CASE STUDY

HANGZHOU BAY BRIDGE, CHINA

ASISOLUTIONS.CO.UK

One of the masterpieces of modern architecture, the Hangzhou Bay Bridge has been opened to the public since May 2008. The £840 million (US$1.5 billion) bridge, measuring 36 km, spans Hangzhou Bay to link China's financial hub in Shanghai and the port city of Ningbo to the south.

Hangzhou Bay Bridge is currently the world's second longest trans-oceanic bridge, after Jiaozhou Bay Bridge in Qingdao, China. It has six lanes with a maximum speed limit of 100 km/h and an expected lifespan of over 100 years.

The bridge shortens the distance between Ningbo (the largest port in the world by volume) and Shanghai (the economical capital of the world's second largest economy) by over 120 km. This provides a reduction in travel time between the two key cities in the Yangtze delta (also called Golden Industrial Triangle) from 4 hours to 2 ½.

As it is placed in one of China's most prosperous regions, the Hangzhou Bay Bridge will further enhance development of the Yangtze River Delta. The general bridge toll is US$11.50 each way, with a fixed percentage of the toll given to the Bridge Management team for the maintenance and preservation of the Hangzhou Bay bridge. Overall return on investment is calculated at 8-10 % in a 15-year period.

After several years of trialling different asphalt preservation and rejuvenation products in the surrounding cities (including the G15 Hangzhou Bay Bridge connecting highway in Ningbo) with similar climatic conditions as the Bridge, RHiNOPHALT® was chosen back in 2014 for its worldwide proven outstanding performance as an asphalt preservative.

The Hangzhou Bay Bridge is expecting a structural life span of over a century, the existing
6-lane SMA surface on the bridge however is only expected to last a fraction of that time, with periodical mill and pave resurfacing as well as localised patching seen as the standard protocol for the maintenance of the grand bridge.

But as a flagship of modern Chinese engineering, and with an annual income of over US$150 million from tolls alone, the Hangzhou Bay bridge management team have been working hard to find a more sustainable method to extend the operational life of the asphalt pavement, to minimise congestion and lane closures of the busy bridge, as well as offering environmental and commercial benefits in the process.

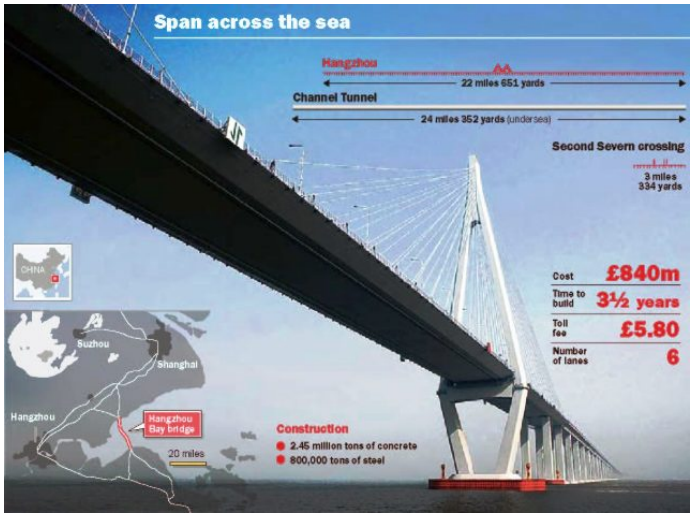
After several years of trialling different asphalt preservation and rejuvenation products in the surrounding cities (including the G15 Hangzhou Bay Bridge connecting highway in Ningbo) with similar climatic conditions as the Bridge, RHiNOPHALT® was chosen back in 2014 for its worldwide proven outstanding performance as an asphalt preservative.

RHiNOPHALT® is a cold spray-applied surface penetrative sealer. It is a cost-effective and sustainable method of preserving and protecting bituminous bound materials. It protects the existing bitumen from the impact of oxidisation due to weathering and UV degradation. It achieves this by penetrating into the asphalt binder at the surface course and provides a durable seal to prevent water ingress and to dramatically slow down further oxidisation, coupled with the benefit of improved cohesion and binding properties with the aggregate matrix.

The solution is best utilised as a preventative maintenance measure in asset management extending the operational life of the pavement and removing the large costs of resurfacing and repair works.

Rather than adding a new layer of surface, RHiNOPHALT® penetrates into the top of the existing surface course and seals in essential oils and resins, whilst at the same time improving the binding and waterproofing properties of the existing surface. As a result, the treated surface will become more resistant to abrasion, stone loss, water ingress and the severe ageing effects of extreme temperatures.

The results from the 2 year study has shown the treated areas to be much more resistant to aggregate loss and to surface erosion over time, and will therefore have a longer service life.



Over 100,000 m2 of the bridge was treated with RHiNOPHALT® between 2014 – 2016. Although still in the preliminary stages of the it's preservation scheme, cores extracted from the Hangzhou Bay Bridge following a RHiNOPHALT® application (both from Treated with RHiNOPHALT® and Control section), were subsequently delivered to the UK for independent UKAS accredited laboratories analysis such as the Accelerated Weathering test in accordance with BS EN ISO 60068, and a Scuffing test. The results from the 2 year study has shown the treated areas to be much more resistant to aggregate loss and to surface erosion over time, and will therefore have a longer service life. This will give measurable financial benefits to the Management Team.

The Hangzhou Bay Bridge Management Team are looking to incorporate the RHiNOPHALT® Technology into its surface preservation scheme. A team of leading pavement engineers from the Bridge visited the UK in June 2016 and exchanged their preservation ideas with UK Highways, the DBFO of M40, another advocate of the RHiNOPHALT® Technology, having recently celebrated 10 years of RHiNOPHALT® on the M40 with nearly 4 million m2 of asphalt treated.