WASTE RECOVERY OF TEXTILE – OBJECTIVE WASTE MANAGEMENT

Drd. ing. **Maria CIOROBÎTCĂ,** Ing. **Ştefan CÂMPANU**

S.C. Fabrics S.A. – Buhuşi

REZUMAT. *„Deşeu zero”* este o strategie inovatoare cu efecte rapide în eficienţa resurselor, este o politică guvernamentală responsabilă, o cale, un scop, o nouă abordare, care cuprinde principiile de conservare a resurselor, minimizarea poluării. Lucrarea prezintă aspecte tehnologice privind conceptul de dezvoltare durabilă, precum şi considerente tehnologice privind realizarea produselor textile cu valoare adăugată mare cu conţinut de fibre recuperate din deşeuri sub forma de resturi de fire pieptănate şi cardate, capete de partizi de fire pieptănate şi cardate, resturi ţesături, resturi de PET.

Cuvinte cheie: deşeuri tehnologice, sistem clasic, promovare eco-design, fire din deşeuri, ţesături, tricoturi.

ABSTRACT. "Zero Waste" is an innovative strategy with rapid effects in resource efficiency policy is a responsible government, a path, a purpose, a new approach, which includes principles of conservation of resources, minimizing pollution. The paper presents the technological aspects on the concept of sustainable development and technological reasons concerning the realization of textile products with high added value containing fibers recovered from scrap in the form of scrap yarn combed and carded ends, lots of worsted and carded scrap fabrics, PET scraps.

Keywords: technological waste, classical system, promote eco-design, scrap yarn, fabrics, knits.

1. INTRODUCTION

According to the National Strategy for Sustainable Development of Romania, after a prolonged transition, Romania still has to overcome significant gaps compared to other European Union Member States, simultaneously with learning and putting into practice the principles and practices of sustainable development in the context of globalization

To pass to a new development model, generating high added value during a reasonable and realistic period time, propelled by the interest in knowledge and innovation-oriented continuous improvement of living standards and relations between them in harmony with the environment, strategic objectives in the short, medium and long aiming have been proposed:.

− 2020: Reaching the current average level of EU-27 according to the basic indicators of sustainable development;

− 2030: Significantly close to the average level of EU member countries in terms of sustainable development indicators.

This recognizes that the Earth has a limited capacity to meet the growing demand for natural resources from the socio-economic system and absorb the destructive effects of their use.

Public policies that are developed in this area are designed to restore and maintain a rational balance in the long term, between economic development and the integrity of the natural environment in ways understood and accepted by the society.

EU waste legislation comprises three main elements:

− the horizontal legislation/sets the framework for waste management, including definitions and principles;

− the legislation on to processing/eg. requiring landfilling or incineration technical standards sets;

− the legislation for proper categories of waste/eg. oil waste, batteries that require measures to enhance the capacity of recycling or hazardous waste reduction.

Since December 2005 the EU Commission supports three specific needs:

− clarifying definitions, in particular those related to waste, and the difference between recovery and storage;

− inclusion in the Directive the environmental objectives/most significant waste management operations are covered by environmental legislation;

− simplifying the existing Directive [1].

These requirements are materialized in the modernization and simplification of waste policies,

establishment of standard treatment and waste prevention.

EU Member States had to implement this directive by December 2010. Prevention programs have been integrated into management plans or programs in environmental policies. The Directive requires Member States to take measures to encourage activities to prevent and reduce waste and adverse impacts on human health and environment.

In this context, the Directive contains examples of waste prevention measures, such as:

− research and development of clean technologies;

− the development of environmental indicators associated with waste generation;

− to promote eco-design;

− dissemination of information on waste prevention techniques;

− training for competent authorities in the field of waste prevention requirements;

− inclusion of prevention measures, other than those covered by Directive 96/61 / EC;

− voluntary protocols, consumer / producer panels or sector negotiations on providing information;

− to promote a credible environmental management, EMAS and ISO 14001;

− undertaking awareness and informing the general public or a specific group of consumers;

− integration of environmental criteria and prevent waste in public and corporate supply activities;

− to promote reuse by establishing, in densely populated areas, centers or networks reuse.

Textile industry affects the environment through the consumption of water, energy and chemicals, as well as the large amount of waste they generate as a result of the use of an impressive number of chemicals and processes which require a continuous activity reduction and recovery of those waste.

2. RESEARCH DEVELOPED NATIONWIDE

2.1 Textile Waste Processing Technology

Textile waste originating from the processes for obtaining synthetic fibers, processing fibers and yarns into fabrics, knits produced nonwoven composite materials, processes of producing textile supports, sections of the textile finishing processes behavior and exploitation by individuals or public and social institutions.

The literature defines four product groups:

− fibers first usage /**Group A** (raw materials);

− fibers recovered after processing:

  − **Group B**/ technological waste results in the first step of fiber and yarn processing;

  − **Group C**/ technological waste results in processing of units weavers, knitwear, textiles and non-woven fabrics and unconventional ones;

  − G**roup D**/ post-consumer waste in the form of textile waste, collected from institutions or population.

Fiber Group "A" natural fibers and chemical fibers are first usage textile waste.

Fiber Group "B" are very varied, depending on the processes and stages of processing and type of commodity; They are in the form of semi-finished heads spinning yarns and / head band, roving or pretort heads, worsted, cloth cleans, fluff with impurities etc.). They can be introduced into the production of spinners with a prior operation of purification and mixing with the original fiber.

Group "C" includes wastes in the form of combed and carded yarn heads, heads, lots heads and strips of fabric, fabric scraps, scrap non-woven fabrics; resulting from surgery cutting, sewing, etc.

Waste in the 'D' group - in the form of clothing or other items collected from households and institutions with varying degrees of wear.

Waste from group "B" and the group "C" are also called technological waste, and those in Group "D" waste collected or post-consumer waste.

The materials in Group "C" and "D" can be processed by cutting processes, fraying and shredding, yielding recovered fiber that can be used to achieve yarns or woven products. The materials in Group "D" require additional cleaning operations and in most cases are used as clothing "second hand".

To obtain recovered fibers from waste preprocessing is required of them, including by type of waste, sorting operations shredders, unraveling, baling.

Sorting can be done from the operator generating the waste in collection centers or preliminary processing. Maximum efficiency is achieved when the sizing is closer to the place from which the waste came. Sorting is done manually and even if it is a simple operation requires accountability as textile waste technological capability is largely influenced by the accuracy of this operation.

The criteria imposed to waste sorting operations are to: place of origin; natural fiber content; presentation; the predominant color or color palette.

Cutting is an operation which is applied in the form of mandatory waste yarn / fabrics / knits to reduce the length or surface.

Unraveling is done on unraveling machines, 1-4 unraveling groups, depending on the type and

nature of waste, finishing mode, recovered fibers destination.

Choosing the technological parameters of cutting and unraveling, in correlation with processing and resulted material characteristics, takes into account the following factors: the type and form of processed raw material processing; cost-quality – effective balance; processing technology parameter optimization in conjunction with physical and mechanical characteristics and structure of recovered fiber.

100% recovered fiber processing or mixed fiber connection technologies can be done for spinning wool or cotton type.

● Technological operations of wool type spinning system: sieving the basic colors; cutting the guillotine cutting machine; manual mixing bed; unraveling the fray with three drums; leisure / recreation room; mixing, shredding the wolf mixture; the aggregate carding four carders; ranked spinning on spinning machines with wool type rings.

● Technological operations of cotton spinning system type: sieving the basic colors; cutting the guillotine cutting machine; manual mixing bed; unraveling the fray with three drums; carding; rolling passage I, II; classical or unconventional spinning

2.2 Experimental Variants

Textile waste processing experiments that can be done at SC Fabrics Buhuşi:

− Waste worsted textile scraps and leftovers that carded current production results from SC Stofe Buhuşi can be processed into classic type yarn spinning system for carded wool, with a prior clipping, unraveling and blending with original fibers;

− Technological waste as semi spinning / head band, roving or pretort heads, worsted, clean cloths, fluff with impurities etc. They can be introduced into the production of spinners with a prior operation of purification and mixing with the original fibers;

− Technological waste of current production of SC Stofe Buhuşi can be mixed with technological waste from third parties (PNA waste etc.), processed in wool type yarn spinning system;

− Fibers recovered from PET can be processed at SC Stofe Buhuşi mixed with connection fibers on the spinning technology carded wool type.

− Technological waste, such as ends and strips of fabrics from the current production of SC Stofe Buhuşi are sold to third parties.

Product variants are designed and tested:

− V1-yarn Nm 5/1; 50% wool / 50% chemical fiber; containing wastes 20% wool 24 μ worsted; classical spun (Fig.1);

− V2-yarn Nm 5/1; 50% wool / 50% chemical fiber; containing wastes 66% (7% carded shaken wool waste / 59% wool + white pneumafil NAP); classical spun (Fig. 2);

− V3-threads 2.5 Nm; 8o% wool / 20% chemical fiber; containing wastes 33% (19% waste CARD / 14% wool pneumafil, PES, PNA) classical spun (Fig. 3);

− V4 threads 2.5 Nm; 70% wool / 30% chemical fiber content (15% PET waste, 15% carded wool waste); classical spun (Fig. 4);

− V5 threads 4.5 Nm from 100% recovered fibers from textile waste (carded scrap 80% wool / 20% chemical fiber) (Fig. 5).

Basic features of recovered fiber mixtures are within the technological limits imposed by processing on spinning wool type technology or unconventional classical system, which enabled processing of 100% or mixed with 50-70% link fibers.

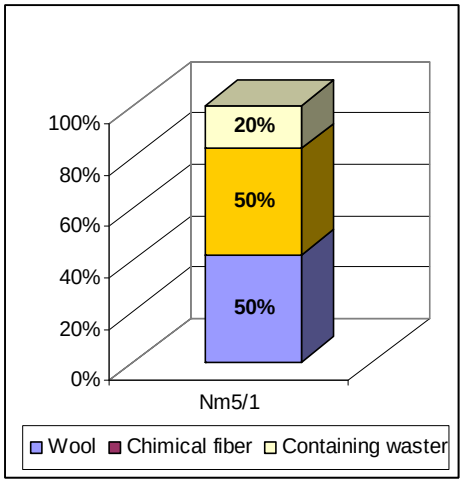

Fig. 1. Variant V1.

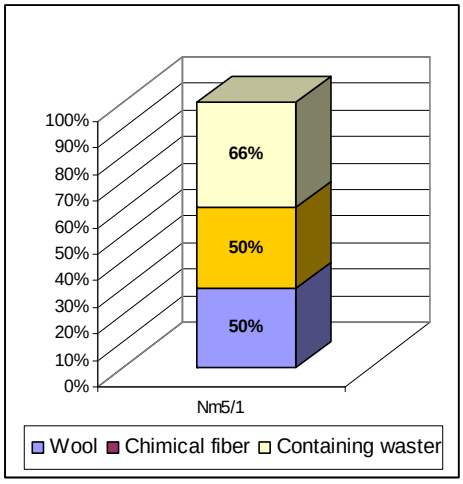

Fig. 2. Variant V2.

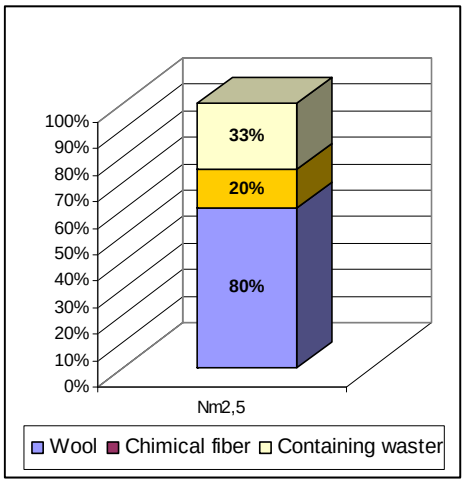

Fig. 3. Variant V3.

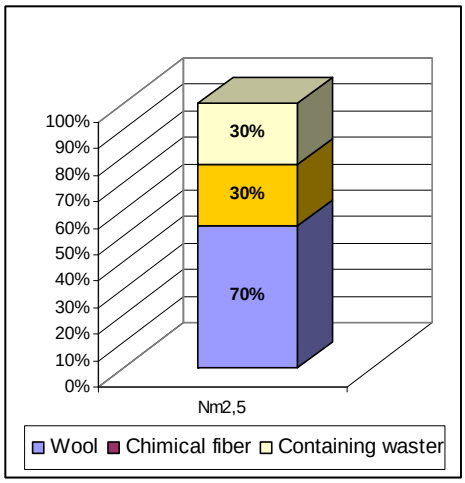

Fig. 4. Variant V4.

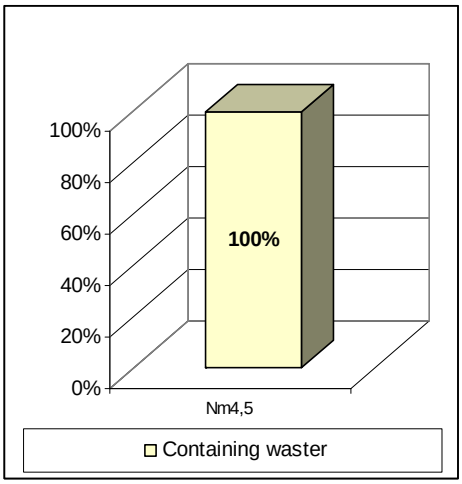

Fig. 5. Variant V5.

The introduction of the 15% recovered PET fibers mixed with 15% of technological waste / carded waste and 70% link fibers / thick wool yarn allows proper processing of 2.5 Nm fibers on carded wool spinning technology, classical system.

Strength characteristics of the wires respectively L_r = 4,1- 5,7 km ensure proper processing of the yarns in the weaving of textile products for beds, leather goods, decorative items, technical articles.

3. CONCLUSIONS

Generally, waste minimization strategy aims to:

− encouraging industry in waste minimization actions;

− increasing awareness on the benefits of waste minimization;

− setting of some "cells" of clean production for promoting waste minimization.

Independent by the degree of influence of some factors, of "the philosophy" of each country, the waste is defined by certain strategic objectives, namely:

− waste processing is performed in accordance with all legislative requirements for waste, including charge of administration (control), and plan future legislative changes and mitigate their effects;

− reduction of waste at source and to facilitate the recovery, reuse and recycling when it is economically efficient;

− defined roles and responsibilities to identify and coordinate every activity within the waste management chain;

− awareness of environmental issues to increase and encourage reduction, reuse and recycling;

− ensuring safe transport and storage of waste;

− adequate training of staff and other stake-holders in waste management issues;

− promote best practices for industrial waste management;

− competent persons to provide guidance for waste management

− appropriate training for all staff who have responsibilities in waste management.

− public education in the field of waste.

Textile waste from textiles (scrap yarn, fabrics, knits) can be capitalized as recovered fibers used for processing woven textile structures, knitted or unwoven, for technical articles (material background, thermal insulating, agro textiles, car upholsteries, etc.) decorative items and leather goods.

Transposition into application "zero waste" through efficient textile and leather products waste, with high added value through competitive technologies require:

− strategic public-private partnerships in order to do the investments in infrastructure and technological networks of waste processing;

− significant research and development efforts by having as a starting point a new approach based on the life cycle of products, the impact of waste generation on the environment, the introduction of new standards, as well as measures to prevent waste production;

− eco - awareness of the business environment.

REFERENCES

[1] ***, *E171 Textile Waste Management*, EUREKA project, 2008-2010.
[2] ***, *Romanian National Strategy for Sustainable Development* 2013-2020-2030.
[3] ***, *Directive 2008/98 / EC* of the European Parliament AND THE COUNCIL, 2008.
[4] ***, *EU Legislation for 21st century* .
[5] ***, *EU-regulation on Waste Presentation at the visit of the CAUES delegation Copenhagen*, 21 March 2007, by Henrik Wejdling Danish Waste Management Association & ISWA, 2007.
[6] ***, *The recycling concept in the context of the revision of the Waste Framework Directive*, EUROFER, may 2005
[7] Maria Zamfir, et al.,*Textile waste*. Ed. Performance, ISBN; 978-973-730-563-3, 2008.

Despre autori

Drd. ing. **Maria CIOROBÎTCĂ**
S.C. Stofe Buhuşi S.A.

Absolventă a Universităţii Tehnice „Gheorghe Asachi“ din Iaşi, Facultatea de Textile, specializarea Filatură-Ţesătorie – 1982, doctorand în domeniul Inginerie Industrială, anul I, 2015. Inginer cercetare-dezvoltare tehnologică din anul 2003. Domenii de competenţă: proiectarea şi realizarea produselor textile, coordonarea şi participarea în cadrul programelor naţionale şi internaţionale de cercetare-dezvoltare.

Ing. **Ştefan CÂMPANU**
S.C. Stofe Buhuşi S.A.

Absolvent al Universităţii Tehnice „Gheorghe Asachi“ din Iaşi, Facultatea de Textile, specializarea Filatură-Ţesătoriec – 1986. Director general la S.C. Stofe Buhuşi S.A. din anul 1999. Domenii de competenţă: management organizațional şi financiar, metode şi tehnici de planificare a proceselor.