Granulometric Heterogeneity of Distillers Dried Grains with Solubles (DDGS) and its Effect on Bulk Physical and Flow Properties

Klein Ileleji, Project Leader

Cooperators:
R. Stroshine, D. Maier
Ethanol Plants in the Midwest Region

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Graduate Student:
Clairmont Clementson, PhD Student

Goals:
1) Quantify granulometric heterogeneity in DDGS, and
2) Quantify the effects of granulometric heterogeneity in DDGS during handling with respect to the following phenomena: (a) particle segregation and chemical variability, (b) particle and bulk density variability, and (c) flow property variability.

Recent Publications:


Clementson, C. and K. E. Ileleji. The effect of granulometric properties on the flow properties of distillers dried grains with solubles (DDGS) (To be presented at ASABE Int. Conf. 2008).

Statement of Problem:
Dried Distillers Grains with Solubles (DDGS) is a granular bulk solid co-product from dry-grind processing of corn to fuel ethanol. It is primarily used in the rations of livestock feed such as cattle, poultry and swine. However, the quality consistency and poor flowability of DDGS have been cited as major hurdles to expanding existing and developing new markets for this feed product. Because of its poor flowability, major rail carriers have begun to ban the transportation of DDGS in their cars. Since most DDGS are produced in the Midwest and has to be shipped out to feedlots and export terminals (in the South, West and East Coast), these bans have affected rail freight costs. Product inconsistencies with respect to the bulk physical properties have also been a challenge to manage, especially with respect to bulk density and shipping costs. There is a need to understand factors and conditions that affect DDGS variability in order to implement appropriate solutions to reduce DDGS variability.

Current Activities:
Recent studies by our lab have shown that granulometric heterogeneity (particle morphology and size) is a major cause of bulk variability in the physical and chemical properties of DDGS. Furthermore, the variability in bulk DDGS is magnified by particle segregation that occurs during bulk handling. Two recent studies by our group; Ileleji et al., 2007 (lab-scale) and Clementson et al., 2007 (plant-scale) showed the effect of particle segregation during various handling scenarios normally encountered in the production and delivery of bulk DDGS. We are currently investigating particle/bulk density and flow property variability cause by granulometric heterogeneity and determine appropriate measures to mitigate against this effect.

Impact:
Based on our concluded studies, we showed that particle segregation occurred during handling such as gravity driven discharge and segregation would led to variability in bulk physical properties and probably some chemical properties. We recommend that a standard bulk sampling protocol be used industry wide in order to obtain representative samples from bulk DDGS and thus reduce variability due to poor sampling.