CleanAir

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Limestone Analyses via Bond Work Index

For full scale on-site grinding systems, the limestone is typically received with a diameter of about 1 in. (25 mm) or less and is fed through a weight belt feeder to the ball mill. Either fresh or recycled water is added at the feed chute in proportion to the feed rate of the stone. The output from the mill overflows to the mill product tank where it is pumped to a set of hydrocyclones. These hydrocyclones separate fines from the coarse fraction. The coarse fraction (underflow) is returned to the ball mill and the fine material is sent to the limestone feed tank. The water balance is maintained to provide 25% to 35% suspended limestone solids in the feed tank.

The limestone grind is usually expressed as a percent passing through a given sieve size. The coarsest limestone grind used in wet FGD systems is one where about 70% passes through a 200 mesh (75 micron) sieve. Fine limestone grinding produces a product where about 95% of the limestone is finer than a 325 mesh (44 micron) sieve. Fine grinding usually requires a larger ball mill system and higher limestone utilization, better reactivity with SO_2, and higher SO_2 removal for a given Stoichiometry, while permitting a smaller reaction tank for some systems. Stoichiometry is defined as the molar ratio of the reactant, $CaCO_3$ for limestone systems, to the SO_2.

CleanAir can simulate an industrial ball mill using a smaller laboratory grade ball mill. This helps us to determine Bond Work Index (BWI) of a provided limestone. Our in-house laboratory ball mill method is applicable to all types of limestones. Wet grinding is used in many limestone wet scrubbing systems to reduce the reagent (limestone) to the particle size necessary for a high dissolution rate. Limestone reactivity and utilization in a wet scrubbing system depend partly on available reactive surface area (particle size). A "soft" limestone can be ground to a given average particle size with less energy (and lower grinding cost) than a "hard" limestone.

One of the main uses for this method is for comparing a number of candidate limestones for an FGD system. The results of such grindability "screening tests," when combined with the results of reactivity tests and purchase/transportation cost data, can be used to select the best stone for a particulate wet scrubbing system.

Another use is for "quality control" or acceptance testing of limestone shipments. This use usually requires that the test be done on a routine basis so that a data base will exist for comparison purposes.

CleanAir has been involved with various scrubber acceptance/guarantee and diagnostic/optimization testing projects. We've analyzed a myriad of scrubber slurry samples from:

- Limestone-based Flue Gas Desulfurization Systems (FGDs);
- Sodium-based Kraft Paper Mills;
- Magnesium-based Kraft Paper Mills; and
- Spray Dryer Absorbers.

These projects have been involved with;

- Performance guarantee work;
- Gypsum manufacturing specifications;
- Scrubber evaluation and diagnostic testing; and
- Gathering research and development data.

Please contact us for current pricing and method availability

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Figure 1: Typical Full-Scale Limestone Reagent Preparation System