"The Benefits of Using Plastic Waste for Interior Decoration and Civil Construction"

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ABSTRACT

This thesis work elucidates roughly the operation of plastic in civil Construction product. The complements used encompass the whole lot from plastic screws and hangers to larger plastic factors which are employed in decoration, electric powered wiring, flooring, wall overspreading and water proofing. Plastic use in avenue product which have proven equal while plastic bottles give convenience, also they produce meaningless waste in tips. As plastic bottles are non- biodegradable, they stay for a while within side the terrain. The waste Polyethylene Terephthalate bottles are taken into consideration as a megacity junk with sustainability function which may be used as a cloth in preference to a many traditional fabric including slipup in product work. Wish in expressions of the use of plastic waste in avenue product.

I.e. plastic roads. Plastic roads especially use plastic convey bags, disposable cups and PET bottles which might be accrued from rubbish dumps as critical substances of the development materials. By the usage of plastic waste as modifier, we will lessen the amount of cement and sand with the aid of using their weight, for this reason reducing the general fee of construction. At 5% greatest modifier content, electricity of changed concrete we determined to look the instances extra than the apparent cement concrete. Using plastic poisons our meals chain below the plastic impacts human health. By the disposable plastics is the primary supply of plastic. For those plastic pollutants isn't best the sea additionally in desert. Plastic will boom the melting factor of the bitumen. Rain water will now no longer seep thru due to the plastic within side the tar. So, this era will bring about lesser street repairs.

keywords: Polyethylene , plain cement concrete, waste plastic, rain water, disposable plastics, non-biodegradable, plastic bottles

INTRODUCTION

The world is full of plastics. Whether we realize it or not, virtually everything we see and use every day is made, in whole or in part, of plastic. Televisions, computers, cars, homes, refrigerators and many other important products use plastic materials to make life easier and easier. However, not all plastics are the same. Manufacturers use a variety of plastic materials and formulations, each with its own.

Nowadays, human observe all of its potentiality to devour extra. The end result of this excessive intake is not anything except decreasing the preliminary assets and growing the landfill. In current times, human from the only hand is continually looking for broader reassets with decrease charge and from the alternative hand is

following the manner to do away with the wastes. The waste nowadays may be produced anyplace people footprints be existed, and remind him that they've now no longer selected the ideal technique for exploitation of the nature.

Plastics are polymers, very lengthy chain molecules connected collectively with chemical bond. About 500 years within side the nature, its miles taken into consideration as a sustainable waste and environmental pollution or easing or recycling of it may be helpful in mitigation of Environmental influences regarding it. It has been verified that the plastics are very sturdy and durable. So use of plastic bottles as innovative substances for constructing may be a right answer for substitute of traditional substances. The goal of this paper is to make it feasible to apply those plastic bottles within side the buildings. An appropriate technique for this example is the use of a few a part of civic garbage or waste as wanted accoutrements for erecting creation.

Object of thesis

1. The use in waste plastic in civil construction works. 2. Low cost material.

3. Easy available material in earth. 4 .Many employment in this project work.

Problem statements-

1. Lots of rubbish with plastic bottle content is floating across oceans.

2**.** If waste plastic bottles and plastics bags end up as litter in waterways they choke drainage systems, and force the flood to flow out of the system.

3. Environmental issues Plastic is a very long life material.

LITERATURE REVIEW

(i) **Raji et al.(2007)** investigated the, They concluded that when plastic wastes can be used as additives on bituminous pavements. Hence in their study, the properties of bituminous mix when modified with shredded syringe plastic waste were investigated. The work was carried out by mixing shredded autoclaved plastic syringes with heated aggregates by dry process.

(ii) **S. Rajasekaran et al (2009) ,** investigated the Marshall's mix design was carried out by changing the modified bitumen content at constant optimum rubber content and subsequent tests have been performed to determine the different mix design characteristics and for conventional bitumen (60/70) also. This has resulted in many improved characteristics when compared with straight run bitumen and that too at reduced optimum modified binder content (5.67%).

(iii) **Ramadevi K. et al. (2012)** investigated the Waste plastic bottles are major cause of solid waste disposal. Polyethylene Terephthalate (PET, PETE or polyester) is commonly used for carbonated beverage and water bottles. This is an environmental issue as waste plastic bottles aredifficult to biodegrade and involves processes either to recycle or reuse. Today the construction industry is in need of finding cost effective materials for increasing the strength of concrete structures. This project deals with the possibility of using the waste PET bottles as the partial replacement of aggregate in Portland cement. Concrete with 1%,

2%, 4% and 6% PET bottle fibers for fine aggregate were produced and compared against control mix with no replacement.

(iv) **Davide Lo Presti, (2013) investigated** the, nowadays, only a small percentage of waste tyres are being land-filled. The Recycled Tyre Rubber is being used in new tyres, in tyre-derived fuel, in civil engineering applications and products, in moulded rubber products, in agricultural uses, recreational and sports applications and in rubber modified asphalt applications. The benefits of using rubber modified asphalts are being more widely experienced and recognized, and the incorporation of tyres into asphalt is likely to increase.

(v) **Mojtaba et al., (2013)** Concluded that reusing the plastic bottles as the building materialscan have substantial effects on saving the building embodied energy by using them instead of bricks in walls and reducing the CO2 emission in manufacturing the cement by reducing the percentage of cement used. It is counted as one of the foundation's green project and has caught the attention of the architecture and construction industry.

(vi) **Shilpi et al.(2014),** concluded that by utilizing PET bottles in construction recycled materials, thermal comfort can be achieved in very low cost housing, benefit in residents for those who cannot afford to buy and operate heating and cooling systems. Plastic is non- biodegradable, toxic, highly resistant to heat and electricity (best insulator) and not recyclable in true sense, plastic PET bottles use in bottle brick technique. This gives relief for the poor people of India to provide cheap and best houses for living.

(vii) **Anzar Hamid Mir (2015) ,**Studied the visco-elastic nature of binders and found that the complex modulus & phase angles of the binders, need to be measured, at temperatures and loading rates which different resemble limit and loading conditions.

(viii) **Sasane Neha .B. et al (2015**) Polyethylene as one sort of polymers is used to investigate the potential prospects to enhance asphalt mixture properties. The objectives also include determining the best type of polyethylene to be used and its proportion. Two types of polyethylene were added to coat the aggregate High-Density Polyethylene (HDPE) and Low- Density Polyethylene (LDPE). The results indicated that grinded HDPE polyethylene modifier provides better engineering properties. The recommended proportion of the modifier is 12% by the weight of bitumen content. It is found to increase the stability, reduce the density and slightly increase the air voids and the voids of mineral aggregate.

(ix)Pratima et al.,(2015) studied that plastic bottles wall have been less costly as compare to bricks and also they provide greater strength than bricks. The PET bottles that is not recycled endup in landfills or as litter, and they take approximately 1000 years to biodegrade. This has resulted in plastic pollution problems in landfills.

(x)Kurmadasu Chandramouli et al (2016), Reported that asphalt concrete using polyethylene

modified binders were more resistant to permanent Deformation at elevated temperature and found improvement in stripping characteristics of the crumb rubber modified mix as compared to unmodified asphalt mix.

(xi)Imran M. Khan, (2016) ,The seasonal change in temperature and loading nature has a significant effect on asphalt behavior because of its visco-elastic nature. Several types of flexible pavement failure/distress occur due to this behavior of asphalt binder, among which rutting and fatigue cracks are very common. In this study, Low Density and High Density Polyethylene and Crumb rubber were used as additions to base bitumen. Complex modulus (G*) and phase angle (δ) obtained from Dynamic Shear Rheo meter (DSR) are the basic perimeters used to evaluate the behavior of the binder in respect to rutting and fatigue cracking. It was concluded that Low Density Polyethylene (LDPE), High Density Polyethylene (HDPE), and Crumb Rubber (CR) modified binder showed significant improvement in rheological properties of the binder.

(xii) Utibe J. Nkanga, Johnson A. Joseph,Feyisayo (2017) concluded that Waste plastic materials including low density polyethylene (LDPE) grocery bags etc. are disposed through landfills: this poses an environmental pollution due to difficult in degradation of polymeric materials by environmental factors. Waste plastic materials can improve desired properties of bituminous mix for repair and construction of flexible pavements. In this project, various proportions of polymeric materials blended with bituminous mix were characterized. Strength and performance of bitumen/plastic blends were tested through Marshall Stability test, extraction test, sieve analysis, water absorption tests and bulk density.

(xiii)R.B. Ahmed, A. Rahman, K. Islam, J. A min , S. K. Palit, (2018), Most of the highways and roads of Bangladesh are generally constructed as flexible pavement and are generally designed with fresh aggregates and neat bitumen. During road reconstruction and rehabilitation, proper handling of demolished pavement becomes a great problem. When this demolished pavement is not properly handled, it causes environmental hazards and creates disposal problems. Reusing of demolished pavement materials may become a possible alternative for pavement construction. Environmental, economic, and social benefits are the encouraging factors for pavement recycling.

(xiv)Puttaraj et al ,(2018) examined that efficient usage of waste plastic in plastic- soil bricks has resulted in effective usage of plastic waste and thereby can solve the problem of safe disposalof plastics, also avoids its widespread littering and the utilization of quarry waste has reduced to some extent the problem of its disposal. Plastics are produced from the oil that is considered as non-renewable resource. Because plastic has the insolubility about 300 years in the nature, it is considered as a sustainable waste and environmental pollutant.

(xv)**S.L.Hake, Dr.R.M.Damgir & Dr.P.R.Awsarmal (2019),** concluded that The situation of present way of life an entire restriction on the utilization of waste plastic can't be put, in spite of the fact that the waste plastic taking the substance of a demon for the present and the future age. In this way transfer of waste plastic is a difficult issue all inclusive due to their non- biodegradability and unaesthetic view. Since these are not arranged logically and probability to make ground and water contamination. This waste plastic in part

supplanted the regular material to enhance wanted mechanical qualities for specific street blend.

(xvi)Aditya Surkar , (june2021) investigated, - Most of the developing nations lack a proper solid waste management system owing to the difficulties faced during the sample collection and treatment phases. Low-density polyethylene (LDPE) contribute as a major source of such pollution due to the widespread use of its products which include water sachets, thin bags, wrapping paper etc. Improper disposal of this waste in the form of land filling can not only cause environmental impact but also negatively harm the surrounding soil and water bodies.

(xvii) Amruta Uthale ,Ankita Sangave ,(2021) concluded that Plastic is global phenomenon and its side effect felt throughout the universe. Plastic waste is non- biodegradable material and researchers found the material can remain on earth for 4500 years without degradation. Plastic waste can be divided in to two categories thermoses & thermoplastic. These plastic are polyimide, polyoxemethylene and polyethylene tetrathatate. A thermoplastic can easily be shaped and molded into products India generates 25940 tons of plastic waste every day, but 40% of it remains uncollected causing choking of drainage and river system, littering of the marine ecosystem etc. Open air burning leading to adverse effect on human health and environment.

(xviii) **S Subha Pradha 1 and K Saranya** (2022) Plastic is omnipresent in the current global scenario and it is difficult to get rid of it completely. Therefore, a strategic plan is essential to recycle the plastic waste. According to the United Nations Environment Programme report, 400 million tons of single-use plastic waste gets generated globally on an annual basis, which amounts to 47 % of the total plastic waste. Out of this huge volume, only 9% of the plastic gets recycled worldwide. In India, 9,400 tons of plastic waste is either dumped in landfills or pollutes the streams and groundwater resources directly. On the other hand, the consumption of the raw materials by the construction sector is rapidly increasing across the globe.

(xx) Erica Cirino1 Sandra Curtis (2023) Plastic pollution and climate change are serious and interconnected threats to public and planetary health, as well as major drivers of global social injustice. Prolific use of plastics in the construction industry is likely a key contributor, resulting in burgeoning efforts to promote the recycling or down cycling of used plastics.

Type of plastic & his properties

These days we observed with Plastic in our day these days activity. Plastics used for packaging, protecting, serving, or even removing all varieties of patron goods. With the commercial revolution, mass manufacturing of products began out and plastic appeared to be a less expensive and powerful uncooked cloth. Today, each critical area of the financial system beginning from agriculture to packaging automobile, constructing construction, those has revolutionized with the aid of using the packages of plastics.

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Seven of the most popular and commonly used plastics.

(i) Acrylic or Polymethyl Methacrylate (PMMA) (ii) Polycarbonate (PC) (iii) Polyethylene (PE)

(iv)Polypropylene (PP) (v) Polyethylene Terephthalate (PETE or PET) (vi) Polyvinyl Chloride (PVC) (vii)

Acrylonitrile-Butadiene-Styrene (ABS)

Polyethylene Terephthalate (PETE or PET)

The most common thermoplastic resin of the polyester family, PET is the fourth-most produced synthetic plastic. Polyethylene Terephthalate has excellent chemical resistance to organic materials and water and is easily recyclable. It is practically shatterproof and possesses an impressive high strength to weight ratio. This plastic material is in fibers for clothing, containers for foods and liquid, glass fiber for engineering resins, carbon nano tubes, and many other products that we use on a daily basis.

Table No. 1 Examples of thermoplastic and thermosetting materials

Thermoplastic	Thermosetting
High density polyethylene (HDPE)	Bakelite
Low density Polyethylene (LDPE)	Epoxy
Polypropylene (PP)	Melamine
Polyvinylchloride (PVC)	Polyester
Polyethylene terephthalate (PET)	Polyurethane
Polystyrene (PS)	urea-Formaldehyde
Polyvinyl Acetate (PVA)	Alkyd

Table No. 2Waste Plastic and its Source

Waste Plastic	Origin
Low Density Polyethylene (LDPE)	Carry bags, sacks, milk pouches, binlining, cosmetic and detergent bottles.
High Density Polyethylene (HDPE)	Carry bags, bottle caps, house hold articles etc.
Polyethylene Teryphthalate (PET)	Drinking water bottles etc.,
Polypropylene (PP)	Bottle caps and closures, wrappers of detergent, biscuit, vapors packets, microwave trays for readymade meal etc.,
Polystyrene (PS)	Yoghurt pots, clear egg packs, bottle caps. Foamed Polystyrene: food trays, egg boxes, disposable cups, protectivepackaging etc
Polyvinyl Chloride (PVC)	Mineral water bottles, credit cards, toys, pipes and gutters; electrical fittings, furniture, folders and pens, medical disposables; etc

Cost

Cost of plastic bottles, plastic bags, and any plastic6made utensils are chipper in cost. These low costs of plastic products increase the demand for it. One of the factors that affect its demand is its cost. For instance, the costs of plastic bag determine the demand of the consumers for the plastic bags, as the cost of plastic bag increases the demand for the plastic bag decreases.

Easy to use

Plastic materials are easy to handle and they are not heavy to carry them. If we take Plastic bags, they are convenient for handling and carrying goods. Moreover, they are accessible at any place and time in the shops.

Incineration

Incineration is one way of waste plastic disposal; it is burning of the waste until the plastic waste is burned-out and turns to ashes. This method of plastic disposal has many health risks to the human and animal. Incineration results in the release of carbon dioxide, a greenhouse gas, and of other air pollutants, including carcinogenic polycyclic aromatic hydrocarbons (PAHs), and dioxins. Reproductive and development system.

Table No. 3 Compounds generated during incineration of PVC and their harm

Name of compound	**Health effects**
Acetaldehyde	It damages the nervous system, causing lesions.
Acetone	Irritates the eyes, the respiratory tract
Benzaldehyde	Irritates the eyes, skin, respiratory system, limits brain function
Benzole	Carcinogenic, adversely affects the bone marrow, the liver, the immune system.
Formaldehyde	Serious eye damage, carcinogenic, may cause pulmonary oedema.
Phosgene	Gas used in the WWI. Corrosive to the eyes, skin and respiratory organs
Polychlorinateddibenzo-dioxin	Carcinogenic, irritates the skin, eyes and respiratory system. It damages the circulatory, digestive and nervous system, liver, bone marrow.
Polychlorinated Dibenzofuran	Irritates the eyes and the respiratory system, causes asthma
Hydrochloric acid	Corrosive to the eyes, the skin and the respiratory Tract
Salicyl-aldehyde	Irritates the eyes, the skin and the respiratory tract It can also affect the central nervous system.
Toluene	Irritates the eyes and the respiratory tract, can cause depression.
Xylene	Irritates the eyes, It can also affect the central nervoussystem. Reduces the level of consciousness and impairs learning ability.
Propylene	Damages the central nervous system by lowering of Consciousness 7
Vinyl chloride	Carcinogenic, irritating to eyes, skin and respiratory system, Effect on the central nervous system, liver, spleen, blood-forming organs

Advantages of Plastics bottles

(i)Many plastics hold a long lifespan that promotes reuse.
(ii)Plastic production processes compare favorably too many other elements.
(iii)Plastics occupy less space in landfills.
(iv)Methane doesn't form due to decomposing.

Disadvantages of plastic bottles

(a) Decomposition (b) Non Renewable (c) Hard To Use (d) Difficult To Recycle

BASIC CONSTRUCTION MATERIALS & PROPERTIES

Materials uses for Bottle wall masonry construction are:

(i) Soil. (ii) Plastic bottles. (iii) Cement. (iv) Nylon rope (v) Water.

Soil - Soil is the basic element in any construction project so before using it in our project we have to study the basic properties of the soil and go through different tests, so as to check whether the soil sample selected is suitable for the given project.

Fig no. 1 Soil

Plastic bottle: In this thesis plastic bottles are used as a fundamental element, so we have gone through every property of the PETE bottles so as to ensure a stable structure.

Fig.no .2 Plastic Bottle

Properties of Pete bottle:
(i)High strength. (ii) High rigidity and hardness. (iii) Very low moisture absorption.
(iv)Low sliding friction and sliding wear. (v)Good chemical resistance against acids.

Cement Cement in general, adhesive substances of all kinds, but, in a narrower sense, the binding materials used in building and civil engineering construction. Cements of this kind are finely ground powders that, when mixed with water, set to a hard mass. Setting and hardening result from hydration, which is a chemical combination of the cement compounds with water that yields submicroscopic crystals or a gel-like material with a high surface area.

Fig .no. 3cement

Properties of cement

(i) Fineness (ii) Soundness (iii) Consistency (iv) Strength (iv) Setting Time (v) Heat of Hydration (vi) Bulk Density (vii) Specific Gravity (viii) Loss of Ignition

Nylon rope: Nylon rope has a very high tensile strength so that it is use as the main binder for PETE bottles masonry.

Fig. no. 4 Nylon rope

Properties of nylon rope:

The properties of nylon as follow:

(a)Good abrasion resistance. (b) Tough and strong but flexible too. (c) High impact strength.

(d)Absorb water which causes reduction in strength and impact properties. (e) Resistant to most of the solvents and chemicals. (f) High softening temperatures and thus molding becomes difficult.

Water- They Use normal tap water

METHODOLOGY & RESULTS

The following methods are use in bottle house:

I. Collection of Raw Material
II. Cleaning Process
III. Preparation for Construction
IV. Construction of Building

Collection of Raw Material

Plastic consumption has grown at a tremendous rate over the once two decades as plastics now play an important part in all aspects of ultramodern life. Collection and disposal of plastic waste has surfaced as an important environmental challenge and its recycling is facing road blocks due to their non-degradable nature.

There are four introductory ways in which communities can offer.

(i) Plastic recycling collection services for plastic bottles.

(ii) containers curbside,

(iii) drop-off, buy-back

(iv) deposit/ refund programs.

Fig. no.5 Collection of raw material

(i).**Curbside Recycling-**

The first, and most widely accessible, collection method is curbside collection of recyclables. Curbside collection is considered a low-risk strategy to reduce waste volumes and increase recycling rates. Materials are usually collected in large bins, colored bags or small open plastic tubs specifically designed for content.

(ii).**Drop-Off Recycling:-**

In this method, containers for designated recyclable materials are placed at central collection locations throughout the community, such as parking lots, mosques, schools, malls or other civic associations. The containers are generally marked as to which recyclable material should be placed in them. Residents are requested to deliver their recyclables to the drop-off location,

(iii).**Buy-Back Centers:-**

Most buy-back recycling centers are operated by private companies and pay consumers for recyclable materials that are brought to them. Buy-back centers usually have purchasing specifications that require consumers to source separate recyclable materials brought for sale.

Fig. no. 6 Buy-Back Centers

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(iv). **Deposit/Refund Programs:-**

These programs requires collection of a monetary deposit purchase of a plastic container. When container is returned to an authorized redemption center, or to the original seller, the deposit is partly or fully refunded to the redeemer

Plastic Cleaning process: - The three method is used.

(i) **Sorting-** The next step in the plastic recycling process is sorting. There are several different types of plastic which need to be separated from each other by recyclers. Further to that, plastics might be sorted by other properties such as color, thickness, and use.

Fig. No.7 Sorting process

(ii) Washing -Washing is a crucial step in the plastic recycling process since it removes some of the impurities that can impede the operation, or completely ruin a batch of recycled plastic.

Fig.No.8 Shredding & Cleaning process

(iii) Shredding- The plastic is then fed into shredders, which break it down into much smaller pieces. These smaller pieces, unlike formed plastic products, can be processed in the next stages for reuse.

Preparation for building Construction -The type of bottles used in this construction type is PET (polyethylene terephthalate) bottles. This is the type of bottle that is considered safe to contain beverages for human consumption. While I haven't personally built anything using plastic bottles, the basic technique is the same as that used for bricks, so if you are a brick-layer, you will find the method easy to follow. In our world, plastic bottles are ubiquitous.

The following Step for use in build construction works

Step 1: Prepare the Bottles

First, filter the sand to remove any stones or debris. The sand must be able to pass through the narrow neck of the PET bottle.

Step 2: Build a Foundation

While you are filling the bottles (hopefully you will have lots of helpers for this job), you can dig the foundation for the house. All good construction requires a solid foundation. Without this, the building is at risk of collapsing like a pack of cards should the earth tremor or a high wind blow

Step 3: Build Support Columns
Build your support column and corners. Lay your sand-filled bottles flat on their sides, and make a tight circle with all the bottles oriented so that their spouts point inward.

Step 4: Build the Walls

Line up all the sand-filled bottles, side by side. Use a spirit level as you go along to ensure they are straight, carefully use cement or mud to hold your bottles in position. When the wall has reached the required height, bind the bottleneck ends together in a cross-cross fashion with string.

Fig. no. 9 Building the walls.

Step 5: Build the Roof

When it comes to the roof, you have several options. Aesthetically, I am tempted to say that a traditional, tile roof would look best on a bottle house, as shown in the picture at the top of this article. You might argue that a bottle house should have an eco-friendly roof, and it is indeed true that roofs can be constructed from an unlimited range of eco- friendly materials.

Fig.no 10 Build the Roof

Step 6: Add Windows, Doors, and Interior Dividers
What about finishing off the house with windows, doors, and interior dividers? Well, the structural integrity of bottle houses is very sound, and you can go ahead and fit normal glass windows and wooden doors.

Construction of Building

Benefits of Building Construction with Plastic Bottles
The following benefits are gained to the whole environment and society by employing plastic bottles in building construction:

- The total waste generated is reduced.
- The source of building material is local. No additional cost for the same.
- The natural resources are preserved.
- The carbon footprint is reduced.
- The plastic bottle is inexpensive.
- The technology used is small and easy to implement.

RESULTS

No. of labour calculation:

One labour can made 400 bottles per day (filling soil in bottles)

Total no. of bottles = 1600

Numbers of labour needed = (1600/400) = 4 nos

Table No. Cost estimation of brick wall masonry

S. no	Material	Quantity	Rate	Per	Amount(Rs.)
1	Brick	1150	5.40	1 no.	6210
2	Cement	5.45	360	1 bag	1962
3	Sand	0.237	370	1 m3	87.39
Total					**8259.39**

Table no .No. Cost estimation of plastic bottle wall

S. no	Material	Quantity	Rate	Per	Amount(Rs.)
1	Plastic bottle	1600 nos	0.45	1 no.	720
2	Cement	5.45	360	1 bag	1962
3	Sand	0.237	370	1m3	87.69
4	Soil	1.99	150	1m3	298.5
5	Labour work	4	450	1 person	1800
Total					**4868.19**

BENEFITS OF PLASTIC BOTTLE MASONRY WALL

The most important benefits of these alternative innovative materials compared to conventional materials such as brick can include:

{i} Good Construction Ability {ii} Low Cost

{iii} Non-Britte Characteristics {iv} Absorbs Abrupt Shock Loads

CONCLUSION

1. Use of interior materials with sustainable uses. For example, the use of PET bottles offers great benefits, such as optimizing local energy use and reducing environmental degradation.

2. Generally the bottle houses are bio-climatic in design, which means that when it is cold outside is warm inside and vice versa.

3. Reusing PET bottles as a building material can have a significant impact on the raw energy savings of buildings, as PET bottles are used instead of bricks for walls, reducing the proportion of cement used and reducing CO2 emissions during cement production.

4. PET bottles can contribute to green buildings by saving energy and resources, recycling materials,

minimizing emissions, significantly reducing operating costs, and increasing workplace productivity. & durable.

5. Use of interior materials with sustainable application such as plastic bottles can have considerable benefits including finding the best optimization in energy consumption of the region, reducing environmental degradation.

6. PET bottles save energy and resources and are economical, so they can contribute to green buildings.

7. Recycling materials, minimizing the emission, having significant operational savings and increasing work place productivity.

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