



CSIR-Structural Engineering Research Centre

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Press Release

CSIR-SERC develops innovative technologies for producing various textile reinforced concrete products

Chennai. 27 June 2017. CSIR-Structural Engineering Research Centre (CSIR-SERC), Chennai, one of the national laboratories under Council of Scientific & Industrial Research (CSIR), New Delhi, has developed pioneering technologies for producing various textile reinforced concrete (TRC) products.

Reinforced concrete (RC) is one of the most widely used building materials in the construction industry in the past and present century. However, the major disadvantage of RC is that its steel reinforcement is prone to corrosion. Textile reinforced concrete (TRC) is an innovative composite material that is making rapid strides in the construction industry, across the globe.

TRC comprises of fine-grained high quality cementitious matrix and nonmetallic alkali-resistant textile as reinforcement. The reinforcing textile can be of alkali resistant glass, carbon, polypropylene, aramid, etc., which are economically and/or functionally superior to classical steel reinforcement in many applications. The textile made of treated coir, bamboo, jute, etc. are also the potential candidates for textile reinforcement. High corrosion resistance of non-metallic fibers and low self-weight of textile allows production of lightweight and thin walled elements. With excellent material properties, most notably freedom from corrosion, lightness and flexibility, textile reinforcements have the potential to greatly transform the construction industry. Another significant characteristic of TRC is its enhanced environmental performance as it requires approximately 60% less concrete than steel reinforced concrete. TRC is also expected to revolutionize the rehabilitation and maintenance of structures, as the corrosion damage and the subsequent high maintenance costs were the major challenges with the steel reinforced concrete.

TRC is one of the major focus areas of CSIR-SERC and various innovative technologies have been developed in the recent past:

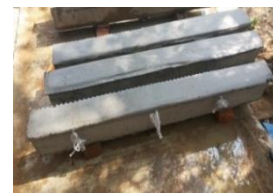
1. CSIR-SERC, Chennai, has developed **textile reinforced concrete prototyping technology (TRCPT)**, an all-in-one precast technology to produce various TRC products, for which an Indian patent has also been filed. Using TRCPT, TRC sheets are prototyped to produce products of various shapes and forms. These products can be custom-made by appropriately choosing the cementitious matrix and textile combinations, leading to vast

application potential. TRCPT completely replaces the conventional way of concrete construction that requires moulds and can be used at sites as well as in precast plants.

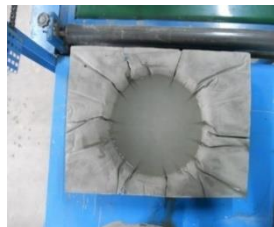
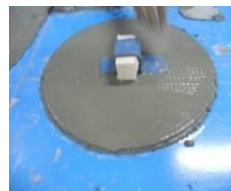
TRC products created using TRCPT can be used for applications such as canal lining, sandwich panels, façade elements, roofing sheets, slabs, shells, jacketing around columns, fire protection, underground construction, composite pipe construction, industrial flooring, street furniture for industrial and residential complexes and non-structural applications such as flowerpot, door and window panes and washbasins. Canopy structures for railway station/bus-stand/cycle-stand roofs, partition walls in houses and offices, sound barriers along the high-speed motorways and railways, outer shells for stadiums/sports complexes are also a few potential applications that enable large-scale use of TRC products. Besides these, TRC can also be used as a repair, rehabilitation and retrofit material especially for concrete beams/slabs, masonry structures, and offshore concrete structures.



Canal lining



Beam strengthening



Applications of TRC Products



Masonry strengthening using TRC

A memorandum of understanding (MoU) was signed between CSIR-SERC and M/s. Smart Built Prefab Pvt. Ltd., Hyderabad, on 10 June 2017 – the foundation day of CSIR-SERC, for technology transfer for manufacturing textile reinforced concrete (TRC) panels for the construction of rapid built, affordable, light weight and durable toilets. The TRC panels are manufactured using TRCPT technology and are light weight, non-corrosive, durable and cost-effective. The technology is available for other interested players in industry as well.

2. An upgraded technology of TRCPT, known as mass scale textile reinforced concrete prototyping unit (MASS-TRCPT) is also developed at CSIR-SERC for mass scale production of precast TRC products that are ready to use. Using MASS-TRCPT technology, CSIR-SERC has developed precast TRC panels for wall, floor and roofing applications.

A novel technology was also developed to produce light-weight TRC tiles of different shapes and sizes for wall/flooring applications to suit industrial flooring. The technology consists of a methodology to produce TRC tiles from a TRC sheet without the use of moulds. The TRC tiles are advantageous over the popularly used conventional concrete screed floor as it avoids crack lines. The TRC tiles developed for industrial flooring is of size 300 x300x 15mm. These tiles have an abrasion resistance of 1.9mm, water absorption of 6% and wet transverse strength of 4.8MPa. These tiles are economical when compared to existing industrial flooring solutions and encompass aesthetics, quick installability, longevity, anti-slip properties and durability.

Technology transfers for the above and more such TRC products manufactured using TRCPT/MASS TRCPT will be available in the near future.



MASS-TRCPT Unit



Plinth Panel



Wall Panels



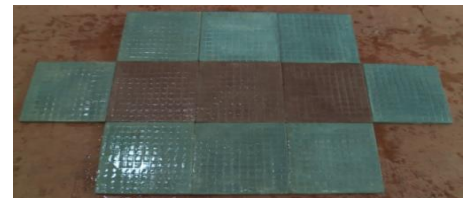
Crash Barrier



Door Panel



Roof Panel



Tiles

TRC products developed at CSIR-SERC

3. A novel precast crash barrier system known as **glass textile reinforced concrete crash barrier system (GTRC CRABS)**, is being developed at CSIR-SERC. At present, the widely used RC crash barriers are rigid and have poor energy absorption qualities leading to serious damage of vehicles and occupants. Compared to RC, GTRC is capable of absorbing more energy. GTRC CRABS is capable of resisting large impact forces during vehicle collision and is elastically deformable thus causing less damage to vehicle and passengers. The GTRC CRABS, being developed at CSIR-SERC can ensure safe travel for road users with minimal damage to vehicles. It is also approximately half the weight of conventional RC crash barrier and therefore can be used even in narrow interior roads where the traditional crash barriers cannot be used owing to space constraints.

Investigations are in progress to make ready-to-use precast GTRC CRABS with connection mechanisms to adjacent barriers and to ground. GTRC CRABS is a unique product and is not in practice anywhere globally as of date. Like all TRC products, GTRC CRABS is highly durable, free from corrosion and eco-friendly.

Towards the infrastructure improvement in urban and rural India, there is a need for innovative and durable fast track construction methods and products at affordable cost. In addition, considering the fast depletion of resources of conventional construction material in our country, there is an immediate need to find and use alternate material for various construction practices. TRC and the associated technologies developed at CSIR-SERC, can lead up to 60% reduction in concrete consumption and reduction in embodied energy giving way to less cost of production, reduced transportation costs, reduced erection and application costs.

For more information on TRC centred technologies and products developed at CSIR-SERC, please visit our website <http://serc.res.in>.