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Review of textile wastes in the construction industry

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ABSTRACT

Pre- and post-consumer textile waste are two categories for this waste. Pre-consumer trash is made up of leftover materials from the textile industry, and post-consumer waste is any manufactured textile-based item discarded due to wear and tear or ageing. The goal of this article is to present the most current information on practical applications for textile waste in the construction sector. It is possible to create insulating goods primarily using textile fibres. The fabrics also served as reinforcement in the composites matrix, or they can be employed in lightweight bricks as an alternative. In cement-based renderings, textile threads can also be used as reinforcement strands. The use of leftover textile fibres as new, sustainable raw resources is investigated. Innovative construction composites' mechanical, hydrothermal, and acoustic properties are examined.

Keywords:
Acoustic properties, hygrothermal properties, mechanical properties,sustainable materials, textile waste

1. INTRODUCTION

Due to the rise in trash production following the rise in consumption, issues with waste disposal have grown in relevance over the past few decades. Waste management is the primary task to ensure environmental protection in a sophisticated industrial civilization. Reducing waste flows to landfills and boosting garbage reuse make it possible to minimise or lessen the environmental impact of waste [1]. In the textile industry, the fashion cycle renders a style outmoded before the actual end of the dress's useful life, resulting in waste and excessive consumerism. From the beginning of manufacture (pre-consumer waste) through the conclusion of its useful life (post-consumer waste), a textile fabric can cause pollution [2]. Pre-consumer waste, also known as post-industrial waste, is made up of all fibre, yarn, and fabric leftovers from the garment manufacturing process, whereas post-consumer waste is made up of all apparel that consumers discard because they are too old or out of style. By reducing the need for landfills, recycling pre- and post-consumer waste can greatly lessen the environmental impact associated with the textile sector.

One of the most significant solutions to the problem of energy consumption is passive building design. In order to assure internal thermal comfort, Lalmi et al. [3] investigate a bioclimatic greenhouse employing a solar energy storage system. The overuse of raw materials will undoubtedly result in a shortage of resources for future generations. As a result, it is now crucial to take into account the environmentally beneficial materials made from secondary raw resources [4]. In order to enhance environmental protection and sustainable development, several studies [5–9] have examined the use of garbage to manufacture building materials.

The recycling of textiles can be divided into two categories: recycling done during manufacture and recycling done after production. The first category, which includes items for home furnishings, views the reuse of textile wastes as raw material with a production process similar to that of textiles. The development of composite materials for the construction industry is an example of the recycling out of the production process, which involves the reuse of textile wastes as new raw materials in a separate production process [10].

Waste textile fibres have a use, although the recycling rate is not considerable. Unsustainable garbage disposal practises are a result of economic factors and a lack of public knowledge. Due to their slow disintegration and high amount of non-renewable petroleum resources, the majority of textile waste materials including nylon, polyester, and polypropylene are still dumped as municipal waste and cause environmental issues [11]. The difficulty lies in creating an industrial production-based economic model that not only benefits the environment but also fosters economic expansion [12]. The textile waste industry offers a variety of lucrative prospects, including those in the construction, automotive, and energy sectors. In response to the rising demand for alternate thermal energy sources, Nunes et al. [13] and Avelar et al. [14] employed textile fibres.

The use of textile waste to create novel, environmentally friendly composite building materials is discussed in this study as the state of the art. These materials' mechanical, acoustic, and hydrothermal characteristics were also studied.

2. TEXTILE BUILDING MATERIALS

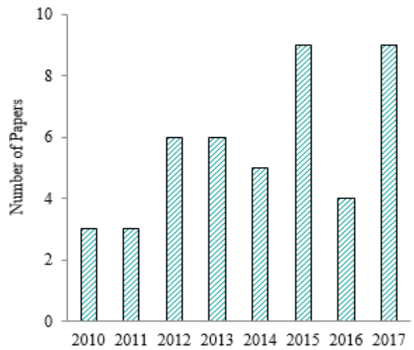

Figure 1. Numbers of papers published annually

The earliest research approaching to the use of textile waste for building materials was published in 2003 [15], this means that it is a fairly new activity. The interest in textile building materials has increased since 2012 and, especially since 2014 a great number of experimental results have been published (Figure 1).Textile waste find mainly application as insulating materials, but also as lightening of bricks. Waste yarns could be valid alternative reinforcement for mortar and render.

The prevailing method used to produce textile composites materials is the mixing of textile fibers with epoxy or formaldehyde resins. The needle-punching technique and the thermoforming of textile waste with polyester fibers are the most efficient processes to produce insulating mats because both processes avoid the addition of toxic binders to the mix.

The needle-punching technique is the oldest method of producing nonwoven fabrics. This technique provides a mechanical binding in which some of the fibers are driven upward or downward by barbed needles. The needling action interlocks fibers and holds the structure together by friction forces.

Polyester (PET) is widely used in the beverage bottles and textile industry. Nowadays there is a great recycling of PET from bottles, but recycling of PET from fabrics is still a big challenge. PET fabrics are often mixed with other fibers, i.e. cotton, creating mixtures that are very difficult to dispose. These fibers are often incinerated to recover energy, but many are still often set down in landfills. PET is a synthetic fabric made from petrochemicals non-biodegradable materials, so its degradation is harmful to the environment. Different methods have been studied to dispose of the PET fabrics (i.e. PET extraction, or cellulose extraction from cotton/PET blend fabrics, or PET dissolution), but they are unfeasible because of their high cost. The use of polyester textile fibers in construction materials is a sustainable alternative of recycling non-renewable resources, creating a new low cost raw materials [16].

3. HYGROTHERMAL,ACOUSTIC AND MECHANICAL PROPERTIES

Hygrothermal, acoustic and mechanical requirements have to be satisfied when considering a building material. The mainchallenge of future buildings is the reduction of energy consumption in their cycle of life. In order to reduce the heating and cooling demands, different strategies are focused on improving the insulating properties of the building envelopes. Efficient insulation materials are also important toreduce the impact of noise [17]. The use of waste allows the manufacturing of bio insulation materials able to minimize theenvironmental impacts of buildings reducing the energy demand both during the construction phase and the use, and able to ensure suitable acoustic performance [18].

Hygrothermal properties

The thermal conductivity (λ) is considered the most important parameter when evaluating thermal insulation. According to Smith [19] the thermal conductivity value of the air is very low compared to a solid matrix. For this reason, porous materials find wide applications as thermal insulators. Textile fabrics consist in a solid matrix characterized by a huge fraction of interconnected voids [20]. The porous structure of fabrics waste can contribute to increase the porosity of building materials in which they are incorporated. Hadded et al. [21] analyzed the thermal behavior of two recycled textile samples, i.e. waste linter and waste tablecloth. It was found that the thermal performances of the materials were mainly influenced by their porosity. The tablecloth structure showed better thermal insulation capacity than linter structure due to the air trapped in the numerous pores.

Tortuosity (ratio of the open pores length and the material thickness) reduces the free passage of heat flux, improving the insulating performances of materials. El Wazna et al. [22-23] utilized 100 % wool (W) and 100 % acrylic (A) fibers to manufacture needle-punched non-woven mats. They controlled some parameters of the needle punching process, i.e. the speed and the thickness of needle, the needle punch depth, the number of barbs and the stitch angle, to improve the tortuosity and the porosity of the mats. All tested samples exhibited good thermal insulation properties, better than other conventional insulation materials (glass wool, mineral wool and extruded expanded polystyrene).

Gounni et al. [24] designed a test wood cell in order to analyze the thermal insulation potential of a non-woven material mainly composed of acrylic spinning waste (As). The outside temperature of the walls of the test cell outfitted with as were compared with the temperature of the control wall without As. Experimental test results showed that the walls outfitted with as exhibited a lower outside surface temperature with a reduction in the heat flux exchanged.

Patnaik et al. [25] carried out a research about different type of innovative needle-punched mats. Two mats were obtained from two type of 100 % waste wool fibers (CW and DW), two others mat from the combination of the two type of wool waste and recycled polyester (CWP and DWP), the last one was manufactured from 100 % recycled polyester (RPET). Test results suggested the possibility to develop suitable materials for roof ceiling insulation with thermal conductivity value comparable to 100 % wool fibers insulators. A protective barrier on the wool fibers was created by spraying silicon in order to avoid that an excessive absorption of moisture affected the thermal performances of the samples. Test results showed that all samples absorbed a quantity of moisture slightly higher than the maximum requirement of 2 % according to standards.

Sometimes, in order to ensure sufficient cohesion between textile fibers to create building materials, the thermal bonding manufacturing processes were used. Hassanin et al. [26] developed insulating panels mixing different combination of Tetra Pak® waste and wool yarn waste. Several mixes of Tetra Pak® and different percentages of wool waste (from 0 % to 20 %) were hot pressed in two stages to reach a thickness of 5 mm. Results showed that the addition of textile fibers caused the increase of the porosity and, as consequence, the decrease of the thermal conductivity. Sedlmajer et al. [27] used the thermal bonding method by bi-component PE fibers. Five different insulating mats were produced with various textile fibers. The textile waste combination tested were cotton pure/recycled PES/bico fibers (40/40/20), recycled PES/bico fibers (80/20), cotton raw/recycled PES/bico fibers (40/45/15 or 45/40/15). All tested materials exhibited good thermal properties but the mats with higher cotton content showed, at the same volume weight, greater performances than the materials with higher proportion of polyester fibers. The effects of the density value and the temperature on the thermal behavior of building materials were studied by Drochytka et al. [28]. They prepared testing samples with polyester fibers and synthetic bi-component fibers by thermal bonding method. Samples with density of 65 kg/m³, 80 kg/m³and 90 kg/m³were prepared. The coefficient of thermal conductivity was measured at four different temperatures (from 10 °C to 40 °C). The thermal conductivity decreased with the decrease of temperature and the increase of density.

Figure 2 shows the thermal conductivity of some analyzed insulating mats. For the references [22-23] are shown the mean values of λ and the density values of the two acrylic samples and of the two wool samples respectively. For the reference [28], only the thermal conductivity coefficients at 10 °C are shown. It can be seen that all examined materials exhibit a thermal conductivity coefficient of 0.037 W/(m·K) mean value, with a standard deviation of 0.005 W/(m·K) .

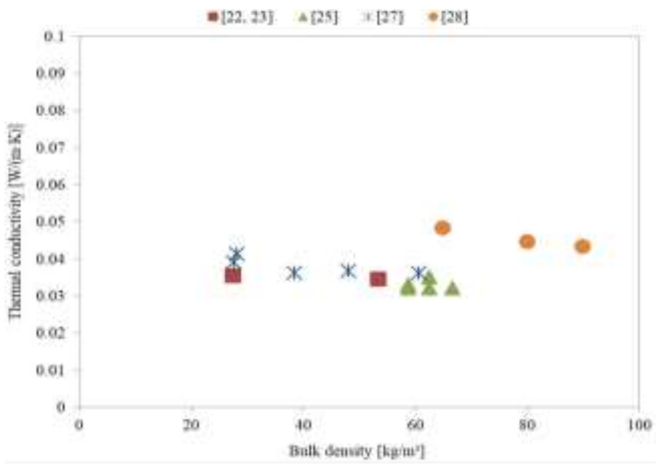

Figure 2. Thermal conductivity versus bulk density for insulating mats

Several authors carried out research to produce innovative insulating sandwich-shaped composite from low cost textile waste and with excellent thermal properties. Ricciardi et al. [29] evaluated the thermal performances of two type of panels differing in central layer thickness. A core of waste paper was glued and pressed between two layers of polyethylene fibers to reach thicknesses of 7 mm and 15 mm. The mean value of thermal conductivity was varying in 0.034-0.039 W/(m·K) range, with higher performance respect to traditional insulating materials. Binici et al. [30] investigated new lightweight composite materials in which a mixture of fly ash, cotton waste and barite was applied between two chipboards. It was observed that when the content of cotton fibers increased, the thermal performances of the chipboards improved. Besides, the use of barite allowed a radioactivity permeability control. Cosereanu et al. [31] simulated the thermal behavior of a sandwich wooden wall with the core filled with different textile waste composite materials. By comparing the innovative wall with the brick wall, was concluded that the wooden structure showed a higher thermal resistance than the brick one at the same thickness.

Trajković et al. [32] and Jordeva et al. [33] produced an insulating material encasing different fabric mixtures in 100 % polypropylene non-woven structure. The mix used for this research were 100 % polyester (blends A and C differing in the size of the waste), polyester/cotton/lycra (blend B: 70/25/5)and polyester/lycra (blend D: 95/5). All tested samples exhibited a thermal conductivity value varying between 0.052 and 0.0603 W/(m·K) . The measured λ values were similar to standard insulation materials (0.030-0.045 W/(m·K)). Tests result also showed that the polypropylene structure containing smaller pieces of cutting fabric exhibited the highest thermal insulation. In addition, the presence of lycra decreased the thermal insulation of the structure.

Barbero-Barrera et al. [34] developed building boards by mixing textile waste and lime paste with different lime-water ratios. The authors proved that the insulating performances of the innovative boards increased by decreasing the lime past content.

Kalkan et al. [37] proposed denim powder fibers (DPF) as a new type of mortar reinforcement. Several perlite and pumice mixtures with a different denim waste content were tested. Samples with DPF additives up to 1.25 % in 28 % perlite exhibited better thermal properties and vapour permeability values than samples in 20 % perlite. All tested mortars showed a thermal conductivity varying from 0.084 W/(m·K) to 0.129 W/(m·K) and a water vapour resistance coefficient from 9.2 to 12.8 respectively.

Several researches [38-41] investigated the use of textile fibers to produce lightweight bricks. They reported thermal conductivities and water absorption values. Figure 3 shows the water absorption values of some examined bricks. Rajput et al [38] investigated the hygrothermal effects of the addition of recycled paper mills waste (PW) and cotton waste (CW) to cement bricks. Three types of bricks were produced by mixing different percentages of cotton waste (from 1 % to 5 % b.w.) and paper mills waste (from 85 % to 89 % b.w.) with 10 % of cement by weight. Results indicated that with the increase of the cotton fibers waste the porosity increased from 0.18 to 0.29. A more porous structure allowed an improvement of the thermal performances (λ decreased from 0.32 to 0.25 W/(m·K)) and an increase of the water absorption.

Binici et al. [39-40] examined the thermal properties of cement bricks reinforced with cotton waste (CW) and textile fly ash (TW) and compared them with commercial concrete bricks (CB). They built and monitored two model house with same size but different envelope material. Experimental investigations revealed that the innovative bricks were more lightweight than the ordinary one, thus they showed better insulation capacity, i.e. the thermal conductivity coefficient was 29.3 % lower than CB. This reduction explained the rapid increase of the heating temperature of the model house constructed with cotton waste and fly ash bricks compared to the same model house made with traditional concrete blocks. As shown in Figure 3, the water absorption of the innovative bricks decreased with the increase of the content of cotton fibers. Algin et al. [41] used cotton wastes as lightening fibers for bricks. The work concerned the hygric properties of lightweight composite materials developed by mixing the cement with different combinations of cotton waste (CW) and limestone powder waste (LPW). Figure 3 showed that the water absorption and the CW percentage content were directly proportional. Substituting of 40 % LPW volume with CW, was achieved a water absorption 27.2 % b.w. that is a satisfactory value compared to other lightweight building materials. Similar results were obtained in the work of Agrawal et al. [42]. Their research was on the use of textile fibers in the manufacturing process of clay bricks. Four different combination of polyester/viscous blend (PV), polyester/cotton blend (PC), 100 % polyester (POLY) and PV+PC+POLY were incorporated in clay bricks. Test results indicated that the samples containing textile fibers exhibited a lower water absorption than the clay sample without textile waste, as shown in Figure 3. It was also concluded that the increase of textile fibers content increased the water absorption of the samples.

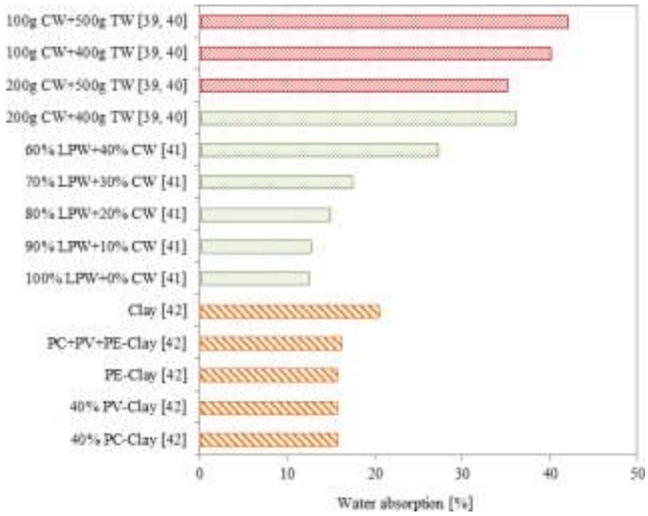

Figure 3. Water absorption values for bricks

The U-factor value, is an important parameter for evaluating the performances of building insulators. Briga-Sà et al. [43] and Paiva et al. [44] carried out an experimental work to determine the U-factor of an external double wall with the air cavity filled by woven fabric waste (WFW) and woven fabric subwaste (WFS). The results indicated that the double wall with the air cavity filled with WFW and WFS exhibited a thermal resistance higher than the double wall with the empty air cavity. Authors stated that WFW and WFS can be considered alternative sustainable insulating materials with thermal properties comparable to usual insulating materials as EPS, XPS, mineral wool, granule, vermiculite or expanded perlite. Acoustic properties Porous materials can convert the energy of sound wave to heat when the sound travels through them. Sound propagation takes easily place in porous matrix characterized by a network of interlocking pores where acoustic energy is dissipated by viscous effects. Fibrous structures are good examples of sound absorbing materials. For this reason most of the textile post- consumer waste and textile industrial waste are mainly used in the form of acoustic absorber [45]. The sound absorption coefficient α is the usual parameter utilized to define the acoustic performances of a porous material and its assessment commonly refers to ISO 10534. In some cases, sound absorbing performance is evaluated by means of Noise Reduction Coefficient (NRC) defined as the mean of the absorption coefficients at frequencies from 250 Hz to 2 kHz.

Several authors proposed the use of polyester in construction materials. Polyester is the most used textile fiber in clothing, thus it is the dominant waste component of the garment industry. Lee et al. [46] proposed the use of recycled polyester fibers to produce innovative sound absorbing non- woven materials by thermal bonding method. The influence of diameter, content and orientation angles of the fibers on the absorption coefficient was investigated. Authors pointed out that by increasing the diameter and the content of fibers, the coefficient α of the non-woven improved as a consequence of the greater possibility of intercepting the sound wave. They stated that the orientation angles of the fibers did not affect the acoustical performances of the innovative materials. Drochytka et al. [28] concluded that the sound absorption coefficient of innovative polyester waste thermal insulators was dependent on the bulk density value, in the higher frequency band between 1000 and 1600 Hz. Trajković et al. [32] and Jordeva et al. [33] observed that the α value of all tested materials was maximum in the range of 1000-2000 Hz and the NRC value was similar to that of other commercial building insulator (NRC was in the range from 0.55 to 0.75).

Tiuc et al. [47] investigated the improvement of the NRC of rigid polyurethane foam (RPF) by incorporating textile waste (TW). Results showed that the rigid polyurethane foam including a 60 % of waste textile fibers exhibited a NRC that was twice as the foam without textile waste.

According to Patnaik et al. [25], the thickness of non-woven materials significantly affected their sound absorption performances. The cause was that a higher thickness lengthens the path of the sound wave through the voids in the material creating more frictional losses with the fibers, with a sound energy damping. The authors carried out a research on new needle-punched non-wovens with good acoustic absorption properties in the overall frequency range (50–5700 Hz). The DWP sample showed a higher sound absorption value than the RPET sample due to the rough surface of the wool fibers that improved the friction phenomena by increasing energy losses. In addition, test results indicated that the fibers length also affected the acoustic performances of the material. About that, DWP showed a higher α value because of the long length of the included fiber that created a very uniform pore structure for sound wave interaction. Similar conclusions were drawn by Seddeq et al. [48] and Ricciardi et al. [29]. Seddeq et al. [47] investigated different non-woven materials containing natural textile fibers (jute, cotton and wool) mechanically connected with synthetic textile fibers (polyester and polypropylene), using the needle punched technique. All tested samples showed a good sound absorption coefficient at mid and high frequencies, but a lower sound absorption coefficient at low frequencies. Test results demonstrated that adding air space behind the sample increased sound absorption at low and mid frequencies. Ricciardi et al. [29] studied that when the thickness of insulating panels decreased, the α coefficient decreased and the peak value was shifted towards the low frequencies. The NRC of the tested samples varied from 0.25 to 0.40 based on the thickness of the layers.

Figure 4 displays and compares the NRC of some textile composite materials examined above.

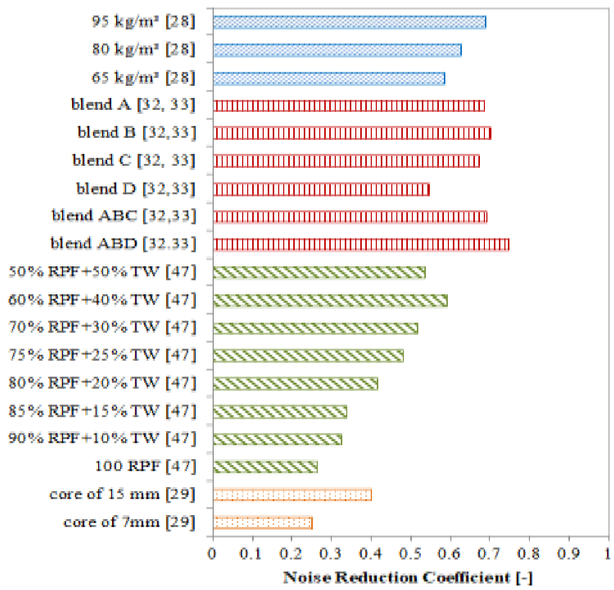

Figure 4. Noise reduction coefficient for same examined composite materials

Barbero-Barrera et al. [34] investigated the effects of the construction water content on the acoustic performances of textile waste-lime panels. It was observed that α increased with a higher water to lime ratio, due to the increase in the amount of pores in which sound waves could easily penetrate.

Segura-Alcaraz et al. [49] analyzed the improvement of the acoustic properties of two type of polyester non-woven by adding a microfiber fabric layer. Results showed that when one or two layers were added, a significant increase in absorption coefficient of the non-woven materials was obtained.

Curtu et al. [50] analyzed the acoustic properties of innovative textile composite materials with a potential role in the urban habitat. The materials tested in the research were produced by mixing wood and textile waste with different binders as acrylic copolymer, clay solved, gypsum solved and formaldehyde. The influence of the type of binder on the acoustic behavior of the samples were investigated. Results pointed out that samples manufactured with acrylic copolymer as a binder exhibited a great sound absorption value at high frequencies, unlike the samples produced with formaldehyde performed a not classifiable acoustic behavior and they were the most reflective composite materials due to the flat and smooth surfaces. Samples blended with clay solved in water exhibited a constant sound absorption coefficient in the frequencies range 800-3200 Hz. Increasing the density value of the materials produced a decrease in the sound absorption coefficient.

Del Rey et al. [51] focused on the characterization of innovative acoustic insulation materials developed from several combination of cotton fibers, polyester fibers and bico PET fibers mixed with phenolic resins or recycled PET fibers. A prototype of a noise adsorbing barrier was designed using the new insulation materials as a core of a metal structure with a drilled plate at the side exposed to the noise source. The new fibrous materials barriers exhibited sound absorption coefficients and airflow resistivity values similar to other commercially available absorptive noise barriers.

Binici et al. [52] examined the acoustic performances of new insulation materials produced by grinding and by mixing agricultural and textile waste. Plaster or epoxy was used as binder. The obtained boards were applied to walls of a test room and sound insulating properties measurements were carried out. An improvement of the sound insulation performances of the walls was proved.

Binici et al. [30] comparing sandwich-shaped chipboards including textile fibers with control chipboards, concluded thatthe presence of fibers improved sound insulation.

Mechanical properties

In order to classify a material as a construction material, it must show suitable engineering properties that attest to its quality and convenient application field. The mechanical properties define the structural or non-structural use of the materials.

Umar et al. [53] used yarns derived from textile waste to produce sustainable composite materials that could replace fiberglass materials in low strength structural applications such as door panels or partition panels.

Aghaee et al. [35-36] developed a textile composite concrete with absorbed strain energy about twenty five times higher than the lightweight aggregate concrete without textile fibers. This was due to the orientation of the tensile mesh glass fibers in the direction of the tensile forces. A material with a great ductility and bending ability was achieved. The use of the innovative panels led a reduction in the specific weight of the internal partitions by about 20 %. The lesser weight reduces the damages and the possibility of collapse of the panels in case of an earthquake. Deformation testing showed that the samples exhibited good bending capacity because of the large amount of absorbed energy.

Zou et al. [54] developed composite materials from PET/cotton blend fabrics in order to find a suitable application of PET containing textiles. The fabrics were sprayed with a solution of ethanol and glycerol or 2-phenyl phenol to reduce the melting PET temperature. Results showed that the use of plasticizers allowed to reduce the composite manufacturing time and temperature, but decreased the mechanical performances of the tested composites.

Ramamoorthy et al. [16] concluded that the increase of the compression temperature and time caused the increase of the mechanical properties of the materials. A further increase of these processing parameters produced the degradation of the cotton fibers.

According to Athijayamani et al. [55] the contact of a composite material with water affected the interfacial adhesion between the fibers and the matrix, weakening the bond and worsening the mechanical properties of the composite material. Binici et al. [52] demonstrated that the insulating panels developed from agriculture and textile waste materials showed high porosity, thus exhibiting low compressive strength. Barbero-Barrera et al. [34] retained that the mechanical properties of lime-based insulation boards were affected by the water content that influenced their porosity. A high water content meant high porosity, thus low hardness and low flexural strengths. Rajput et al. [38] tested bricks with good compressive strength (21±1 MPa) to propose as not -load bearing partition walls. They concluded that the amount of fibers used for producing the bricks influenced their mechanical properties due to the nature of fibers to be water-absorbent.

The bricks tested by Agrawal et al. [42] showed a higher average compression value than regular bricks. The compressive strength of all tested materials decreased severely by adding more than 20 grams of PV, PC or polyester additives. Binici et al. [39, 40] produced textile waste and textile ash bricks which allowed to reduce the thickness of the load-bearing walls because of a high compressive and flexural strength. The compressive strength values of all tested materials varied from 8.95 to 13.40 MPa and the flexural strength values was estimated at about 3 MPa. Algin et al. [41] showed that brick samples containing high CW percentages could be used preferably for non-structural applications due to low compressive and flexural strength values. Results proved that with the increase in the CW replacement, the mechanical performances of the analyzed samples decreased.

Kalkan et al. [37] showed that samples with 20 % perlite and DPF percentage content up to 1.25 % by weight exhibited a higher compression and flexural strength than those with DPF reinforcement above 1.25 %. Pinto et al. [55] proposed wool and acrylic thread waste as sustainable alternative reinforcement fibers for cement-based renders. The effect of fiber content and fiber length on the mechanical properties of the new render were investigated. Results showed improved mechanical performances by increasing fiber content and decreasing fiber length. Dos Reis et al. [57] produced an innovative polymer concrete reinforced with textile fibers using different percentages of cotton, polyester, silk and rayon. By comparing the composite material with the simple polymeric concrete, it was concluded that the addition of textile fibers did not improve the mechanical behavior but reduced the brittleness.

Binici et al. [30] proved that by increasing the content of textile waste and the thickness of the panels, the increase in bending strength could be achieved. Liu et al. [58] prepared foamed gypsum blocks from flue gas desulfurization gypsum and textile fiber waste. Results indicated that at 3 % of the textile fibers content the samples showed the maximum compressive strength of 1.6 MPa. Temmink et al. [59] used post-consumer denim waste bounded with thermo set bio-resins (bio-epoxy and acrylate epoxidize soybean oil resin) to develop innovative composite materials. Results displayed that both resins were suitable for manufacture material with structural applications.

4. CONCLUSION

Collecting textile waste without recycling it can seriously harm the environment. Reusing these waste materials to create new building materials solves the pollution issue and protects natural resources for future generations. In this work, the many types of textile building materials and their qualities have been studied. Sustainable thermal and acoustic insulators made from textile fibres can take the form of mats, panels, energy-efficient bricks, creative concrete, or plaster mortar. In comparison to traditional building materials, textile materials have superior thermal characteristics and are more acoustically efficient. The mechanical qualities of plaster mortars are improved by textile fibres. An intriguing method for creating composite materials that are environmentally beneficial alternatives to traditional ones is to use textile waste as a supplementary raw material. In conclusion, despite the fact that there is still more work to be done, textile materials are potential building materials. This effort can aid in gaining a comprehensive understanding of the subject and serve as a springboard for further research breakthroughs.

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