The Effect of Corn Particle Size on Various Phases of Production
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Ensuring your pigs grow quickly, efficiently, and profitably involves special attention to the diet, since feed typically represents 2/3 to ¾ of the total cost of producing market pigs. One characteristic of a feed quality control program that is sometimes neglected is particle size. A consistent desired particle size will ensure that diets are efficiently utilized, enhancing pig performance while minimizing nutrient excretion while improving handling and mixing characteristics. In general, reducing particle size increases the overall surface area of the grain allowing digestive enzymes more area to break down nutrients and begin the digestive process. However, reducing particle size too much can cause bridging and dust problems, increase energy usage and reduces throughput at the feed mill, and can increase the incidence of gastric ulcers. A recent paper from scientists at Kansas State University (Goodband et al., 2005) summarized the effect of particle size on pig performance.

Particle size is measured in microns, which is the average geometric diameter of particles and is determined using sieves or screens. Although average micron size is important, so is the variability or range in micron sizes. A large range or variation in micron size would infer a significant portion of very fine and very coarse particles, both of which are undesirable from a pig performance and feed flow standpoint. Most ground grain samples will have a standard deviation of 1.8 – 2.4, although upper limits should not exceed 2.25 for hammer mills and 2.0 for roller mills.

Based on interactions observed for particle size and age of the pig, it appears that younger pigs more completely chew feed, and therefore the greatest potential for fine grinding to improve feed efficiency is in finishing pigs. A recent Kansas State University study utilizing starter pigs showed a 4.5% improvement in feed efficiency when decreasing average particle size from 877 to 624 microns using a hammer mill, with little effect on growth rate or feed intake. These results are consistent with other studies evaluating nursery and grow-finish pigs, and indicate that feed efficiency effects are due primarily to improvements in nutrient digestibility.

Sow lactation studies have also shown improved performance with decreased particle size. Wondra (1993) observed a 10% improvement in litter weight gain (84 vs. 77 lbs) during 21 day lactation period when sows were fed diets with an average particle size of 600 microns vs. 1,200 microns. Baudon et al. (2003) did not observe improvements in litter performance, but lactating sows fed 600 micron vs. 1,500 micron diets had increased feed and water intake, returned to estrus a half day sooner, and lost 18% less backfat.

A dietary particle size of 700 microns is a good goal and general recommendation for corn-soybean meal based nursery, grow-finish, and sow lactation diets. Every 100 micron reduction in particle size improves feed efficiency by 1 to 1.5%, but also increases the incidence of gastric ulcers, reduces feed mill efficiency, and can negatively impact feed bridging.

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