

## Green manufacturing is the focus for the Nation

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**Abstract:** It is really a very hard time, when all of us asking for sustainable development in every sector of our daily life. But to ensure the sustainable development we all have to be concentrate on some renewable sources of energy. In present circumstances, to fulfil our mission, we have to innovative as well as creative. In modern era, Construction of Building, Housing complex, and other high rising is a common story of any metropolitan city in the world. Our study is mainly focuses on the effective and efficient use of some waste material mainly in manufacturing "BRICKS", which is a one of the most fundamental material for building construction. In the study, we are trying to emphasize on some rarely used waste material for making "Eco-friendly Bricks" and it's significant impact on the environment as well as on civil engineering segment also. We believe that huge pollution growth can only be reduced by reusing and recycling the waste in an efficient and effective manner, and we need to arise our curiosity on it's positive impact so that we can able to shift our self from traditional approach to innovative and creative one.

**Keywords:** Geo-Polymer, Fly Ash, Green Leaf, Sustainability.

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### I. Introduction

High population growth day by day in every country in the world is reducing the available space for inhabitant in a single storied or two storied building. So, now a days high rising construction is obvious and we have discussed that Bricks are one of parent material for these construction.

In the Tenaga National University, some Malaysian scientists have used waste from mining, coal and steel industry to produce prototype bricks, to produce this, they have used quarry dust, iron oxide that forms on steel at the time of production process and ash from coal combustion furnaces with proper water and cement.

The most amazing fact was that the scientist are formed the bricks within the mould without applying any kind of pressure. And compare to traditional bricks it is cost effective also. According to the scientists, the new bricks have variety of promising properties, like corrosion resistance, compressive strength and others. The findings of the so called scientists were published in the April edition of "Construction and Building Materials".

Another professor "Mohamed Heikal" of Egypt's Benha University told in SciDev.Net that new bricks can be used as an alternative of conventional bricks, and they exhibits more durability, resistance against weather related freezing and thawing, and also have the low water absorption capacity.

A researcher at Italy-based University of Parma's Department of Civil Environmental Engineering says that using waste material to produce bricks is the optimal solution to storing waste material and also effective to reduce the material cost as well.

### Environmental Friendly Bricks With High Civil Engineering Impact:

#### **Geopolymer Bricks:**

Dr. Lianyang Zhang, the U.A Professor, First evolved the way to manufacture brick by using the mine tailing (Waste) material, and those bricks are not required high temperature like 1800°F, it can also be cure at a room temperature or slightly elevated temperature.

#### **Procedure for production of Geopolymer Bricks:**

It simply requires mixing the tailings with an alkaline solution. Bricks are formed by compressed the mixture within a specified mould under a specified pressure and after that curing the bricks at slightly elevated temperature.

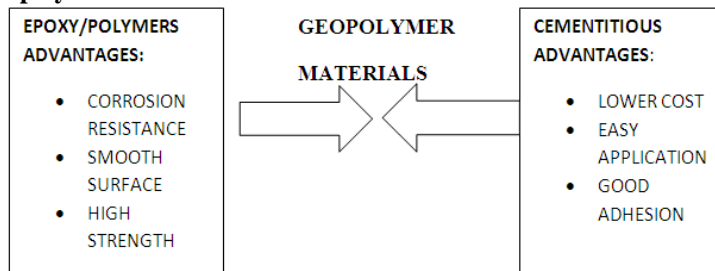
#### **Advantages of the Geopolymer Bricks over the conventional clay bricks:**

- (1) It simply requires less temperature compare to traditional bricks, which reduces cost and also reduced the amount of carbon dioxide gas at the time of combustion.
- (2) Reduced consumption of energy.

(3) It does not requires clay or shale,so it does not have any kind of adverse effect on the landscape.



**Advantages of the geo polymer:**



**Bricks by using fly ASH:**

Swedish architect John Axel Eriksson in the mid-1920 first introduced “Fly Ash Bricks”,it not only make some revolution of the entire construction industry but also help to fight against huge ash, generated in thermal power plant station in daily basis.The use of Fly ash in construction or other sector of engineering also ensures the cost effectiveness as well.

**Procedure of production:**

- Fly Ash bricks are machine made bricks manufactured by hydraulic or vibratory press.
- Raw material are required fly Ash aby-product of thermal power station, Hydrated lime, Gypsum, Locally available sand dust and water.
- Raw material are mixed by required proportion to a pan mixer for semi dry uniform mix.
- Semi dry mix is placed in the moulds of hydraulic or vibro press.
- Moulded bricks are air dried for one to two days under shed depending upon weather condition. And water cured for 14-21 days.
- Thus the bricks are produced are sound, uniform shape and compact.

**Advantages of the Fly- Ash Bricks over the conventional bricks:**

- 1) Fly ash bricks can be produced with or without frog.
- 2) Requires less mortar in brick work as bricks are well shaped, uniform.
- 3) Cost effective as it saves mortar.
- 4) Environmental friendly as it saves agricultural field which is supposed to be used for clay bricks.
- 5) It can be manufactured at the construction site also.



**Some Examples of Fly Ash Bricks used in India:**

- (1)NTPC'S NETRA office building at greater noida.
- (2)IIT Delhi has used these bricks for their cafeteria and Management school.
- (3)NTPC Township in Simahadri in Andhra Pradesh, Sipat in Chhattisgarh,Kaniha in Orissa and many others area as well.

**Green leaf bricks:**

Green Leaf Brick are newly manufactured fired masonry brick composed of 100% recycled materials, designed and engineered especially for the sustainable construction. These brick were developed to make use of waste streams with little residual commercial use, and through ingenuity & innovation, create a state-of-the-art masonry brick composed entirely of refuse. Green Leaf Brick are not recycled brick, but are quality, newly manufactured red, burgundy, and brown brick made from select materials that are rescued from landfills, open pit mining by products and plant refuse. No new lands are mined to secure materials for use in the manufacturing of Green Leaf Brick. Included in these carefully selected materials are processed sewage wastes, recycled iron oxides, recycled glass, mineral tailings, and other virgin ceramic scrap. All of the materials used in Green Leaf Brick can be classified as post-consumer or post-industrial (pre consumer).



**Green Leaf Bricks for Sustainability:**

Brick and masonry products can contribute greatly to the sustainability properties of a building. Builders and designers seeking LEED certification for their projects can benefit in several ways by using Green Leaf Brick. Unlike most construction materials, properly installed brick can last for centuries. Because of the thermal mass associated with brick construction, temperature swings within a structure are minimized. This can help reduce the size of the HVAC system required, which will help save on energy costs. The large mass will also help with soundproofing a structure. Sustainability is critical in the LEED equation and masonry brick are time proven as one of the longest standing and strongest building materials available to man.

**Advantages of Green leaf bricks over Traditional bricks:**

**Durability:** Brick is resistant to damage from wind and water, and does not need additional finishes.

**Compressive Strength:** Brick can carry heavy loads, but it is often used as a veneer over a separate structural system because of costs.

**Acoustical Performance:** Brick's mass makes it good for reducing sound transmission; however, its hard surface reflects sound.

**Chemical Makeup:** Brick's raw materials are chemically inert; consequently, they will not contribute to indoor air pollution.

**Fire-Protection:** Brick is non-flammable and makes an excellent fire barrier.

**Bricks by using paper industry by-product:**

The paper industry produces a lot of pre-consumer waste that can easily be put to use in various ways. A group of scientists at the University of Jaen in Spain have come up with a way to turn paper industry byproducts into eco-friendly bricks. The production process for the bricks is less time-intensive than for traditional bricks, making them more cost-effective to produce.

The process is surprisingly simple. The paper waste is mixed with clay and with sludge left over from waste water purification, then the mixture is pressurized and extruded into long pieces. The long pieces are cut into small, brick-sized pieces and then fired in a kiln.

All told, the bricks are great insulators but not quite as strong as traditional bricks. The team behind the development of the new bricks is working on fixing the problems inherent in making building materials from paper waste. With the addition of other types of waste materials, they may eventually develop bricks that can compete on the same level as traditional clay bricks.



**In all of the various evaluation methods described above, brick's many positive attributes earn it high marks. Those attributes include:**

- Efficient manufacturing practices:** Manufacturers have significantly reduced the energy required to mine, manufacture and transport brick. In 2007, on average it required 1,239 BTU per pound, as determined by the BEES software, a sharp reduction from the approximately 4,000 BTU per pound required in the past, according to the Brick Institute of America.

- Alternative energy sources:** Brick plants today make use of non-fossil fuel resources, such as burning methane captured from landfills, sawdust and agricultural waste products. For example, Boral USA uses methane in its Union City, Oklahoma plant and its LEED-certified Terre Haute, Indiana plant. In both cases, the methane not only replaces fossil fuels that the plants would otherwise consume but also removes a pollutant that the landfill operators would otherwise have to deal with.

- Recycled content.** Brick can be made from unwanted materials, such as the mine tailings that constitute brown fields in some communities. In addition, waste products such as sawdust can be incorporated in brick in a burnout process that creates an end product that is lighter than but just as sturdy as regular brick.

- Minimized waste.** Very little waste is produced in manufacturing and building with brick because the materials are inherently recyclable. A pound of clay material yields almost a pound of brick once water is extracted. During the manufacturing process, any materials that are left over after one run of bricks has been fired can simply be re-mixed into the next run. On the construction site, any brick debris can be recycled in a number of ways, including crushing the material for landscaping uses, reusing remaining brick for other projects and adding it to concrete as aggregate.

- Efficient transportation:** Because materials to make brick can be found throughout the United States, manufacturing plants are sited to minimize the distance of transportation, both of the materials to make the brick and of the finished products to major areas for construction activity. The Brick Institute of America reports that most brick is manufactured from materials that are an average of 15 miles away from the plant. In addition, there are two or more plants within 500 miles of 49 of the 50 largest metropolitan areas within the United States, which includes the majority of construction projects in the country. More than 70% of the 50 have at least one plant within 200 miles. The energy used to transport brick is further reduced when lighter-weight products are used. For example, the Boral facility in Augusta, Georgia –which sells the largest quantity of brick in the United States –employs a specialized method of manufacturing that combines clay, shale and recycled wood waste to create such a lighter brick.

### **Future Scope of the study:**

Here is a huge future possibilities for these green, pollution free and cost effective bricks as because required land for clay bricks is getting almost finished and huge requirement of non-renewable energy for producing traditional clay bricks also getting costly and a detrimental effect of burning fossil fuel also a major reason to pollution . So, now all of us trying to find out some unconventional sources for building materials with economic efficiency and the above discussed bricks can meet up our requirements .

## **II. Conclusion**

As early mankind moved out of caves and into communities, brick was a preferred building material. Its ingredients were easy to find, the manufacturing process was simple and the results were durable. With today's increasingly sophisticated approach to construction and people's growing commitment to sustainability, it is comforting to discover that brick remains a leading building material that can be trusted to deliver high performance, low maintenance, long life and a comparatively small footprint on the world our children have loaned us. From architects who incorporate brick in their designs for its energy efficient qualities, to builders who appreciate its durability and ease of construction, to owners who enjoy its liveability, brick is a top choice for building cladding. The fact that it is also sustainable makes it a building material for the ages.

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