

Project titles:	Self Healing PA surface layers treated with rejuvenators in the context of improved maintenance schemes (LVO I, LVO II, LVOIII)		
Project number:	Infraquest 2010-2012 3 projects IQ-2010-10 (A50), IQ-2011- 13 (A73, A1), IQ-2012-24 (A30, A1 after winter, A30 after winter, A50 after 1 year, A73 after 1yaer)		
Start date:	October 2010	End date:	31July 2013
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Embedding in IQ-programme:	<p>The project appliesto the IQ Masterplans ‘Wegen’ (service life) and Materials (innovative materials & techniques for maintenance and management) .</p> <p>Test methods will be developed to determinethe effect of adding rejuvenators to the surface of Porous Asphalt layers directly and the influence of rejuvenators on the service life with regards to raveling. Both relatively young PA layers (approximately 5 years old: preventive maintenance) and PA layers at the end of their surface life (prevent possiblewinterdamage before reconstruction) will be investigated. At the same time calculations are done by TNO on the impact of the new maintenance activity and innovative materials on the LCA/MKB for a certain maintenance/reconstruction scheme as determined by RWS.</p> <p>The obtained knowledge will result in theformulation of recommendations for preventive maintenance activities (ravelling) on PA surfaces to increase the surface life of the heavy trafficked lane to that of the fast lane and to prevent winter damage before an old PA layer can be reconstructed This will strongly improve the possibilities for economic maintenance activities in pavement management schemes for PA surfacings. Another important contribution will be that from the developed test methods a strong basis can be laid for an acceptance protocol for other innovative products in the market.</p>		
Type of project:	Fundamentalconcept	<input type="checkbox"/> Integration & development	<input checked="" type="checkbox"/> Evaluation of procedures <input checked="" type="checkbox"/> Product-in-context / valorisation
Graphical abstract:	<p>The graph plots 'Eigenschap' (Property) on the y-axis against 'jaar' (year) on the x-axis. It shows three curves representing different maintenance scenarios: a reference curve (Rref), a curve with rejuvenator (Rref), and a curve with rejuvenator plus a third component (Rref + rej3). The curves show a decrease in property over time, with the Rref + rej3 curve showing the highest resistance to aging.</p>	<p>A hierarchical flowchart titled 'Test methods' at the top. It branches into three categories: 'Volumetric, spatial tests', 'Chemical tests', and 'mechanical tests'.</p>	
Research questions:	<ul style="list-style-type: none"> • The following questions need to be investigated for Three products based on different philosophies: • What happens with the aged binder in the PA layer at micro/molecular level after treatment with the different rejuvenators? • How far can the rejuvenators penetrate into the aged bitumen and to what level are properties changed? • Determine the major contributions of each treatment in terms of: filling of microcracks, softening of the aged binder and adding of new binder to the bridges between the stones • Develop test methods to investigate the above mentions questions. The test methods should make contributions at the micro- and nano level. • Is it possible to formulate an acceptance protocol for other innovative products based on the developed test methods? 		
Conclusions:	<p>The project will contribute to the development of improved maintenance schemes for PA surfacings in the long term. In the short term the expected contributions of the new products to improving the ravelling resistance will be determined. Test methods will be developed to show the effect of different rejuvenators on the existing PA layer. The outcome of these projects will determine the possibilities of upscaling this type of maintenance method.</p> <p>The research on the winterdamage sections will result in a very fast indication (after one winter) how these products can be used to survive a severe winter in the near future, before reconstruction in the next year.</p>		
Other results:	<p>-LCA/MKB results will be provided by TNO</p> <p>-A first indication will be given for an acceptance protocol for new innovative products (TNO)</p>		
Dissemination:	<p>The research will be concluded with a number of research reports for each test method that will be used (for A50 project 5 reports are produced) and for each field trial. A summary report in Dutch will be provided for each field trial. All results will be discussed in several workshops (smaller groups and nationally) during the projects and at the end of the projects. All developed test methods and their results may be published in peer reviewed scientific journals, conference presentations and professional publications (dependent on acceptance and permission of Infraquest).</p> <p>Apart from this at TUDelft a PhD student (Yuan Zhang) is further investigating the working of rejuvenators and will write a number of papers on the subject in close cooperation with Infraquest.</p>		
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