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Use of Waste-Tire Materials in Architectural Application in Egypt

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Abstract : With the increase in the production of the automobile, a lot of waste tire need to be disposed. Due to the reduction of available sites for waste disposal, a lot of countries forbid the disposal of waste tire rubber in landfills. Researches seek for a long time to find alternatives to the waste tire. Reusing and recycled waste tire rubber is the promising material in the Architectural Applications due to its light weight, flexibility, insulating properties, and energy absorption. There are many studies show that Egypt capable of competing within the global tires Reusing sector, the paper aims to how to improve this Sector to face its future challenges and attract Foreign Investment, many points should be considered such as improving the legislative framework, rising of awareness, developing business development service and, role of external institutionalization and financing.
Keywords: tires wastes, Tires bales, sound barrier, landscaping mulch, Architectural Applications, reuse management.

Introduction

Recycling waste materials is not a new phenomenon, **Fig.1**. The reuse of solid waste can improve of environmental quality, contribute to solutions of urban issues, energy shortage, and waste disposal. Recycling provide job opportunities to the needy people, conserve finite resources and save the environment. Recycling of rubber receives less attention than other waste materials such as Paper, glass, steel cans due to its final product, quality and public acceptance, financial value, marketability, and margin of the earning.

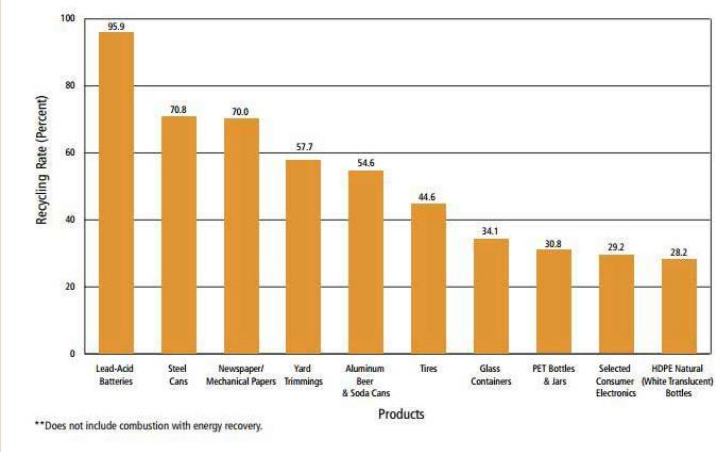

Fig.1Recycling Rates of Selected Products. http://flatrock.org.nz/archive/2014/Nov/14/waste-not/

Growth of population, rapid industrialization caused overall usage of rubber producing proportional quantities of wastes. "Management of waste-tire rubber is very difficult to handle because it is not easily biodegradable even after long-period of landfill treatment" **(Guneyisi et al. [1])**. In less-industrialized countries for example in Cairo, Egypt, show that 22% of the used tires are being recycled **(Rehan Ahmed and Arnold van de Klundert,[2])**. The recycling and reuse in Egypt suffer from many factors as shown in **table (1)**.

Table (1) factors affect on the recycling and reuse in Egypt.

legal framework	Egypt lacks a legal framework for used tires management. However, the recycling or reuse facilities should be included in the environmental register.
planning	There is a need to initiate a national program for wasted tires collection, treatment and disposal.
financing	No financial allocations are directed for wasted tires collection, treatment and disposal.
collection, treatment and disposal	The majority of tire waste is collected by tire dealers and sold to mediators for recycling.

Source:(ElSalam , Magda, [3])

In industrialized countries used tires in several applications. It has been used as a fuel in cement kiln, as artificial reefs in the marine environment, and as feedstock for making carbon black **(Siddique and Naik,[4])**. It has been used as an erosion control, guard rail posts, sound barriers, and in asphalt pavement mixtures (**Toutanji,[5]**). (**Najim and Hall,[6]**). It has also been used in architectural application as a playground matt, building with tire bale, landscaping mulch, and so on. "Statistics indicate that only in Cairo, some nine million pieces of tires are dumped every year", so this paper suggests actions for an optimal reuse of tires wastes in Architectural Applications.

1- Environmental Effects of Tire Disposal

There are many negative and positive environmental effects of tire disposal besides, the effects on worker health and safety.

1-1Negative Environmental Effects of Tire Disposal

One of the greatest environmental concerns is an end-of-life tire **(U.S. Environmental Protection Agency,[7] and Reisman and Pechan [8])**. They cause a fire hazard, trap rain water, and occupy a big volume in landfills **(U.S. Environmental Protection Agency,[7] and Perederii et al[9])**. Besides, they require a lot of time for natural degradation due to the cross-linked structure of rubbers **(State Council of Educational Research & Training,[10] and Soltani et al[11] and Adhikari et al[12]).**

1-2 Environmental Benefits of Recovery

- By conserving the value added, recycling makes the material available while avoiding the environmental effects related to production**.**
- Recycling has benefits to the global material supply.
- There is a net resource and energy benefit to the use of secondary rubber.
- Recovery projects have effect on risk reduction

1-3 Risks to Worker Health and Safety

- Rubber dust can be hazardous upon inhalation or through contact with the skin.
- Fumes from chemical processes**.**
- Vapors from the" hot" processes, where rubber is molded or pressed at high temperatures**.**
- Smoke and the particles associated with burning of tires**.**
- Physical injury to workers**.**

2-Technical properties of Tires

Tire seems to be one plain black mass, but it consists of a complicated mixture of several types of rubber, organic compounds, reinforcing wire in multiple sections of a tire, carbon black, and inorganic materials, **fig.2** .There are summarized discussions about some properties waste tires that assist designers make new products from them, **table2**.

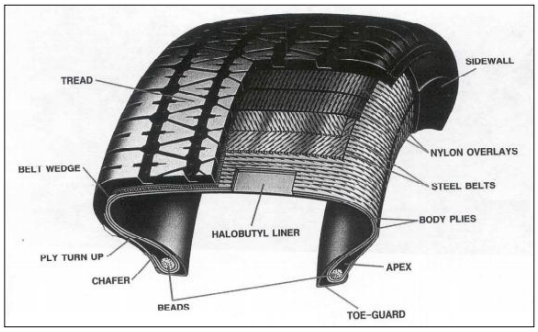

Fig.2: Raw Materials and Binders .Source: (Krishna C. Baranwal, [13])

Table 2 Technical Characteristics of Whole or Processed Tires

Density/ soil or stone is much heavier than tires and tire products. "The density of whole and shredded tires depends on size, deepness, and compaction", **Table 3**, **(Krishna C. Baranwal,[13])** . shred density increases with increasing overburden weight and with decreasing shred size .
Durability/"Tire rubber includes carbon black, UV stabilizers, and antioxidants to increase resistance to wear, sunlight, and chemical decomposition. These features are independent of particle size. Strength of whole tires is enhanced by reinforcing wire and fabric, but this extra strength is lost as wire and fabric are taken away from smaller particles. Abrasion resistance is clarified by the long life of tires in contact with roads. Tires and shreds are not damaged by blunt trauma, but they can be punctured by sharp objects".
"Moisture Absorption/ Researchers indicate maximum moisture absorption of 2–4 percent Hydraulic Conductivity: Water flows through whole and shredded tires readily, even when they are compressed under heavy overburden. Conductivity increases with larger particle size and decreases with increasing compaction. Conductivity ranges from 0.5 cm/sec for compressed 10–38 mm shreds to more than 20 cm/sec for 25–64 mm loose shreds".
"Thermal Insulation/ Rubber is a poor thermal conductor and good thermal insulator. Thermal conductivity depends on many variables such as particle size, content of reinforcing wire, compaction, moisture content, and ambient temperature".
Acoustic Insulation/ rubber is a bad acoustic conductor when used with irregular surfaces. There are obstacles have limited crumb rubber application for sound barriers such durability of the bonding agent, the flammability, and the cost. An acoustical barrier of baled tires is limited by aesthetics, economics, and durability of baling wire.
"Temperature Tolerance/ Tire rubber is qualified for withstanding a full range of temperature extremes without undergoing permanent property change. Flexibility property changes by temperature, but this change is repeatable and reversible" .
"Leaching Characteristics/ Tire shred leaching characteristics have been tested under a wide range of pH conditions. Tire chips are used in many applications above the water table to reduce long-term leaching exposure and in relatively natural conditions Extensive practical experience with such uses has proven the absence of any harmful impact".
Energy Content/ Tires have energy content greater than coal because they are made from oil and gas, so they suitable for use in many industries such paper, cement, and power.
"Impact Cushioning/ products of Shredded tire have elasticity and durability that lends to cushioning applications. Loose-fill crumb rubber utilized below playground equipment instead of wood chips, sand, and pea gravel. Crumb rubber has been blended with polyurethane binders and poured on top of an asphalt base to make a fixed cushioning surface. Crumb rubber has been compression-molded with

polyurethane binders into large (1–3 square feet) interlocking tiles that can be secured to an asphalt base as a cushioning surface".
"**Flammability**/Tire shreds have a reported flash point higher than other materials such as wood, paper, foam, and fabric. When crumb rubber is united with a binder, the binder controls the flammability of the resulting product if the binder has a lower flash point".
"**Color**/ tire chips can be mixed with some types of paint. This has been fully shown in colored mulch applications where durability has been shown to depend on the paint, not the rubber substrate. Crumb rubber has been used as a comparatively cheap substrate and colored ethylene propylene diene monomer rubber has been used as the surface layer in pour-in-place playground surface cushioning".

Table 3: The density of whole and shredded tires.

Whole tires	7.5 Ibs/cubic foot	Baled tires	30 Ibs/cubic foot
Laced passenger tires	10 Ibs/cubic foot	Shreds (loose – surface compacted)	22-50 Ibs/cubic foot
Stacked or Laced truck tires	14 Ibs/cubic foot	Shreds (compacted CE uses)	37-60 Ibs/cubic foot

The identification of the different categories of used tires

The various stages in the life of a tire can be summarized in the following diagram, **Fig.3**.

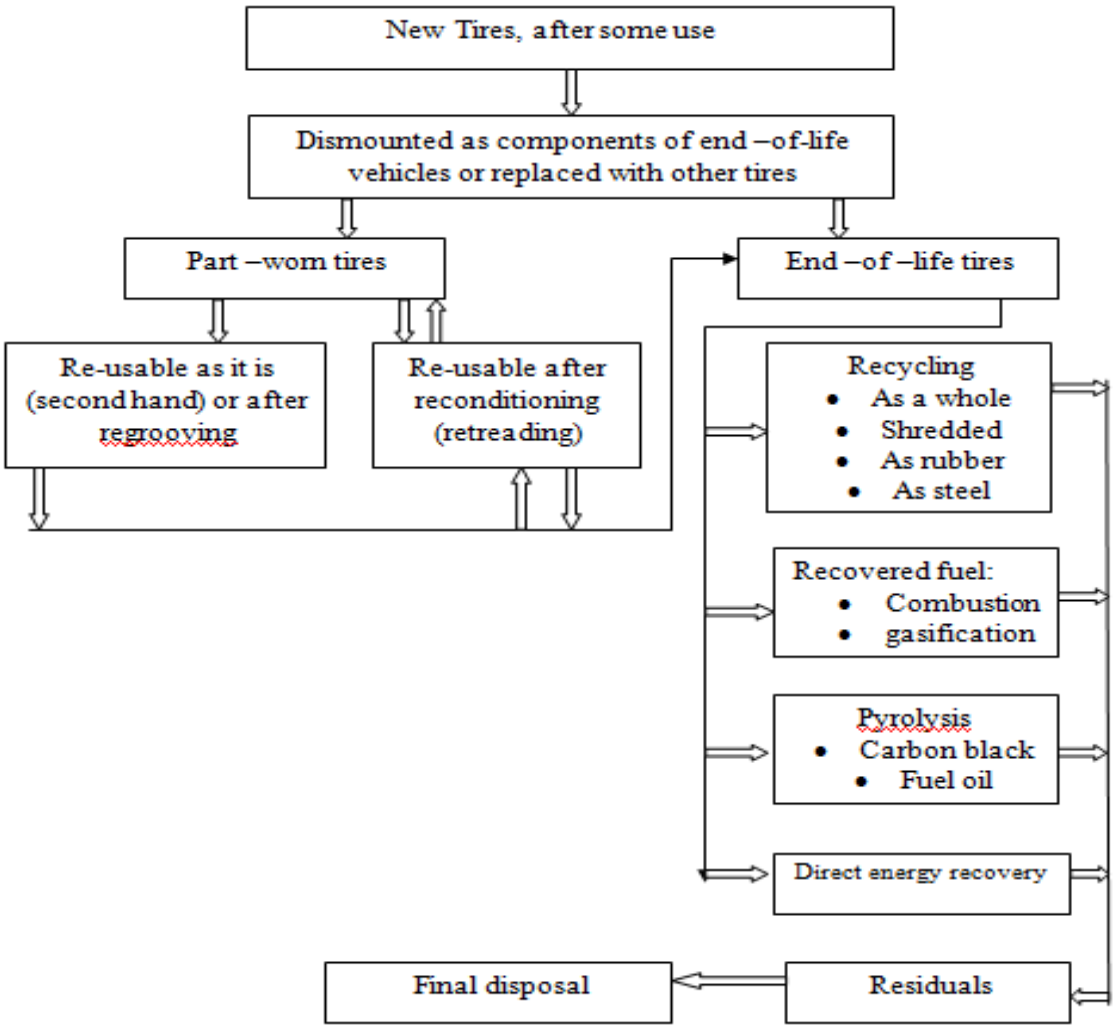

Fig.3: the various stages in the life of a tire .Source: (Krishna C. Baranwal, [13])

3- Uses of tires

There are lots of innovative ways to recycle tires such as playground cover, landfill construction material, the following is a list of existing products made of recycled tires, **table 4**

Table 4: Possible applications for recycled rubber from used tires

Sport Surfaces	Automotive Industry	Construction	Geotechnical/ Asphalt Application	Adhesives and Sealants	Shock Absorption and Safety Products	Rubber and Plastic Products
- Kindergarten Playgrounds and Recreation Areas - School Sports Areas -Athletic Tracks -Tennis and Basketball Courts - Golf Tee-Off Areas - Swimming Pool Surrounds and Garden Paths - Lawn Bowing Greens - Non-Slip Boat Dock Surfaces	- Bumpers - Car Body Underseal and Rustproofing Materials -Splash Guards and Fenders - Floor Mats for Cars and Trucks - Floor Lines for Trucks and Vans -Dunnage Materials for Shipping	- Hospital Industrial, and Bathroom Flooring - Floor Tile - Carpet Underlay - waterproofing Compounds for Roofs and Walls -Foundation waterproofing - Dam,Silo,and Roof Liners	- Rubberized Asphalt for Roads and Driveways - Sub-base for Horse Racing Tracks - Subsoil Drainage - Drainage Pipes -Conditioner -Filtering for Mercury and Metallic Surfaces - Porous Irrigation Pipes - Road Building and Repair	-Adhesives and Sealing Compounds - Textured and Non-Slip Paints - Compounding Ingredient(Filler)for Rubber Mouldings and Extrusions - Compounds for Conveyor Belting Repair - Expansion Joint Compounds - Roof Coating and Waterproofing	-Shock Absorbing Pads for Rails and Machinery - Sound Barriers for Highways - Crash Barriers - Abrasion Lining in Mining Equipment	- Pipe Insulation and Lining - Basebaords and Kickplates - Flower Pots - Garbage Cans - Shoe Soles and Heels -Wire and Cable Insulation -Industrial and Agriculture Tires - Bam Mats and Flooring - Conveyor Rollers and Idlers -Filler in Many Plastic Mouldings and Extrusions

Source: Canadian Council of Ministers of the Environment [14].

4- Uses of tires wastes in architectural application

Tires wastes have been used in architectural application as a playground matt, building with tire bale, landscaping mulch, tire sound barriers and so.

4-1 Building with Tires

Building by using tire bales is useful for reducing landfill utilization, waste, and for obtaining a product that can have positive societal impact.

4-1-1 Building with Tires bales

"A tire bale is considered a construction block produced by compressing whole tires and tying by steel wires, **Fig.4**. A baler is used to produce tire bales. The tire baler produces tires with the size (50. x 60. x 30) in. and weighs approximately one ton. The unit weight of a tire bale after compressing is between 35 - 45 lb/ft3, which makes it ideal for lightweight fill and non-structural applications. Tire bales have been used to construct gabion baskets, erosion control walls and retaining walls. They may be appropriate for structural fills provided that an adequately thick cover of soil is provided over the scrap tire bales" (**Davis et al,** [15]).

"One bale requires 100 recreational vehicle tires. When the bales stacked in running bond and finished with a cement-based grout and plaster have the potential of forming a strong, stable wall (**Leonard and Jones** [16]). they used for walls in residential and commercial structures in non-seismic areas **fig. 5 and** 6.Building with tire bales to date has only included single story structures with walls not exceeding 4 bales" .

Fig. 4– A Typical Tire Bale. http://www.tirebalehouse.com/

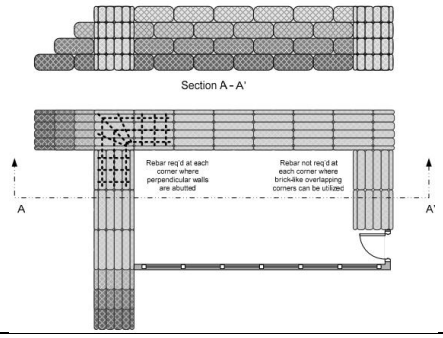

Fig.5: sketch of some possible tire bale layout. Source: http://www.solaripedia.com /files/1171.pdf

Fig.6: Southwest View of Tire Bale House near Fountain, Colorado

4-1-2 Building with rammed earth tires

The compaction of rammed earth may be done manually, mechanically, or pneumatically. Dynamic compaction using manual or power tampers to mix the soil, vibrate the dirt particles, and packing them tightly, **Fig.7**. When it finished, it will be as strong as concrete.

"Rammed earth buildings have many characteristics: Fireproof walls, rot resistant, and impregnable to termites. The solid walls with thick 45.72-60.96 cm are soundproof. The walls help maintain a comfortable temperature. When it designed with taking the advantage of solar energy, it can be 80% less energy consumption. Initial construction is 5% more expensive than wood-frame construction because it is too labor intensive.

It is believed that modified rammed earth tires are a safe and trustworthy way to build single story homes after the testing and analysis which have done", (**Aaron Zimmerman,**[17]), **Fig.8**. Tire walls are made from two materials, tires, and soil or dirt. They are covered in concrete or adobe to fill in the gaps.

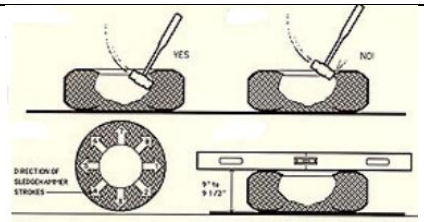

Fig. 7: the standard construction and filling of a rammed earth tire, (http://www.earthship.org).

Fig.8 Tires are packed with rammed earth. http://www.greendiary.com/5-interesting-recycled-building-materials.html

4-1-3 Rammed earth car tire foundation

Tires are used as foundations for "straw bale" buildings, **Fig.9**.It's too easy to construct. It isn't needed previous experience, it costs nothing because car tires can be collected for free at most garages, they use materials that are otherwise difficult to dispose of environmentally, and they are very sociable.

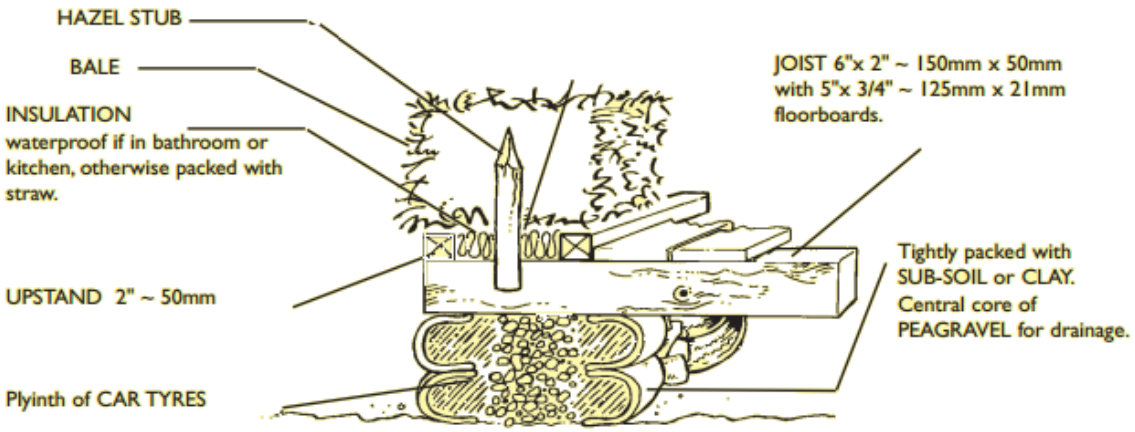

Fig.9: section through tires-parallel to joints (Amazon nails, [18])

4-1-4 Waste tire pads

"This method focuses on cheap seismic base isolation pads using scrap car tires. Layers of rectangular shaped cut from tread sections of tires and then collect on top of each other can function as an elastomeric bearing", **fig.10**. Since the tires are being prepared for friction, load transfer between scrap tire layers would be big enough to keep all layers intact.
Using scrap tires and tinplates is to have cheap seismic isolation, weight decreasing, ease of using, simple shear stiffness modification by modification the layer numbers, besides positive environmental impact**, fig.11**.

Fig.10: rectangular shaped layers cut from tread sections of used tires for isolation http://cdn.intechopen.com/pdfs/32586/InTech-Recycling_of_scrap_tires.pdf

Fig.11: shows low cost tire pads. http://www.sefindia.org/forum/files/low_1_464.pdf

4-1-5 Recycled waste tire rubber in the construction industry

Researchers study the possibility of using waste tire rubber in concrete mixes (**Toutanji,[5], Siddique and Naik,[4] and Najim and Hall, [6]**).

In the study of (**El-Gammal, et al, [19]**) "the density and compressive strength of concrete using tire rubber has been examined. Recycled waste tire rubber has been used replace the fine and coarse aggregate by weight using several percentages, **fig.12**. The results of this study proved that although, there was a significant lowering in the compressive strength of concrete using waste tire rubber than normal concrete, concrete using waste tire rubber demonstrated a ductile, plastic failure rather than brittle failure, **Fig.13(a-b)**. From the results of this study, it is strongly recommended to use rubcrete in the production of curbs, roads, concrete blocks, and non bearing concrete wall".

"The percentages of the most commonly recycled materials used in concrete, **fig.14**.Tire rubber (4%) was found to be used in concrete including concrete barrier applications", (**Johnny et al [20]**).

Fig.12: Crumb rubber used in the concrete mix

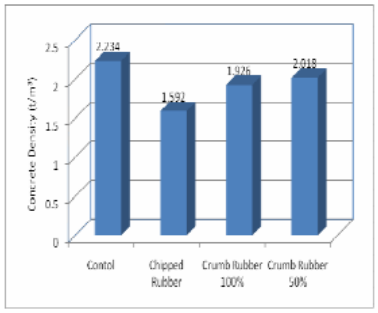

Fig.13-a: Effect of the waste tire rubber on the concrete density (El-Gammal, A. et al, 2010)

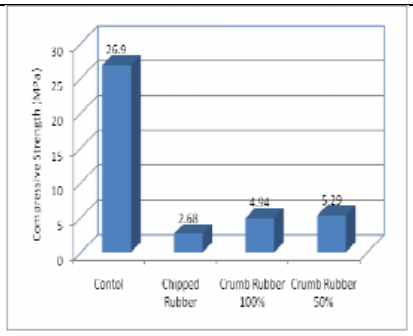

Fig.13-b: Effect of waste tire rubber on the compressive strength of concrete

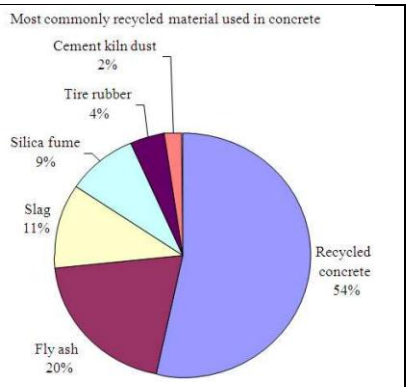

Fig.14: shows the percentages of the most commonly recycled materials used in concrete.

4-2 tire noise barriers

Numerous factors need to be considered in the design of noise barriers. First of all, barriers must be acoustically adequate. Acoustical design considerations contain barrier material, the location, dimensions and shapes. A second set of design considerations contains Safety/Vehicle Impact, Fire Resistance and Emergency Access, Lighting and Maintenance Considerations, , Installation (**Environmental Protection Department,** [21]) .

Rubber sound absorptive walls are more costly but they are more efficient in sound absorption and reflection.

1. "Scrap tire waste can be used in combination with a structural element to make an aesthetic, functional, and long-lasting barrier wall .The recycled scrap tire core consists of a mixture of different crumb rubber sizes and a phenolic binder. The structural element, **fig.15**, shaped into a tongue-and-groove building plank, is a fiberglass-reinforced plastic composite that has consistent and predictable mechanical properties with an expected life cycle of 50 years".
2. SmartWall is a concrete wall panel system that is similar to typical precast concrete wall systems, but has an added element of shredded scrap tires as aggregate in the concrete mix, **fig.16**. The SmartWall design consists of concrete panels nominally 4 inches thick, but also includes protruding angled surface elements intended to reduce horizontal sound reflections and thereby provide better noise reduction overall Smart Wall is available in a wide variety of colors by tinting the concrete.
3. "Whisper-Wall is a post-and-panel wall system. A typical precast noise wall panel is 8-inches thick and consists of four inches of a sound absorptive mixture on four inches of structural concrete. The panels are designed to be stacked using a top-down construction method. This method varies the height of the bottom panel and allows full height panels to be stacked up to the sound attenuation elevation, **fig.17**. Cast into the top and bottom of each panel is a tongue and groove keyway that aligns and interlocks each panel along the horizontal joint. Panels can span up to 24 feet and be stacked as high as 54 feet. The final product is durable in all types of climates. **Table 5,** shows Decibel Reduction Comparison chart between some materials".

Fig.15: the recycled scrap tire core for sound barrier. Source: Felsburg Holt et al [22]

Fig.16: SmartWall from used tires for sound barrier. Source: Felsburg Holt et al [22]

Fig.17: Whisper-Wall absorbs sound using recycled Rubber tires. Source: Felsburg Holt et al [22]

Table 5: shows Decibel Decreasing Comparison chart.

Decibel Decreasing Comparison chart						
Material	STC Rating	Highway Noise Level	-	STC Rating	=	Noise Level After wall Installation
Recycled tires	37	90 dBA	-	37	=	53 dBA
Concrete	28	90 dBA	-	28	=	62 dBA
wood	26	90 dBA	-	26	=	64 dBA
metal	27	90 dBA	-	27	=	63 dBA

Source: http://carsonite.com/pdf/AcoustaShield-reflective.pdf

"Highway noise is about 90 dBA. A neighborhood is considered calm at 45-55 dBA. Sound Barrier of recycled tires will make the neighborhood calm".

http://carsonite.com/pdf/AcoustaShield-reflective.pdf

4-3 Recycled Rubber Products in Landscaping Applications.

Landscapers can design high-quality ,cost-effective, and environmentally useful projects by using recycled rubber products.

4-3-1 Use of recycled waste tires for mulch

Rubber landscape mulch is produced in several ways from used tires, Shaving the surface to produce a rubber, flakes, material that likes natural bark mulch, Fig.18; or grinding tires into nuggets which are passed through magnets to eject steel wire, Fig.19. The rubber can also be color treated to fit any architectural demands.

Fig.18: Rubber Mulch Flakes

Fig. 19: Nuggets

"The advantages of using Rubber landscape mulch (RM) :does not float or blow away, cost effective , reduces weed growth, drastically reduces maintenance time and expense, non-toxic, odorless, minimizes dust ,does not provide a food source for most insects or termites, available in a variety of colors, made from 100% recycled rubber".

"Flammability tests **(Steward et al, [23])** showed that the application of cigarettes to RM failed to cause ignition. Other trials conducted also showed that out of 13 mulch materials, RM was the last material to catch fire when exposed to a propane torch flame ".(**Steward et al., [23]**).

4-3-2 Use of recycled waste tires for sports tracks and playground

Safety playground is the most important part to the Childs. Rubber mulch is the best solution to save a child in case of a fall (**Birkholz et al., [24], Groenevelt and Grunthal [25]**). The quantity of rubber mulch is based on the height of the structure and on the children ages. The advantage rubber mulch has over plant-material mulches is its elasticity, which gives it a high quality when used in a fairly thick layer. Experiments have shown that rubber mulch is superior in breaking falls to traditional bark mulches, **Fig.20.**

4-3-3 The hand crafted recycled tire equipments

There are several creative things to do with old recycled tires. The creative hand crafted tire swings becoming quite popular these days, Fig.21. They can make in different shapes and sizes. It made from one single used tire.

Fig.20: Tire playing surface., (Vidair et al., [26]).

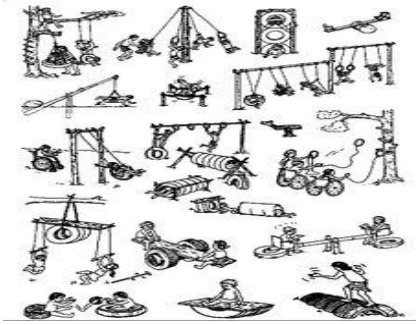

Fig.21Hand-crafted tire made from used tires. http://creativerubberworks.wordpress.com/tag/tire-swing/

4-3-4 tires planters

The heat absorbed by the rubber helps plants like potatoes and tomatoes grow. It is possible to hang tires on a vertical surface, to create uncommon wall planters, filling just the bottom portion with soil, **Fig.22**. it is easy, cost-effective way to obtain a garden in urban areas, and a creative environmentally-friendly way to turn useless thing into something productive.

Fig.22: create unusual planters http://webecoist.momtastic.com/2011/11/14/25-items-made-from-reclaimed-recycled-tires/

5-Tires managing Sector

Reduction, re-use, recycling, and energy recovery are the main alternatives for managing scrap tires, (**Antonio [27], Humphrey and Swett [28]**). Reduction requires large research investments and technological developments to extend the tire life span and decreasing its weight (**Ahmed et al [29]**). As for reuse, some markets have been reused whole scrap tires as roads crash barriers and car races, in maritime ports and as new tires for carts (**Collins et al [30]**).

Studies indicate that only in Cairo, some nine million pieces are dumped annually, (**Community times [31]**). About "1%" of waste tires in Cairo are directly used in the manufacture of new products. Nylon cord beaded tires are recycled by removing the nylon cords for baling various materials. The recovered rubber is shaped into semi-final and final products such as gaskets, small swivel wheels for office chairs and tables, and briefcase handles. Tires are also split into layers for direct use in the manual production including sandals, gaskets, stool seats, carrier straps, and door mats. Tires are also burned to obtain the steel wires for binding paper bales, and for the calorific value of the rubber for asphalt melting vehicles. The rubber powder is used to manufacture artificial grass 'tartin' for natural greenery, as well as creating soundproof walls when mixed with other building material. The cotton fibers that make up part of the tire components are used for upholstery purposes.

6- Study for tires Reusing Sector in Egypt

A private company in Alexandria processes over 2 million tires annually and produces over 16,000 tons of fine grind mesh crumb rubber. Completely wire, fiber, moisture and contaminant free, this company manufactures floor coverings and mats made of vulcanized rubber. Several private companies handle waste tire recycling and export shredded and powdered tires, crumb and grinded rubber, recycled powder from inner tubes and nylon cord.

In Assiut Governorate, CEMEX cement project allowed the factory to upgrade its process, through replacing fossil fuel with old tires, agricultural, industrial and other household wastes.

At the 10th of Ramadan industrial zone, Marso Company installed a tire recycling line consisting of a heavy duty mill to grind wasted tires to crumbs of 20-25mm , a magnetic separator is used for steel separation from the rubber.

Table 6 shows Egypt`s strengths and weaknesses that threaten the sector.

Egypt`s strengths	**weaknesses**
- High population - vast market - cheap labors - sites	- Lack of awareness - No standards for tires reuse, - Lack of raw materials - Lack of technology and equipment
Opportunities	**Threats**
- More than 80% waste tires are not used yet - Using new reusing technologies - There is a chance to expand its local and export market. - High experience in tire reusing	- Many actors are taking part in the Egyptian market - Competition of other countries who have cheap labors and low cost reusing equipment

- **Vision of the study**

Egypt can compete within the global reusing sector, and there are many studies to reuse tires in architectural application.

- **Goals**

To improve Egyptian tires reusing sector to be innovative, environmentally cleaner, and qualitatively productive.

- Programs

1. The Legislative Framework Development
2. Raising the Awareness
3. Improving reusing business development service
4. Role of External Financing and Institutionalization

1- The Legislative Framework Development
- provide a healthy work environment within the production workshops. - It is necessary to forbid the use of reusing tires in the manufacturing of human diet and drink. - Encouraging system when they commit to the environmental requirements for production. - Issue legislation that control exporting for locally reusing tires or that will allow the importing of reusing tires.
2- Awareness Raising and Promotion
to increase the level of awareness of all parties such as: .The government parties(the legislative and supervisory bodies) .Society(individuals, civil society organizations, schools, and universities) .Foreign investors
3. Improving reusing Business Development Services
- Developing of Collecting and Sorting Operations - Developing Local Capacity to Manufacture reusing Machines - Hold Training courses for tires reusing - Technical Consultations - Transfer of reusing technologies - Testing services for materials and products - Information Center for the reusing Sector - Market for reusing tires.
4. Role of External Financing and Institutionalization
External financing of new equipment or operations and for protective equipment and/or preventive equipment maintenance may contribute to decreased risks and improved environmental performance.

Results and Conclusion

Many studies indicated that the use of recycled tires has positive impact. This include the benefits in increasing sustainability of the architectural usages and construction industry while decreasing cost and the need for natural resources, and giving solutions to environmental pollution.

This research try to discover the using of tires wastes and reuse them in the Architectural usages , and Study for tires reusing in Egypt .The current study based on the analysis of the threaten. Results indicated that there are many uses of tires wastes in architectural usages but people do not aware of the availability, quality of the performance, cost savings, or the environmental benefits.

Recommendations

1. It should be promoted Recycling and reuse of waste rubber in less industrialized countries.
2. Stronger legislation to encourage reusing, and improve collection management.
3. Allocation of land at spots which can be reached easily by waste pickers and dealers.
4. Improve workers skills and increase production quality by training courses .
5. Involvement of NGOs, voluntary and civic organizations .
6. Create more end-use markets for tires reused products
7. Providing health facilities and protective gears to workers in the reusing business, like masks, gloves and shoes.
8. Development of innovative technologies for waste tires through small and micro-projects

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