

Economical concrete protection with mastic asphalt

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I have consciously chosen the title of my presentation – „Economical concrete protection with mastic asphalt“ – in a very general way. However, I would like to say it now for the audience more explicit. For example: „Mastic asphalt is the most economic concrete protection for parking constructions“. Or: „Mastic asphalt in parking constructions is a lot more economical than synthetic material coating systems“.

The very positive developments in the evaluation of the durability of surface protection systems in parking constructions – especially from our point of view as mastic asphalt specialists – are the background of my presentation. I add to parking constructions underground car parks, trafficable intermediate parking decks, open-space parking decks including all the necessary ramps.

In Germany, since 1975, tyres with spikes are forbidden. Instead, one spreads out salt on the roads to make them free of ice. This salt – NaCl, sodium chloride – prevents the ice formation on roads down to -12°C. The traffic whirls up the chloride in solution and thus the later reaches the bridge piers and bottom sides of bridge decks. Wheel cases bring the chloride in parking decks.

With the introduction of the standard ZTV-Bel-B in 1987, bridge deck layer systems on a separating layer have been forbidden on all federal highways. The construction method with a vapour-diffusing membrane posed the danger to let water seep underneath and should give way to the construction method where all layers are in bond (composite construction). To prevent blistering in the bridge deck layers, all concrete bridges had to be levelled pre-treated, grounded with an epoxy resin and then sealed or be layer-levelled.

This new standard construction method – one layer made of bituminous sheeting and one layer made of mastic asphalt – was / is a success and entered therefore 1995 in the waterproofing standard DIN 18195. Due to the enthusiasm of the mastic asphalt industry to have – finally – a standardised construction method for waterproofing, one removed the “waterproof covering” – two layers of mastic asphalt in bond, but on a separating layer – from our VOB standard of DIN 18354. Today, in Switzerland, the industry still seals parking decks with great success with exactly this method.

Concrete is a „crafty“ construction method. Concrete can pick up a high pressure, but only a little tension. Steel can excellently bear tensile strengths. The steel concrete combines the strengths of both materials. However, one must not forget that the concrete has to brake first before putting the steel under tensile stress.

However, increasing traffic and spreading out of salt are damaging our concrete engineered constructions. An increased content of CO₂ in the air is responsible for the decarbonisation. With it, the concrete loses its alkaline environment and the steel begins to corrode and rust. The increase in volume of the rust (approximately 9%) leads to spallings and red-brown rust stains (corrosive edges). This claims experience is visible.

The pitting corrosion caused by the chloride is – for the safety evaluation of a construction – hard to estimate, because you do not see it!

Whereas the decarbonisation from outside to the inner part of the construction is slowly and therefore, damaged concrete can relatively easily be renewed, the stress caused by salt hits the steel concrete constructions in the middle of the heart. The concrete must crack to transmit the rising forces.

Even all the new concrete technologists, which include research work about crack width limitation, can change something on this fact. Even in the smallest crack, water is present and leads present chloride to the steel. This combination of water and chloride gnaws on the steel like a mouse on the cheese. If the tensile forces cannot be hold by an accordingly large profile anymore, there is a risk of cracking and collapsing.

Therefore, in 2001, while reworking the concrete standard, the exposure classes have been included. Depending on the stresses of a concrete structure – pillars, supports, bottom sides or plate surfaces – one has to foresee corresponding protective measures. The standard did not make statements about the waterproofing nor about the way how to protect the concrete.

The synthetic materials (EP, PU, PMMA, PE), which are in use since 1987, opened-up new market areas. One developed system solutions for walls, ceilings, floorings, difficult waterproofing details and so on. But in combination with high dynamic loads, the „turn of the tide“ winter/summer and the water effects with salt these working materials have their limits.

In 2005, the “German Concrete and Construction Technique Association” published a leaflet – not a standard !!! – “Durable parking decks and the concrete construction method”. This document mentioned the mastic asphalt construction method, but presented the different construction methods with liquid resins as “**equivalent**”.

Put yourself in the position of a planning engineer. Synthetic material is thinner, lighter, fancier and cheaper than mastic asphalt. In Germany, at this time, we had the peak of the period of high interest rates. Stinginess was sexy! The market for parking decks was completely dead for mastic asphalt two years after publication of the leaflet.

Fortunately, on 15.9.2008 we had the bankruptcy and collapse of the Lehmans; it introduced the end of the high interest rates period. In the meantime, it has become chic and sexy again to invest in “concrete money”.

Nevertheless, there have been also smart peoples like the advocate Gerd Motzke from Mering. He was the chair judge at the OLG Munich, Chamber for Constructions. Mister Motzke is not a fan of mastic asphalt, but he could not understand why big and beautiful parking decks, constructed according to the state of the art, failed within the guarantee time of 5 years and the corresponding dossiers landed on his desk. Parking decks must be planned for a lifetime of more than 50 years.

He put his finger in the wound of the planning engineers and asked for more economy and efficiency: „The architect / planning engineer is responsible vis-à-vis the owner-builder for the efficiency of its buildings like the doctor for the life of its patients“ (January 2012).

“We, as courts, name a parking deck with a liquid plastic coating a "substitution model": Cheap production costs are replaced by expensive maintenance and repair-maintenance costs“ (Jan. 2014). "Of course, you are allowed to build coatings, but I tear your ears long, if you do not inform your client accordingly in order to let him know that there will come an expensive rat tail of refurbishment costs" (Jan. 2016). Due to the engagement of Gerd Motzke, today, expressions such as maintenance schedule, maintenance costs, repair-maintenance and refurbishment costs currently are included in the sets of standards. Regarding the efficiency and the economy one must not only take into consideration the construction costs but also the maintenance costs.

Our HOAI – fee structure imposed on architects and engineers acting as public contractors – does not make it easier. The word “maintenance” is mentioned for the first time in the performance class 9. According to Mister Motzke one has to clarify the maintenance and refurbishment questions already when choosing the appropriate concrete protection. Normally, the engineer planning the supporting structure, which is already involved in the performance classes 2 or 3, chooses the protection. Mister Motzke: „For the engineer it is an addendum topic!“ But even at this early time the builder-owner must be informed about the different cost developments depending on the selection of the different concrete protection systems.

The above-mentioned DBV leaflet „parking decks and underground car parking“ still exists. It was reworked in 2010 as well as in 2015. Coatings are still allowed.

Our industry got a big gift from the so-called „Münchner Round “. The “Münchner Round “ is a cooperation of several partners of the construction sector: architects, engineers, experts, universities, but also builder-owner of the region of Munich. The „Münchner Round “ has compared the most important surface protection systems of the DBV leaflet concerning production costs, maintenance costs, renovation costs and extrapolated it over 50 years. Published by the Technical Academy Esslingen, Jan. 2016.

You can guess three times which construction method is the most economical? Of course, the construction method with mastic asphalt. Mastic asphalt is a little more expensive in production and application, but it is unbeatable in maintenance.

Has someone still some reservations concerning possible imprints under wheel loads? We must not promise 50 years without maintenance. We are in the working field of concrete protection! We are not in the working field of waterproofing. A waterproofing must be maintenance-free. Surface protection requires maintenance. But, in contrary to a liquid plastic coatings, we can always execute our maintenance work. An elaborate and expensive concrete repair is almost never required.

You all know the phone calls of engineers, which do not know our material. When in my office the question about “mastic asphalt in parking decks” arise, the phone call takes approximately 20 minutes. At the end of the phone call the engineer has understood, that he can only built – when he will be honest – with mastic asphalt. As soon as he chooses another construction method there is the danger that he has to refund the higher maintenance and refurbishments costs to the builder-owner, calculated by the court. What do you believe? Which construction material this engineer will put in the tender?

Finally, I would like to wake up our industry a little bit. Fight against the argument "mastic asphalt is not chic and not fancy". Of course, still today, most of the mastic asphalt surfaces are sanded or chipped with pre-coated chippings. But even there are many design options. The sand can have different colours. Bitu-chippings are also available with a colourless binder. Why not polish the surface? Or if the customer wants its corporate colours even in the parking deck, then our mastic asphalt can indeed be coated, but on top of it!

In Germany, there are only half as many mastic asphalt companies compared to ten years ago. The above-mentioned reasons have certainly played their part. But it is up to us now to convince the architects, the engineers and the planners of our construction method! There are much more concrete rehabilitation companies than mastic asphalt firms. Do you think that they let draw the butter from the bread? Certainly not.

That is why I urge you today: Get out! Go to your planner, your engineers, your architects! Make our construction method known again! We have the better arguments on our side! The efficiency in terms of sustainability, the 'Münchner Round "and the courts are on our side. Any questions?