SHOTCRETE: ANALYSIS OF THE EVOLUTION FROM DRY-MIX UNTIL WET-MIX

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ABSTRACT

In the construction of concrete structures, the high-speed spraying of a material onto a surface is a very productive technique since it combines two stages of the process (placing and compacting) in a single action. This form of applying concrete is known as shotcrete.

Basically, there are two methods in order to spray concrete. The dry-mix shotcrete and the wet-mix shotcrete. The first was the dry-mix (1911). In this method, the solid part and water are justly mixed in the nozzle of spraying. The wet-mix has differences about the fabrication of concrete and about its transport. In this case, the mixture between water and solid part is made before the material enters in the hose. There are two possibilities to transport concrete: compressing air or by pump.

The election of dry-mix or wet-mix shotcrete depends on different aspects, as the characteristics of the work where is necessary to use, the enterprise characteristics, the environmental characteristics…

This work is based basically on the study of different aspects of concrete production, the evolution of shotcrete from the dry way until the wet way and the actual situation in Spain and in the rest of the world of shotcrete.

The general framework and objectives of this work, as well as the methods used, are laid out in Chapter 1. Chapter 2 contains a description of the current state of knowledge about spraying shotcrete technics, their differences and a compilation of different proposals in order to get the correct proportioning of a initial shotcrete.

Chapter 3 includes the reasons why wet-mix is nowadays, the most common method of spraying and the specific characteristics of wet-mix shotcrete. It is also said about the wet-mix design, the additions that are used, analysing the advantages for the concrete. The aspects which are emphasized are the use of steel fibers and accelerating products which have let to improve shotcrete properties and frequently make a shotcrete better than a common concrete not only in quality but in economical rentability too.

In chapter 4, it is analysed all the compiling information. Different tunnel constructions where shotcrete has been used (annexe 1), have been collected and each tunnel has a card with different facts: identification of tunnel, proportion of materials and other interesting parameters. The analyse and the compare study consists on the view of the actual situation of shotcrete in Spain, in Europe and in the rest of the world and the extraction of conclusions.

Finally, Chapter 5 presents the conclusions that have been obtained and the tendencies of shotcrete in a close future.