Effective Use of Corrosion Inhibitors in Highway Structures

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Summary

The corrosion of European concrete highway structures leads to traffic disruption, significant expenditure on remedial works and ultimately threatens to impact on European competitiveness. A potentially more efficient component in maintenance strategies is the use of surface applied corrosion inhibitors, which may delay the onset of corrosion or retard the corrosion rate of steel in concrete. This paper presents a proposed framework of guidelines for the effective use of corrosion inhibitors based on a study conducted as part of the EU Fifth Framework SAMARIS project. The proposed guidelines call for an initial desk study to assess the potential use of inhibitor and an assessment of risk control to the specifiers satisfaction. If necessary (for risk assessment and control) a preview trial is recommended, based on defined performance criteria from which a proposed rehabilitation strategy is finalised and again considered against the risk assessment. If resources permit, performance monitoring post repair is recommended as part of a pro-active maintenance strategy, since such an approach may represent one of the most effective uses of corrosion inhibitors in service life management.

Keywords: Amino alcohol, concrete, corrosion, durability, inhibitor, reinforced concrete.

1. Context and test programme

Surface-applied corrosion inhibitors are applied to hardened concrete with the purpose of penetrating the cover to the reinforcing steel and forming a protective film to mitigate the corrosion processes. Inhibitor technology is a continually developing rehabilitation technique. Their market position in the context of highway structures is to offer a solution that, if used in appropriate circumstances, can extend the service life of a structure in an economical way, through delay of depassivation and/or reduction of rate of corrosion, once it is propagated.

This paper reports on trends identified in trials on concrete specimens in the laboratory. In addition an indicative performance envelope is presented that resulted from the reported tests and other trials that formed part of a work package of the EU SAMARIS (Sustainable and Advanced Materials for Road Infrastructure) Project. The work package set out to examine the effectiveness envelope of amino alcohol inhibitors in chloride contaminated concrete based on a hypothesis that significant influences are chloride concentration, sustainability of inhibitor reservoir near the reinforcement and the state of the corroded reinforcement at time of inhibitor application. These constraints represent boundaries of the window of opportunity for use of inhibitors as part of a repair strategy but key to effectiveness is the combination of circumstances. This helps to explain conflicting findings in the literature [1] because the full circumstances of each case were not always known or reported and some conditions may have been outside the effectiveness window of the technology. The trends identified in the SAMARIS trials led to a qualitative determination of an indicative performance envelope that informed the drafting of guidelines for specifiers, published as a main

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