materials. The samples had 60x60cm length and width and height (thickness) of 50,

70 and 100 mm. The isolation structure was stitched with 4 stitches along its length and width distanced on 15 cm leading to a change in height, and therefore a change in density. Thermal conductivity - λ(W/mK) of the textile structure was measured with the Heat flow meter FOX600 instrument. In the same time the instrument automatically measures the sample thickness.
Based on the measured value of the coefficient of thermal conductivity λ and equation 1 the value of thermal insulation R of the sample is determined [5],

$$R = \frac{h}{\lambda} \quad (m^2K/W) \qquad (1)$$

Where :
h - thickness (m)
λ - coefficient of thermal conductivity (W/mK).

Table 1 Used fabrics

Fabric	A	C	D
Thickness(mm)	0,16	1,2	1,6
CV (%)	2,17	1,80	1,38
Mass per unit area (g/m^2)	92	245	272
CV (%)	3,13	1,16	1,38
Raw material content (%)	PES 100	PES 100	PES/Lycra®95/5
Weave	Twill 3/2 Z	Twill 3/2 Z	Twill 2/1 S
Fabric appearance			

3. Discussion

The main goal was to determine the thermal insulation of the structure compared to the standard insulation structures, as well as textile insulating structures in form of fibers. The results of the 10 samples showed thermal conductivity coefficient (λ=0,052-0,060 W/mK), comparable to the values of standard insulation materials (λ=0,030-0,045 W/mK) and the values of insulation materials made from recycled textile fibers (λ=0,039-0,041 W/mK). A significant correlation was not found between the thermal conductivity –λ and the thickness-h nor density-ρ. The values of thermal insulation ranged from 1,658 m^2/WK (sample D) to 1,924 m^2/WK (sample A_2). The coefficient of variation of thermal insulation between the samples was 5,44 %. The fabric with the smallest pieces A_2 shows a higher thermal insulation.

4. Conclusion

Cutting waste from polyester fabrics is usually thrown away which is a loss of valuable resource, on top of environmental pollution. Instead, it can be used to make thermal insulation material-eco-friendly insulation for internal double walls in buildings. The production process is simple: shredding the waste into small pieces and consolidation of the structure, in this case with sewing. In addition to the economic benefits, production of this kind of insulation material will have an ecologic benefit by decreasing environmental pollution arising from polyester apparel cutting waste.

References

[1] G. Horga, et al.: Investigation on determining the coefficient of thermal conductivity to textile materials recoverable used for thermal protection of hot pipelines, *Tekstil ve Konfeksiyon* Vol. 23 (2013.) No. 2, pp. 94-99

[2] A.M. Papadopoulos., et al.: Composite insulating materials as a tool for the reduction of cooling loads, *International Conference, Passive and Low Energy Cooling,* Santorini, Greece (2005)., pp. 803-807

[3] A. Briga-Sa., et al.: Textile waste as an alternative thermal insulation building material solution *Construction and Building Materials* Vol. 38 (2013.) pp. 155-160

[4] A.M. Papadopoulos, State of the art in thermal insulation materials and aims for future developments, *Energy and Buildings* Vol. 37 (2005.), pp. 77-86

[5] N. Oglakcioglu, A. Marmarali: Thermal comfort properties of some knitted structures, *Fibres&Textiles in Eastern Europe* Vol. 15, (2007.) No. 5-6, pp. 94-96