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Review paper on the Textile Reinforcement concrete (TRC)

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ABSTRACT

This present paper give the outline of novel idea and manufacturing technology of the TRC material .It also give the outline of the present and future scope of the TRC systems. Recently, in the construction system it has adopted and gain the many popularity In many western countries and in many applications in has been used. But in our India due to the lack of the awareness it not be used, and lack of the many codal provisional this technology not used in India. This paper take insight of this new technology in various possibilities and also be show advantage And future scope of this new technology.

Key words* : *Textile reinforced concrete, fibre, concrete, construction

I.INTRODUCTION

In the past century reinforced concrete (RC) is the most successful building material. But the one draw back of the steel material is it does not exist with this material. Recently, textile reinforced concrete (TRC) in which steel is replaced with Glass fiber or Alkali matrix it give the valuable option in consumption of concrete & weight of the structures. TRC offers the state of arts and give the freedom of design and size. TRC can made tailor also in the choice of binders and the textile as per our application. In the global scenario many TRC practical application Establish in western countries. Guidelines has been issued for the design and construction of TRC systems. It has been seen that the glass fibre and concrete can give the effective novel class of the TRC applications. this paper give the prefabrication idea of the structural and non -structural applications. TRCPT(textile reinforced concrete prototyping technology which give the multiples of products produced in single technology, And give idea about the present and future scope of the TRC (textile reinforced concrete) systems.

II.TEXTILE REINFORCED CONCRETE & ITS IMPLICATIONS

In the past century reinforced concrete (RC) is the most successful building material. Joining steel bar reinforced and concrete produce an almost exemplary composite material. RC is extremely powerful, Profitable And Tenacious. It fulfill nearly into every form. So it is widely used as constructing building and bridges, It is

extremely accomplished. but there is one problem in RC(reinforced concrete) to protect metal reinforced the RC has minimum thickness. A minimum concrete cover of 20-70mm per layer is necessary to protect steel bar reinforcement from corrosion. But by using TRC(textile reinforced concrete)we find more light weight, elegant and more efficient structure in Comparison to RC structures.

Textile Reinforced Structure produces from carbon fiber represent an wonderful alternative, Reinforced material made from steel. TRC give us the same advantage as traditional reinforced concrete, but TRC gives some new opportunity as compared to RC. To produce textile reinforced, continous fluces are processed in a planate structure by a textile technique to produce an optimal calibration and arrangement of fibre in structural members.TRC is a technique in which we produce thin concrete with an extremely high load capacity. It is an very auspicious alternative for repairing concrete structures.

TRC is made from carbon fibre grid structure which are mix in a fine grained concrete matrix ,since the reinforced material used in the TRC (Carbon fibre) do not corrode under normal environment condition so no concrete cover is required for protect the reinforcement.TRC in concrete provide very high bond force as compared to concrete because carbon textile reinforcement very larger surface area as compared to traditional reinforce steel bar.

TRC produce from carbon provide very high strength. It provide strength in concrete about 1500N/mm. Which increase ultimate loading capacity of reinforced concrete

Textile reinforced concrete is a inventive materials, which contains fine grain high quality cementious matrix ,low weight technical textile, and Non corrosive alkali resistance fibre. Which is made up of the treated coir, bamboo, jutr, etc….are the possible materials of the trc. Which contain our self excellent material properties such as free from corrosion, lightness, flexibility which has the great cast and use in the archietchreure and the most of the constructions company.

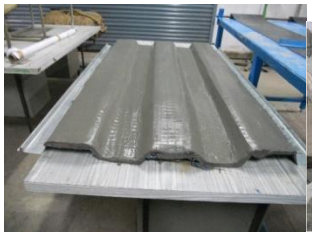
Another most important characteristics of the the TRC is apprecate environmental performance. After automobile and Coal-fulled power plants Concrete is third most lagest contributer of the Carbon dioxide emission, Single Concrete is the one third responsible for the carbondioxide emission in the environment, Which cause global warming. Combination of the steel bar it is fevy high energy consumption with carbondioxide hoofprint. In comparision with steel reinforced 60% less concrete required reinforced with TRCs, therefore it lessdamage to the environment and agreement with many of the environmental advantages. Trc not promices of the ecological building materials but also it give benefit to the cost and energy saving. It reduces the maintainces and quality of raw material extraction which help in the good service life of the building.

III.ADVANTAGES OF TEXTILE REINFORCED CONCRETE

TRCs technology used in the improvement of the rural and urban areas, So therir is a need of the more construction method with affordable cast. The TRC panals are made by the TRCPT technology which is light in weight,Non corrosive, durable, and cost-Effective. The panal are made from this is made toilet,The total weight of this toilet is about 500kg And 2 people are require for installation of this toilet in about 3to 4 hour, without use of special weightlifting instrument like cranes

By the use of TRCPT we make the number of products Structural and Non structural such as the flower pot, window panes, roofing sheets, slabs ,shells,façade elements,street furniture etc.




IV.EVALUATION OF ECO – EFFICIENCY

For sustainable Retrofitting applications, Fiber Reinforced polymer (FRP), Ferrocement and textile Reinforced Concrete (TRC) have been evaluated this performance .there are many Investigation have been carried out for flexural strength of RC beams with TRC. It is observed that in the case of TRC, It is not possible to tailor the material according to design requirement and most of the time strengthed structure become stiff after computing the embodied energy. Eco effective of these retrofitting material has been evaluation it has seen that the amount of carbon dioxide emitted by TRC is less than the other retrofitting material. If the RC frame is reterofit with TRC ,It goes less damage compared to ferrocement And other materials.

V.TEXTILE REINFORCED CONCRETE AS RETROFIT MATERIALS

Textile Reinforced concrete binding matrix made up of fiber graded concrete with consist of textile reinforcement which is made up of glass, carbon or aramid. TRC is a complex material with main qualities are minimal layer thickness, high tensile strength, low weight, high corrosion resistance, and can content in additional corrosion protection for existing concrete reinforcement.TRC strength which contains Reinforcement fiber grid can improve the performance such as binding or flexural strength , shear strength, torsion, stiffness and axial torsional forces. The Flexibility properties of TRC it can make possible the make curve geometry such as shell structures and columns. The dimension and magnitude of TRC structure is much smaller then the RC structures. which provide totally new opportunity to the construction company .Since the Reinforce material not corrode under the normal environment condition, so no cover is required for the protection ,which can make our structure economically . Since no concrete cover is needed , very thin strengthening layer can be produced using TRC. If Glass fiber textile is used as reinforcement it will have much larger surface area than traditional steel – bar reinforcements . Thus, very high bond forces glass fiber can be introduced into the concrete,thus the glass fiber givs both the evidences for workability first it has short anchoring length and second it has very dense crack pattern. TRC produces from glass textiles passes directly higher strength than the standard steel bar reinforcements. If we increase the ultimate loading capacity TRC is suitable for the repair applications. If we use the TRC strength layer on the RC structure it has the positive influence on the concrete cracking.

(a) (b)

VI.DURABILITY MODEL FOR GLASS FIBER IN TRC

For the high load bearing capacity TRC is an innovative material for thin walled structure. There are many Investigation carried out for the safe design on the TRC material with comparison to the Rc structure in different weathering condition In which Glass fiber is embedded in fine grain concrete . For the new development TRC which contain multi axial fabrics are used in combination with fine grained concrete which provide high tensile strength And high load bearing capacity . The use of the textile mainly made of glass fiber which are place in the main stress direction of the composite to the use of randomly distributed short fiber. In thin walled structural Element TRC is Innovative material with a high load bearing capacity.

VII.PERMEABILITY OF FIBER GLASS ROVING EMBEDDED IN CEMENTITIOUS MATRICS

Recently, TRC are developed for some serious applications. Due to incomplete penetration of cementious matrix into bundle of fiber the performance of TRC is low in comparison to the dry textile . Since , the alkaline environment of moisture concrete restricts the usage of the ordinary steel rod , Hence the glass fiber has been served as the concrete reinforcements due to effective cast reason And durability in alkaline environment glass And carbon fiber are used in concrete. Both of them are superious mechanical properties. The strength of TRC depends n the bond between the reinforcement And the matrix, This bond between the reinforcement and the cementious matrix is affected by the many factors such as curing condition,pressure applied, laminate casting, fabrication technique, treatment of fiber surface. In the modern day glass fiber is the strengthening agent for the building materials. AR glass fiber proof ourself it serving as ideal Reinforcement for the concrete. It is very efficient against crack propogation at early stages of the concrete setting process.

VIII.LITERATURE REVIEW

Conventional steel which used in Reinforcement its main disadvantage and problem is corrosion.The conventional steel is come in contact with corrosion rapidly, many of the remedial method are applied to the overcme of this problem, such as improving the concrete cover ,which results gives the overweight of the structure ,and the structure is made uneconomically. In recent few year ,quest to improve this was answered by TRC, In which we use Reinforcement of the non-corrosive materials such as Glass fiber, Carbon fiber, Alkali resistance glasses. TRC give many other advantage such as high- strength to weight ratio, easy handling ,Instnt installation etc. In Recent few year BASALT is appeared as a novel fiber. It is found in the abundament type rock in the earth crust . It can alsobe produce by conventional method & techniques. Basalt contaib excellent fiber – reinadhesion & high strength.

The textile strength of basalt is higher than the other TRC material and which has good mechanical properties,high chemical stability. It has non- toxic in nature Recently, In the past centurary many research are done to put the use of various natural fibers which are the easily available and can found easily in triopical and non- tropical region. A cement is good binder with concrete which is composite material after mixing water its formulation is hardening . Portland cement is better fine grained materials but it affect environment seriously. Geo polymer has some technical benefits these two. The quality of bond between the reinforcement And concrete matrix is improve after formulation of three phase materials which is made by the concrete matrix textile reinforcement and Interface.

After the use of new Techanical textile which increase the use of new application, here we made the façade panals which is a panel that have been used in the many sanatory syatem. Which has the least possible weight and less environmental Impact.

Since the popularity of the TRC is increasing due to its own property say easy Construction and Design , TRC panel are High strength and give quality of its surface. The new application after the make some serious changes in the old one the strength of TRC has been increased. TRC is failed in the many ways which show in the various of experiment , The most of the failour modes are as follows:

- Microcracks are developed easily
- Generation of microcracks to macrocracks
- Debonding of the fiber reinforcement to the surround fine grade concrete.
- Fracture of fibers
- Sliding between concrete partiles and the fibers

IX.METHODOLOGY

(1) Pull out test

For understand the Bond characteristics Between various textiles and the cement of matrix by pulled out test. Textile concrete used world wide to improve the tensile and flexural strength of concrete .Textile reinforced concrete also increase the Structural integrity. For improvement of cracking and plastic shrinkage the TRC used with the combination of concrete. TRC is also effective in reducing water permeability of concrete. Concrete is brittle in nature and weak in tension after adding the TRC material in this its property is fully changed.

The assumption made in the pull out test

- Roving made homogeneous and make simplified in structure as well as possible
- The loading is quasi – static
- Poisons ratio and other mechanical constant not taken into the account.
- The elongation of the matrix fiber neglected

For the analysis of the bond behavior between the rovings of textiles reinforcement and surrounding fine grade materials we can use the pull out test.for found complete pullout and we not found the cracking the fiber volume fraction of the sample has to be low. for the circular specimen sample the pull out phenomenon can be described analytically. For the hundred of filament and most thik sample the is not be acceptable.

(2) FTIR (Fourier transform Infra red)

The sample choosen in exposed by the Infra red radiation, Some infrared radiation are absorb whose frequency are not match, Which frequency are match it can be reflected back no two molecular structure have samre spectrum . which is very helpful in the multiple nature of analysis.

(3) ATR (Attenuated Total Reflection)

ATR was used the chemical structure of the cement . Transmission method with 16 scans for a background and 16 scans for a sample was used. The spectral range was 4000- 750 cm with a resolution of 4 pixels pr cm.

(4) Inductively Coupled plasma (ICP - OES)

Ranging of the specific materials we can use this method. ICP can be performed by various techniques such as spark optical emission , spectra copy , X ray- Fluorescence spectroscopy, Inductive coupled plasma spectroscopy.

It is very power full tool by using emission spectrum sample, it can Identify the elements present in the sample .The emission used in this are inductively coupled plasma optical emission spectrometer.

(5) Four point bending Stress Method

The strength of panal can be measured by the four point bending stress method. In which one side we kept lightening and other side is asymmetrically structure due to which we find the tests in both the direction. The design of testing Sample consist of two parts, first board which has thickness 4mm And bim which has thickness 4 to 6 mm on the back side of the sample. The overall dimension of the sample are 360×100×18(mm).

Textile reinforcement

The design of the sample (façade panal) has specific required for the dimensions. The distance between axial thread in both horizontal and vertical direction are 24mm. we use for the Reinforcement AR glass, And concrete as a binder to increase the tensile strength of revoing.

Preparation of Specimens

First we made a sample with similar size on the 3D printer.It was made on the silicon mould which is placed on the wooden frame work. First we set concrete in the wooden layer after that a silicon layer of reinforcement. Then the mould is in assymetrical so it is tested in the both direction, we compare the observe bord and the ribs, this test are carried out t four point at 300mm between support and 100 mm loading between them.

X.DISCUSSION

There are many types of textiles are present in the market The type of textile choosen as per our work, reinforcement and the composite materials, The most of the textiles materials are listed below

- **Glass fiber** : It is used to making fibre concrete where contact are a make durable. In this only AR glass are used.
- **Asbestos fiber** : It has very good mechanical properties, and it is very cheap, so it is easily available
- **Poly-vinyal- alcohol** : it is made by artificial polymer
- **Carbon Fibre** : It is most popular in textile due to over several properties high tensile strength, low weight, low thermal expansion, high fire & alkali resistance.
- **Aramid fibre** : It has high tensile strength and high youngs modulus
- **Hybrid fabrics** : It has high corrosion resistance fabrics, adjusted to its direction and stress

If we decrease the number of imperfection we can improve the lightend testing specimen. The quality of manaually prepared ,TRC slab contain more problems in which we can do the design base experiment , The tensile strength which we use in the TRC can give the reverse strength between serviceability limit and ultimate limit state. If we use the TRC with smaller diameter then we improve the quality of textile reinforce in the mould around the threads ,due to which the strength reserve of the panal after developing the first crack collapse it will give the sufficient time.

XI.CONCLUSION

A novel and prefabrication technology produce in this paper to develop TRC(textile reinforced concrete) systems.Concrete is the third most responsible of the carbon dioxide emission after that the Automobiles and the coal-fulled power plants.After the use of the TRCs it reduce the 60% of concrete in comparision to the steel

reinforcement, it results it less harmful to the environment. The prefabrication technology avoid the mould which is produce in traditionally, it give the solution of all in one kind of structural and non structural components in multi TRC products. this paper give the present and future scope of the TRC systems

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