

The Use of Coal Combustion By-Products to Remediate Phosphate Wastes

by

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Abstract: Over 100 million tons of coal combustion by-products (CCB) are produced annually in the U.S.; approximately 30 pct is used in cement, bulk fill, wallboard or mine reclamation. Also, an estimated 500,000,000 tons of fine tailings exist as phosphatic clay suspensions in lagoons and ponds as a result of phosphate mining and processing. The solids concentration of these phosphate suspensions or “slimes” is in the 10 pct range. Because of its calcium content and pozzolanic properties, fly ash from FBC units or from PC power plants could be mixed with phosphate slimes to form a stable material. . The addition of coal combustion by-products would promote chemical dewatering by alkaline addition and hydration reactions. The product would be a material that can be handled easily, and since phosphate/CCB material would be high in phosphorous and calcium, it could be processed for direct use in agricultural applications, such as soil amendment, mulch or fertilizer.

The Federal Energy Technology Center is conducting a preliminary assessment to determine the characteristics of phosphate suspensions, quantify the chemical and physical characteristics of CCBs, and test proportions and mixing conditions for phosphate/CCB mixtures. Laboratory tests indicate that the addition of 10 to 50 pct CCB by weight increases the solid content and decreases settling time. Depending on the amount of alkaline CCB added, the pH of the suspension increased from 7.2 to between 8 and 9.2. Leaching tests of phosphate/CCB material will determine the release rate of P and Ca, and also determine the potential release of trace elements. Based on the prelliminary results, the combination of CCB and phosphate slimes is a feasible solution to an environmental problem in phosphate mining and promotes the beneficial use of CCB.

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