EUROPEAN PULTRUSION TECHNOLOGY ASSOCIATION

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EPTA highlights potential of cost-effective, sustainable composite solutions for future infrastructure

Corrosion presents an immense challenge for the infrastructure sector. Rehabilitating, replacing and upgrading ageing structures is a growing burden worldwide, with significant economic and environmental impacts. A new briefing from the European Pultrusion Technology Association (EPTA) discusses how lightweight, corrosion-resistant composite materials have the potential to deliver reduced life cycle costs, and a lower carbon footprint, than steel, concrete and wood structures.

The latest EPTA industry briefing, *Opportunities for pultruded composites in infrastructure*, details the advantages of polymer composite materials for the infrastructure sector and explores two applications where pultruded composite structures and components are already making a positive impact – rebar for concrete reinforcement, and bridge building. The report is available to download from the EPTA website.

Tackling the cost of corrosion

The deterioration of bridges and other critical structures due to corrosion is a major expense for many countries around the world where maintenance and rehabilitation budgets are limited. The Covid-19 pandemic could lead to further spending cuts. Corrosion is also extremely costly for the environment, resulting in the utilisation of more resources over a structure's lifetime.

The search for the next-generation of construction materials that can deliver resilient, safe and reliable infrastructure capable of long, maintenance-free service has driven increasing use of composites over the past 20 years. Offering corrosion resistance, superior mechanical performance, greater design freedom and faster installation, composite materials can provide a lower total cost of ownership for infrastructure owners, especially for applications in aggressive environments where steel, concrete and wood quickly succumb to corrosion. Life cycle assessments (LCAs) are also demonstrating the potential benefits of composites over conventional construction materials from an environmental point of view.

"Extending service life and minimising maintenance requirements are key to developing more cost-effective, sustainable infrastructure," explains Dr Elmar Witten, Secretary of EPTA. "Pultruded composites can help designers and asset owners to reduce through-life costs and environmental impact across a wide range of applications, from bridges, seawalls and piers, to structures for industrial sites and tunelling."

From rust-free rebar to better bridges

The corrosion of the steel rebar used to strengthen concrete is a primary cause of the deterioration of concrete structures. Pultruded composite rebar offers a way to eliminate the expensive problem of corrosion almost completely, extending a structure's life. With a tensile strength twice that of steel rebar but at a quarter of the weight, pultruded rebar to easier to transport and quicker to install, and since it does not rust less concrete cover is needed and maintenance requirements are minimal.

Composite rebar is becoming the material of choice for infrastructure located in aggressive environments, such as seawalls, docks and piers in contact with seawater, as well as dams and bridges close to freshwater, chimneys and storage tanks on industrial sites, and in transport infrastructure exposed to de-icing salts, such as bridge decks. Pultruded rebar is needed for specialised applications where steel cannot be used, such as hospital buildings housing sensitive magnetic resonance imaging (MRI) machines, for example. Composite rebar also brings benefits in temporary applications where the concrete structure must be easily demolished after use, such as retaining walls used in tunnelling.

The use of composites in bridge design is also increasing, both in rehabilitation projects such as replacement decks, as well as in new builds where the design possibilities of composites can be fully exploited**.** A composite bridge can deliver the same performance as a steel structure with a weight saving of 50% or more. This enables more streamlined bridge designs which require less substantial supporting structures and foundations and are much faster to install. Modular structures with reduced part count can be prefabricated to reduce onsite construction time. Faster installation means less disruption to users and lower costs for owners and operators of busy transport infrastructure. Since composite bridge structures are highly resistant to moisture, chemicals and harsh weather conditions, they do not require regular re-painting or repair to protect them from corrosion. Composite bridges are being designed to provide a service life of 75 years or more.

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A growing number of projects worldwide are demonstrating the successful adoption of pultruded profiles in bridge beams, decking panels, trusses, bridge enclosure systems, parapets, ramps, arches, grating systems, handrails etc. Pultruded composites are particularly suited to small-to-medium span pedestrian and cycle bridges, and replacement bridge decks where features such as curbs, drainage systems and anti-slip surfaces are moulded into prefabricated systems. Composite decks are a cost-effective solution where resistance to corrosion is the key requirement, and for bascule and other movable bridges, where they reduce energy requirements. In renovation projects, lightweight composite decks minimise stress on the supporting structure.

Wider awareness of the benefits composite materials can offer based on several decades of real-world applications, combined with authoritative design guidelines and standards and a growing focus on through-life costing and sustainability are building a strong case for the further adoption of composites in future infrastructure. Life life costing (LCC) and life cycle assessment (LCA) studies will increasingly play an important role in identifying the optimal economic and environmental solution for each project.

About EPTA

Pultrusion is a continuous process for producing linear fibre reinforced plastic (FRP) profiles with a uniform cross-section. Since pultrusion allows for extremely high fibre loading and accurately-controlled resin content, pultruded parts have excellent structural properties and are produced at a consistently high quality. EPTA was created in 1989 by a group of leading European pultruders with the mission of supporting the growth of the pultrusion industry by maximising external communication efforts and encouraging knowledge sharing between members. Since 2006, the association has existed under the umbrella of the AVK – Industrievereinigung Verstärkte Kunststoffe e.V., in Frankfurt, Germany. EPTA organises the bienniel World Pultrusion Conference in Europe every two years and in collaboration with the American Composites Manufacturers Association (ACMA) co-organises the North American Pultrusion Conference in the intervening years. For further information please visit www.pultruders.org

Press enquiries

Dr Elmar Witten, Secretary, EPTA, c/o AVK
Tel: +49 (0)69 / 27 10 77- 0, Email: elmar.witten@avk-tv.de