Lifecycle Assessment of Different Constructive Solutions in Aggressive Maritime Environments - Application to the Viaduct of the Oil Terminal of the Port of Leixões

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Abstract

The maritime environment is one of the most aggressive for infrastructures. This type of exposure affects severely the durability of any infrastructure, if proper preventive measures are not taken into account.

In the construction of new structures one of the most important factors to take into account is the ratio cost / durability. This way, it is intended to make a study of two different structural solutions, as well as an analysis of their life cycles, for the viaduct of the oil tanker terminal of port of Leixões, in Portugal, since the current structure has reached the end of its life cycle after 50 years. It will be then designed a solution of precast and pre-stressed reinforced concrete beams with a reinforced concrete slab, and another solution with steel beams with a reinforced concrete slab. The new structure will be designed according to current regulations, which are developed in a way that such structures should reach a service life of 100 years.

It is expected that this study will be able to provide a solution that is economically viable for the replacement of the viaduct, and where it is possible to reach the expected life time of 100 years with the lowest possible cost.

Keywords: Maritime environment; Viaduct; Life cycle; Durability; Cost.

1 Introduction

The maritime environment is one of the most aggressive environmental exposure on the planet for reinforced concrete structures. If proper protective measures to this very aggressive environment are not taken the durability of materials and structures can be compromised. The building materials degrade when exposed to this environment, causing damages of diverse nature in the structures. This aspect has been seen in many structures and buildings that showed early deterioration in recent years [1].

To this end, new structures must be dimensioned, constructed and maintained to have adequate performance during construction, service life and dismantling [2].

The Viaduct of the Oil Terminal of the Port of Leixões is exposed to the aggressive waters of the

https://doi.org/10.2749/nantes.2018.s15-1
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