

Development of an Automated Foam Index Test

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ABSTRACT

In 2003, nearly 112 million tons of cement and 11 million tons of coal combustion ash (CCA) were used for concrete construction in the US. The savings in construction costs in the US could be as great as \$1.4 billion per year if the amount of CCA used to replace cement was increased from the current ~10% US average to the 30% level specified in standards. However, mineral admixtures like CCA's react differently than does cement to commonly-used and specification-required chemical admixtures like air entraining agents. Although the foam index test was devised to measure the effect of CCA on air entraining agents, it is a visual test known to be imprecise and prone to misinterpretation; results from it are also not transferable from site-to-site. To create an operator-independent foam index measurement method, an Automated Foam Index Test (AFIT™) has been devised, the physical basis behind which is shown to be correlated to processes occurring within foams. The precision of the AFIT™ foam index values for CCA's from eleven coal combustion utility sites was obtained and was $\pm 5\%$ (2σ), three times better than visual foam index values. The applicability of AFIT™ to mineral admixtures having widely variant unburned carbon contents and particle sizes, and using protocols that have already been established in industry, is discussed relative to a table top instrument that rapidly and automatically measures the foam index of CCA's.

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