

# Paving the way for concrete

The application of concrete in European transport infrastructure holds much potential, but with usage varying from one country to another, it is an under-utilised option. With the ability to cover a wide variety of applications, the European Concrete Paving Association (EUPAVE) explains why concrete pavements are the smart, safe and sustainable choice.

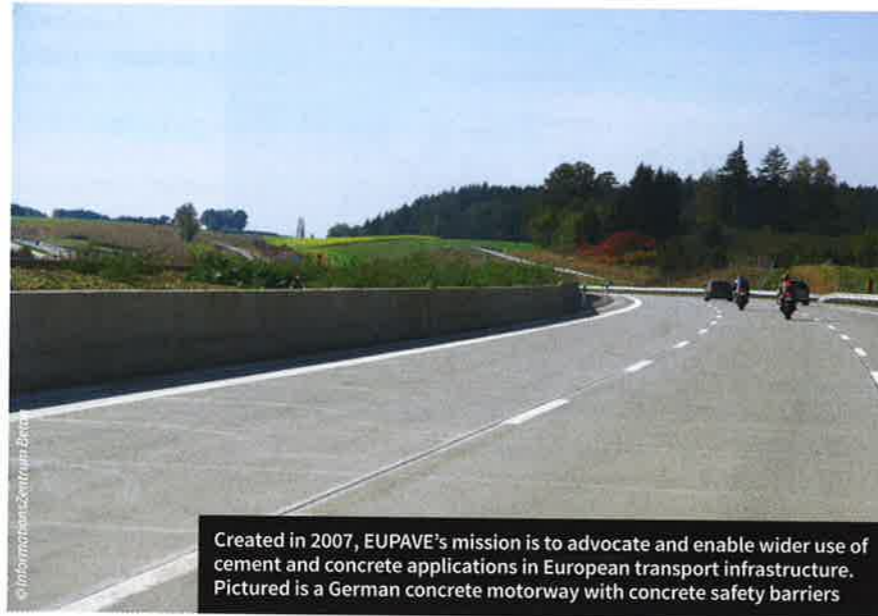
■ by **EUPAVE**, Belgium

Cement and concrete are indispensable materials for the realisation of infrastructure networks, of which roads are an essential part. Concrete roads are an excellent solution but are widely under-utilised in many countries as concrete pavements are not considered an alternative to asphalt. However, a change in mind-set would enable the development of the use of concrete roads to the considerable benefit of society, the economy and the environment. It is a big 'grow the pie' opportunity for the concrete paving industry, and for the cement and concrete industries at large.

The European Concrete Paving Association (EUPAVE) was created in 2007 to advocate and enable the use of cement and concrete applications in European transport infrastructure. It achieves this by engaging with EU, national and local decision makers, disseminating technical know-how and promoting innovation and best practices.

In his expert view, Stéphane Nicoud, president of EUPAVE, explains the possibilities for the concrete paving market: "The percentage of concrete roads is very different from one country to another, that is what we see in Europe but also in other parts of the world. What we strive for is that the concrete pavement option gets a chance to compete in every road project. In many countries and administrations it is never considered even though concrete pavements would prove a better solution in many cases.

"Comparison and selection can be done during the design process based on a life-cycle cost analysis but, ideally, also during the procurement stage through the use of alternate bid or Design-Build-Operate (DBO)/Public Private Partnership (PPP) models in the case of sizeable road projects. In the DBO/PPP case, the contractor is interested in long-lasting, high-performance solutions which require



Created in 2007, EUPAVE's mission is to advocate and enable wider use of cement and concrete applications in European transport infrastructure. Pictured is a German concrete motorway with concrete safety barriers

minimum maintenance. The alternative bids system offers two designs: one with asphalt and one with concrete. Contractors bid for the one they want and the winner is chosen based on the most economical option after adding to the asphalt price a correction factor accounting for incremental maintenance cost versus concrete."



Stéphane Nicoud, president of EUPAVE

## Life-cycle cost analysis

Mr Nicoud goes on to explain that both the EU Green Public Procurement Criteria for Road Design and the EU Public Procurement Directives plead for the use of life-cycle cost analysis (LCCA), taking into consideration not only the initial investment cost but all the costs during the life cycle including periodical maintenance and rehabilitation. For this reason, EUPAVE's latest publication 'A guide on the basic principles of Life-Cycle Cost Analysis (LCCA) of pavements' has been entirely dedicated to this important topic.

In addition, studies from EUPAVE's colleagues at the American Concrete Pavement Association (ACPA) have demonstrated that any competition between the two types of pavement always leads to lower pavement prices and, consequently, to more value for money for the road authorities. In many cases concrete pavements turn out to be cheaper in investment cost, even before taking into account their longer life.

"However, we are aware of the difficulties for some countries or regions

Luc Rens, consulting engineer for the Belgian Cement Association and managing director of EUPAVE



*"Concrete pavements have always been appreciated for their durability and low maintenance – and it is not hard to grasp how this translates into sustainability benefits."*

to get started with concrete pavements, simply because there are still too many prejudices or they have no experience. This is where EUPAVE can help," Mr Nicoud notes.

## Comfort, safety and longevity

Luc Rens, consulting engineer for the Belgian Cement Association and managing director of EUPAVE, confirms: "For many people concrete roads are still associated with bumpy and noisy surfaces. That image is related to the old design of concrete pavements with long panels, wide expansion joints and roughly textured surfaces. Many of these pavements are over 40 years old and are still in service, a long time after their projected lifetime! In addition, driving comfort and rolling noise were barely considered 40 years ago.

"Today, modern concrete roads are still known for their longevity but in combination with safe and comfortable surfaces. Indeed, the design has been adapted to shorter slabs with narrow transverse contraction joints. The use of dowels and hydraulically-bound base layers ensures a good load transfer between the slabs and prevents the differences of elevation across the joints. Besides the jointed plain concrete pavements, there are also the continuously reinforced concrete pavements (CRCP) where the transverse joints are absent and shrinkage is controlled by a network of very fine cracks.

"The newer types of surface finishing such as exposed aggregate concrete, longitudinal tining or grinding provide low-noise surface courses that can compete in terms of acoustic level with dense asphalt surfaces. In contrast to bituminous surfaces, concrete pavements do not suffer from rut formation, which also means that aquaplaning is excluded. When built correctly at the initial stage, concrete pavements maintain their driving comfort and safety over their entire service life."

## A sustainable fit

Another major point is that concrete pavements "fit perfectly with sustainable construction," Mr Nicoud continues. "First of all, they embody the principles of a circular economy. In the waste

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the environmental performance of a concrete pavement can be carried out using life-cycle analysis (LCA). “Concrete achieves excellent results for many environmental indicators including: energy, water, smog, natural resources and ecotoxicity, Mr Rens points out. “It is clear that the environmental footprint of a concrete

road with a service life of 30-40 years or more, and requiring very little intervention for maintenance or renovation is positive, given the long-term savings over time on raw materials, transportation and energy.”

#### Wide variety of applications

Mr Rens goes on to explain that concrete pavements cover a wide variety of applications. “We are not just talking about motorways, highways or trunk roads. Let us take a look at some developments in urban and rural areas. Safe solutions for mobility include the provision of roundabouts in plain concrete or continuously reinforced concrete. Roundabouts are critical points for urban mobility. In addition to improving traffic safety due to increased visual perception of the route, these concrete roundabouts also reduce the number of points of conflict and limit maintenance operations. The visual appearance of through-roads, streets and squares is an important consideration in the urban environment. A wide range of concrete paving blocks, coloured exposed aggregate or imprinted concrete can be used in such locations, for purely aesthetic reasons or for an improved readability of the street.

“Concrete also permits the integration of different urban mobility modes.

Increasing use is being made of concrete as a sustainable solution for the infrastructure used by public transport systems, whether buses, trams or trains. Dedicated bus and tram lanes in concrete offer a practical approach to public transport since they meet the long-term requirements of functionality, comfort,

hierarchy (Prevention, Reuse, Recycling, Recovery, Disposal), it is clear that concrete practices in general, and pavements in particular, lie in the upper levels of this hierarchy.

“Concrete pavements have always been appreciated for their durability and low maintenance – and it is not hard to grasp how this translates into sustainability benefits. The advantages of concrete in pavements span the three pillars of sustainability: social, economic and environmental. Durability means prevention of waste – the most resource-efficient road is one you resurface once every 30-40 years, rather than every 5-10 years. Concrete is 100 per cent recyclable. Concrete, having reached the end of its life, can be crushed to provide aggregates for use in new concrete, or in unbound applications such as road bases.

“The lighter surface colour of a concrete road also has the advantage of an albedo, or reflecting power, higher than black bituminous surfaces. The reflection of this energy ensures a slowing down of the greenhouse effect, which is equivalent to a reduction of 25kg/m<sup>2</sup> of CO<sub>2</sub>. In urban environments, light-coloured surfaces can, therefore, reduce the effect of local warming and the risk of smog.

“Furthermore, the higher rigidity of concrete pavements leads to a reduction of heavy vehicle fuel consumption by up to six per cent, resulting into a considerable reduction of CO<sub>2</sub> emissions during the whole life cycle of the infrastructure. In most cases these two effects more than offset the CO<sub>2</sub> footprint of the concrete material, which results in a lower CO<sub>2</sub> footprint than for the equivalent asphalt infrastructure. The use of blastfurnace slag cement or other types of blended cement in concrete mixes can also further limit the concrete’s CO<sub>2</sub> footprint.”

A more complete assessment of

cost-efficiency and aesthetics. Moreover, sidewalks and cycling paths meet the needs of the vulnerable road user. Concrete provides aesthetically pleasing and slip-free surfaces for all types of public spaces.”

#### Success stories

Getting started is the message, stresses Mr Nicoud. “It does require effort but can end up very beneficial for the cement and concrete industry and, after all, for society as a whole.”

An inspiring example can be found in Poland. In the 1990s there were hardly any concrete roads when the Polish Cement Association decided to set up a large information and promotion campaign. It began by organising seminars and conferences, both for local and national authorities, and a national fair for the road construction industry. The next step was to provide training for contractors, organised site visits and publishing guidelines, videos and offering a dedicated website. This holistic approach has proven to be a success – today Poland counts 630km of concrete motorways and expressways and 900km of local roads built in concrete. Moreover, the development of the Polish motorway network is still ongoing. By end-2023 another 750km of concrete motorways and express roads are expected to be built.

Other countries are following Poland’s example both inside and outside Europe. These include India, Indonesia, Russia, Belarus, Ukraine, Uzbekistan and Nigeria. Based on life-cycle cost, all these nations are embarking on introducing concrete roads on a large scale with a total volume estimated at over 100,000km.

“In the meantime EUPAVE will continue the advocacy of the concrete paving sector, the promotion of best practices and the technical support to its members, looking forward to helping with new success stories,” concludes Mr Nicoud. ■

