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015 • Recycling of waste oils as rejuvenators for aged bitumen in RAP

Sara Filippi,* Miriam Cappello, Giovanni Polacco, Damiano Rossi, Massimo Losa and Maurizia Seggiani

Department of Civil and Industrial Engineering, University of Pisa, Largo Lucio Lazzarino, 56122 Pisa, PI, Italy

*e-mail: sara.filippi@unipi.it

The recycling of materials considered "waste" is an important goal for developing low environmental impact processes, even in pavement constructions. Therefore, the use of reclaimed asphalt pavement (RAP) is an important strategy in the preparation of new roads [1-2]. Anyway, the bituminous binder in RAP has been subjected to oxidative aging, that determines a physical hardening and limits its workability and performances like the cracking susceptibility. For this reason, quite expensive additives, acting as rejuvenators, must be used together with RAP to restore the binder original viscosity and properties, thus allowing an increase in the percentage of RAP in the new formulations. In this study the recyclability of a waste mineral oil (MO) from the automotive industry and a waste domestic cooking vegetable oil (VO) as rejuvenators for aged bitumen in RAP was tested (Figure 1). The oxidized bituminous binder in RAP was simulated using a 50/70 base bitumen that was artificially aged in laboratory. Several mixtures were prepared by adding different percentage of recycled oils to restore the desired properties. Waste oils were compared measuring compatibility, diffusivity, and rejuvenating efficiency. The domestic cooking vegetable oil resulted the best rejuvenating agent and about 4.0 wt.% of this additive is enough to restore binder viscosity and stiffness.

Figure 1. Schematic approch to realize a sustainable road pavement using RAP rejuvenated using waste oils.

References

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[2] Antunes, V., Freire, A.C., Neves, J., A review on the effect of RAP recycling on bituminous mixtures properties and the viability of multi-recycling, *Constr. Build. Mat*., 2019, 211, 453- 469.