Florida Department of Transportation
Summary of Final Report, BB-889
October 2000

USE OF STABILIZER AGENTS IN MIXER DRUM WASH WATER

PROBLEM STATEMENT

It is common practice in the ready-mixed concrete industry to thoroughly clean the inside of a concrete truck's drum at the end of each day using approximately 150-300 gallons of water. According to the Water Quality Act (part 116), truck wash water is a hazardous substance (it contains caustic soda and potash) and its disposal is regulated by the Environmental Protection Agency (EPA). In addition, a high pH makes truck wash water hazardous under the EPA definition of corrosivity. These regulations require concrete producers to contain truck wash water on-site and prohibit its discharge off-site.

One alternative to disposal of concrete wash water in the usual way is the use of chemical stabilizing systems. The use of these admixtures circumvents the necessity to remove any wash water from concrete truck drums, and allows wash water to be reused for mixing more concrete. The admixture is added in a dosage dependent on the amount of waste water present in the drum of the concrete truck, and on the time span desired for the reuse of the water. These admixtures momentarily stop the hydration process, literally putting the cement present in a "dormant" state. Because the hydration process is interrupted, the cement in the wash water will not harden into concrete, nor will it adhere to the inside of concrete truck drums. The stabilized water is calculated into the next mix of concrete and more concrete can then be mixed in the concrete trucks.

Though preliminary studies have shown that concrete stabilized wash water can produce acceptable concrete, the main concern to FDOT is the state and type of admixture residues in the wash water, the effects of these residues on concrete properties, and the percentage range over which these derivatives have detrimental effect on concrete performance. Suspicion of detrimental effects on concrete durability is sufficient cause to deny use of stabilizer agents.

However, if stabilized water were to be used, the benefits would include reducing the amount of water needed to clean ready-mix truck drums, reducing labor costs pertaining to washing out trucks, eliminating wash water disposal, eliminating the need for settling ponds/slurry pits and disposal costs, and reducing EPA concerns pertaining to wash water.

OBJECTIVES

The objectives of this study were (1) to verify the performance test results reported by Master Builders (a producer of stabilizing admixture systems trademarked as DELVO) for concrete produced with Florida aggregates and wash water containing DELVO Stabilizer; (2) to provide supporting data and suggest key points to be considered by FDOT engineers in the development of guidelines for the use of stabilizer/activator systems; and (3) to develop the use of DELVO technology in the reuse of mixer wash water in order to reduce concrete mixtures costs, increase concrete construction productivity, and reduce the adverse environmental impact associated with the disposal of mixer wash water.

FINDINGS AND CONCLUSIONS

This study was a multi-phase project which studied the adapability of DELVO stabilizer for different concretes. The first three phases investigated the use of the DELVO stabilizer for overnight applications with Florida aggregates and Class I (non-structural) concrete, while phases four and five tested its use for overnight applications with Class II – Bridge Deck concrete. Specific results and conclusions for **Phases I, II, and III** included:

- DELVO used without the addition of a type D water reducer/retardant admixture (Pozzolith 220-N) produced concrete that performed equal to or better than its control mixture. The only difference with the stabilized mixture was that in reaching the maximum water/cement ratio of *0.55*, it had a slump of 1.75 inches and workability was harsh.
- DELVO used in combination with a type D water reducer/retardant admixture (Pozzolith 220-N) produced concrete mixtures with higher slump, longer set times, and lower unit weights, compressive strengths, flexural strengths, and moduli of elasticity, than that of the control mixtures.
- Fresh concrete at normal and elevated temperatures, with the addition of type A water reducer and stabilized for overnight applications in accordance with the procedures recommended by Master Builders, had all achieved at least 90 percent of the compressive and flexural strengths of the untreated control mixtures. In several cases, the stabilized mixtures exhibited strengths greater than 100 percent of the unstabilized control mixture.
- The overnight-stabilized mixtures experienced drying shrinkage within 0.0020 inches of that of the control mixtures. The general trend was that the stabilized mixtures sustained less shrinkage than did the control mixtures.
- The results of the chloride-ion permeability and time to corrosion tests were somewhat variable but indicated that the stabilized and control mixtures were of comparable quality with respect to chloride-ion penetrability and time to corrosion.
- The fresh properties of concrete, such as setting time and workability, appeared to be affected by the DELVO stabilizing admixture. Setting times were longer and workability appeared to be somewhat harsh.
- Sulfate resistance of stabilized wash water mixtures was not adversely affected when compared to the control mixtures.

Phases IV and V

- Stabilized wash water concrete appeared to have minimal detrimental effects on concrete properties, even at elevated temperatures (95-100 degrees Fahrenheit).
- The mechanical properties of FDOT Class II – Bridge Deck concrete were not adversely affected by stabilized wash water concrete in this study.
- The use of stabilized wash water had no adverse effect on early strength gain of concrete and would not affect formwork removal time.

- The final set time was longer for the stabilized mixes. Set times were found to be controlled by the dosage of stabilizer admixture applied (or the dosage of activator if used).
- Stabilized wash water concrete exhibited similar adiabatic temperature results when compared to concrete made from potable water. It appeared that thermal properties of concrete were not affected by the use of stabilized wash water.

This research project was conducted by Abdol Chini, Ph.D, at the University of Florida. For more information, contact Michael Bergin at (352) 337-3248, michael.bergin@dot.state.fl.us