Full-Depth Reclamation of Asphalt Pavements Using Lime-Activated Class F Fly Ash: Structural Monitoring Aspects

William Wolfe[1], Tarunjit S. Butalia[1], and Harold Walker[1]

[1]The Ohio State University, Department of Civil and Environmental Engineering and Geodetic Science, 470 Hitchcock Hall, 2070 Neil Avenue, Columbus, Ohio 43210

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ABSTRACT

Two existing failed asphalt pavements (4.5 miles in length) in the fastest growing counties of Ohio, USA (Delaware and Warren) were rehabilitated in summer of 2006 with Class F fly ash in combination with lime and lime kiln dust. After the construction, relationships for the service performance and structural behavior of the FDR pavements were monitored to determine how the fly ash sections compared to other more traditional pavement rehabilitation techniques. Service performance and structural behavior were determined with the use of sensors embedded in the road and Falling Weight Deflectometer (FWD) tests. This allowed the research team to measure the horizontal strain (longitudinal and transverse), vertical displacement (load deflection behavior), pore pressure, and pressure through the pavement depth and conduct a structural capacity assessment for the reclaimed road. These assessments were done at regular intervals in the order of months so that the time dependent properties of the reclaimed pavement could be evaluated.

Monitoring results of the FWD tests conducted up to 2 years after reclamation show that the sections utilizing fly ash (in combination with lime or LKD) outperformed the cement test section, while the emulsion sections were not as effective. The mill and fill test section indicated little or no increase in resilient modulus values as would be expected. The cement+emulsion and LKD+emulsion mixes were effective but their performance was much lower than the cement, fly ash+LKD, and fly ash+lime mixes. The cement+emulsion and LKD+emulsion resilient modulus values were lower than those typically obtained for soil cement (less than 500 ksi). The cement, fly ash+LKD, and fly ash+lime sections exhibited resilient modulus values comparable to open graded cement stabilized aggregates (more than 750 ksi). The cement treatment resulted in a significant increase in resilient modulus within 3 weeks of construction and beyond this curing time, the stiffness increase was very slow. On the other hand, the fly ash+LKD and fly ash+lime test sections indicated slower shorter-term increase in stiffness but after about one year of monitoring, the fly ash+LKD and fly ash+lime sections had outperformed the cement test section. The fly ash+LKD section average resilient modulus value one year after construction was in excess of 1,000 ksi.

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