

## **Fish Oil Ethyl Esters for Bitumen Modification In Surface Dressing**

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White spirit has been successfully used as a bitumen softener (flux-binder) for surface dressing in Iceland since 1978. However, road bleeding problems have been associated with the white spirit and more recently growing demands for less hazardous and more environmental friendly source has driven the search for an alternative softener. Rapeseed oil has been partly used as a softener in surface dressings in Iceland since 2007, but requires optimal weather conditions when applied and is associated with several undesired technical problems. Fish oil ethyl esters are a by-product from the steadily growing omega-3 health product business and over 12.000 tons are accumulated globally per year. They have been domestically available in Iceland since Lysi hf started a new process plant in 2008. Fish oil ethyl esters are highly purified and unlike white spirit remain with the bitumen after dressing.

In this study we investigated and compared the physical and chemical properties of the fish oil ethyl esters and rapeseed oil as well as their corresponding bitumen blends in various ratios. The fish oil ethyl esters were found to be more homogeneous and of much higher purity than the rapeseed oil. Furthermore, as a marine oil product the fish oil ethyl esters contain long chain polyunsaturated fatty acids, which readily oxidize and then polymerize when warm and in the presence of oxygen. This was an obvious difference between the two softeners offering additional binding (adhesion) effect for the fish oil ethyl esters on top of its excellent softening ability.

The first road trials using fish oil ethyl esters as a softener were performed very successfully in July 2010. Since then they have fully replaced both rapeseed oil and white spirit in surface dressing laid today in Iceland.