Development of Light Emitting Tiles

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Abstract *- This project is to develop paving slabs to convert mechanical energy from people footsteps to a considerable amount of electrical energy. Harvesting kinetic energies is generating electricity without depleting natural resources. This would help those people visualize the path to move during night time .This project mainly focus to help the old age group people apart from normal people. To design a suitable mold type for the production of the flooring material. To design tile flooring system with the piezo electric sensor embedded in it. To test the flooring material for its drainage properties to overcome skidding problems. To design waste plastic tile. Development of low cost tiles affordable by all community. To reduce the cost of concrete when compared to that of conventional cement tiles Beneficiary product that could be helpful in the future to face upcoming energy crisis times. Intensification of every country mainly depends on the enlargement of their resources and infrastructure. The compressive strength modulus of rupture, abrasion and water absorption are found to be reasonable for specified mix proportions. Thus this paper concludes that to make people to walk in the night even without light/electricity easily and to overcome the skidding.*

Keyword: *kinetic energies, piezo electric sensor, flooring material, mold type.*

1. INTRODUCTION

India is facing a challenge in disposing waste in many landfills throughout the country. The landfills situation is resulting in high disposal cost and potential environmental problems. If current trend continues, with waste production projected to grow by each year. A product that would help old age/disabled people by protecting them from skidding. A beneficiary product that could be helpful in the future to face upcoming energy crisis times. Development of low-cost tiles affordable by all community of the society. It means that made a low coast material tiles in that piezo electric sensor is embedded inside so it will absorb energy in day time and it will release energy at night time through the light emitting tiles without current. According to Government of India, more than 15,000 tons of plastic waste are generated in India. Every day, of which 6,000 tones remain uncollected and littered. Such huge waste from the society not only poses the environment threat problems like ozone layer depletion, ground water pollution and increased pressure on other land resources. Keeping this in view, an attempt has been made to develop new form of tiles that could sense the motion of the human being and guide them by emitting light along the path of the tiles. Such innovation may help the society during night time accessible areas and in particular elderly and disabled people may consider as main beneficiaries from this proposed idea.

2. MATERIAL PROPERTIES

2.1 Cement

Ordinary Portland cement (53 grade) confirming to the standards of IS: 12269-1987 was used throughout the investigation. The specific gravity and fineness is found to be 3.15(IS: 4031-PART1) and initial setting time be 30min and consistency (IS :4031 PART 5) is 36%.

2.2 Fine aggregate

Manufactured sand (M-Sand) is a substitute of river sand for concrete construction. Manufactured sand is produced from hard granite stone by crushing. The crushed sand is of cubical shape with grounded edges, washed and graded to as a construction material. The size of manufactured sand (M-Sand) is less than 4.75mm.

2.3 Plastic waste (LDPE)

Plastic waste used in making tiles was collected from the surrounding locality LDPE is indicated by resin number 4. It includes plastic bags. The plastic bag used is of about 50 microns. The basic properties are provided below.

Table I Properties of LDPE

S.No.	Particulars	Value
1	**Melting point**	150^{o}
2	**Thermal coefficient of expansion**	100 to 200 x 10^{-6}
3	**Density**	0.910 to 0.940
4	**Tensile strength**	0.20 to 0.40(N/mm^2)

Plastic are inexpensive & durable and as a result level of plastic production by humans are high. Plastic pollution can afflict land waterways & oceans. Moreover 1.1 to 8.8 million metric tons (MT) of plastic waste in India in each year.

Carry bags (product cover) - 70%
Water bottle - 30%

2.4 PZT

A piezo electric sensor is a device that uses the piezoelectric effect. To measure changes in strain acceleration, temperature, pressure or force by converting them to an electrical charge

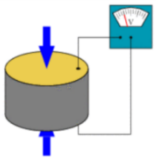

Fig 1 Peizo electric sensor

The little strip on the end of the diode tells you which way to put it in your circuit.A diode is a device that only allows current to flow in one direction.

The schematic symbol for a diode looks like this

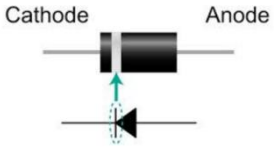

Fig 2 Diode

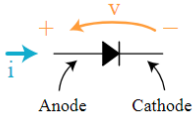

Fig 3 Diode mechanisms

The black arrow ▶ in the symbol points in the direction of the diode's forward current i, the direction where current flow happens. The diode's voltage v, is oriented with the +plus sign on the end where forward current comes into the diode. We use the sign convention for passive components. The optional curved orange arrow also indicates the voltage polarity.

2.5 PLASTIC SAND

Plastic waste used in making tiles was collected from the surrounding locality LDPE is indicated by resin number 4. It includes plastic bags. The plastic bag used is of about 50 microns. The basic properties are provided above. Plastic wastes are heated in a metal funnel at a temp of above 150°. As a result of heating the plastic waste melt.

Fig 4 Plastic sand

The materials fine aggregate and coarse aggregate as described in previous chapter are added to it in right proportion at molten state of plastic and well mixed. After using the metal mold is cleaned through at using waste cloth. Now aggregate is coated with plastic and it will dried 24 hours.

Fig 5 After sand

Now this mixture is transferred to the mold. Then the blocks are allowed to dry for 24 hours so that they harden. After drying the tiles is removed from the molds and ready for the use.

3. EXPERIMENTAL PROCEDURE

Harvesting kinetic energy may be considered as a sustainable method for generating electricity without depleting natural resources for the benefit of human comfort living. Even though huge figure cannot be targeted, small amount of electricity generation can be probable that could enable to tile to guide the path. The core technical part of the project is to develop paving slabs (i.e., tiles) that convert mechanical energy from people footsteps to a considerable amount of electrical energy This would help visually impaired people to visualize the path (kitchen/bathroom) to move during night time, especially when there is power cut off. This project mainly focuses to help the old age group people apart from normal people and can be claimed as novelty of the

project. It is proposed to design a suitable mold type for the production of the flooring material with piezo sensors embedded.

Eco friendly tiles made from waste materials with suitable percentage of waste plastic of 10%,20%,30%30%,40%,50% may be considered replacement of sand. Main challenge lies in fitting the tile system according to plan of the house where the beneficiary is targeted. As the human motion is detected in the form of foot pressure on the tiles, sensors senses the pressure and convert them into electrical energy that uses the tiles to be light glowing showing the direction. Such light emitting tiles not only guides elderly/disabled people to basic amenities also take the technological benefits to appropriate target groups. Developed low cost tiles will be affordable by all community of the society. It is a beneficiary product that could be helpful in the future to face upcoming energy crisis times. Also it is the duty of every civil engineer to engage him/her to develop new materials from the waste materials available on earth, A force applied along a neutral axis displaces charges along the x direction, perpendicular to the force. The amount of charge depends on the geometrical dimension of the piezoelectric element the amount of energy displaced is strictly proportion to the applied force and independent of the piezoelectric element size and shape

Table II Proportion of materials

Materials	10%	20%	30%	40%	50%
Fa	0.7 kg	0.68 kg	0.6 kg	0.53 kg	0.45 kg
OPC	0.7 kg	0.7 kg	0.7 kg	0.7 kg	0.7 kg
PZT	yes	Yes	Yes	yes	Yes
Water Content	0.4%	0.4%	0.4%	0.4%	0.4%

4. CEMENT TILES

The material to produce the tiles are cement, m-sand, plastic sand(LDPE), aggregate chips. In above table describe that replacement of sand in this experiment give the best result in 10%,20%,30%plastic sand it give best result.

Fig 6 cement tiles

5. SENSOR EMBEDDED IN TILES

5.1 PZT

Normal sensors generally get repaired when it comes in contact with water. Hence these sensors are coated with Aradalite solution for proper functioning, though it comes in contact with water.

Fig 7 Sensor

5.2 CIRCUIT

It mainly helps us to avoid short circuit and fire by providing proper connection. It's a type or way electrical connection drawn before the execution to check will it will work or not. The piezo electric sensor connected to diode in two ways (positive and negative). Here battery is used to save the power in day times. in night time it will automatically emit the light with help of battery.

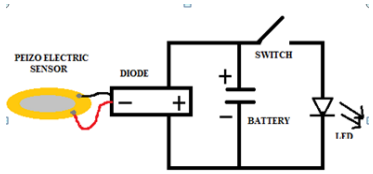

Fig 8 circuit diagram

6. LIGHT EMITTING TILES

The figure shows the complete setup of sensors connected with external battery through wires along with strip lights. When pressure is applied over the tiles by principle of piezo electric sensor, electricity is generated. Those electrical energy are saved in an external battery in morning times. Those energy are used at night times.

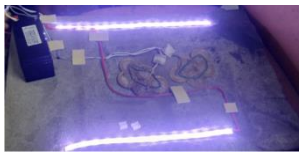

Fig 9 Light emitting tiles

6.1 Compressive strength

The results are obtained, its show that compressive strength of tiles in 7days. The compressive strength of sample I obtained as 17.9N/ mm^2, 17.7N/ mm^2, 9N/ mm^2, 7.22 N/ mm^2 sample 1,sample 2, sample3, sample 4 respectively..

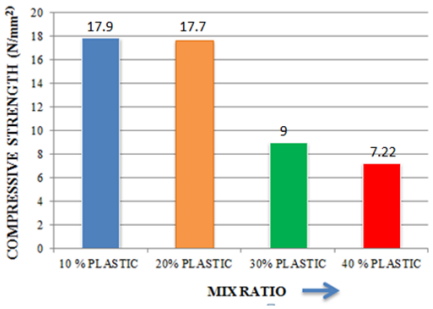

Fig 10 compressive strength

7. CONCLUSIONS

Based on the raw materials collected, the mix proportions were designated with appropriate ratios. Tile specimen were cast according to the mix proportions planned and cured for a period of seven days. After seven days, the tile specimen were tested for its compressive strength and water absorption. The compressive strength for sample1, sample2, sample3, sample4 were found to be satisfactory with respect to their compressive strength.

A separate tile was made with embedded Sensors within them. Those sensors are then connected with strip lights that glow when pressure is applied over those tiles by the principle of piezo electric sensor. Those electrical energy are saved in an external battery in morning times. That energy are used at night times.

Based on the preliminary investigation it is proposed to implement light weight tiles by introducing waste material (plastic waste) in the sample in the future work.

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