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Dimensions: 8.5 inch wide, 11 inch tall

Material: Paper, 92 Bright White or better, 75g/m² or heavier

Colors: Color Print on White

Printer: HP Color LaserJet 8550-PS

Finish: None

Adhesive: None

Special Notes: Illustrations are Ref Only ** Not to Scale ** (Shown page 1 of 3)



Application Note

Water Activity for Monitoring the Quality of Dried Distillers Grain
By: Brady Carter

Dried Distillers Grain with Solubles (DDGS) is a co-product of the grain bio-ethanol manufacturing process. It is created through a multi-step process. First, the non-fermentable material leftover from ethanol production is removed as stillage. Excess water is removed from the stillage by centrifugation and the wet grains are combined with condensed distillers solubles and dried to create DDGS. It is sold primarily as a high quality feed supplement, but could potentially have many uses including as a nutritional supplement for humans. The sale of DDGS contributes substantially to the economic viability of an ethanol production plant. Consequently, optimization of DDGS quality and shelf life are of utmost importance.

Recommended Analytical Methods for DDGS

On February 1, 2007, the American Feed Industry Association released a study titled "Evaluation of Analytical Methods for Analysis of Dried Distillers Grains with Solubles." This study examined analytical method efficacy for evaluating DDGS. The objectives of the study were to choose a set of tests that would best characterize the physical and chemical characteristics of DDGS and ensure its safety and quality. The main concerns for DDGS shelf life are susceptibility to microbial degradation, maintaining flow properties, and moisture migration.

Water influences all of these concerns. In this study, the only moisture analysis method listed was moisture content. Unfortunately, moisture content is not the most effective moisture analysis method for the concerns listed above. Water activity is a better predictor of microbial safety, flow

properties, and moisture migration. Ethanol producers will have more success ensuring the quality of their DDGS product while saving time and money if they use water activity as one of their quality assurance tests.

What is Water Activity?

Water activity represents the energy status of the water in the system and is equal to the relative humidity of the air in equilibrium with a sample in a sealed chamber. It is based on thermodynamics and is defined as the vapor pressure of water (p) over a sample divided by the vapor pressure of pure water (p₀) at a given temperature. Though not scientifically correct, it may help to picture water activity as the amount of "available" water in DDGS. It is not determined by how much water is present in DDGS, but is a comparison of how much the water in DDGS resembles and behaves like pure water.

Water activity values represent a scale that ranges from 0 (bone dry to 1.0 (pure water). As water activity decreases, the water in DDGS decreases in energy, is less available, and behaves less and less like pure water. For example, a water activity of 0.80 would indicate that water in the system has enough energy to support mold growth while a water activity less than 0.60 means that the water in the system cannot support the growth of any microorganisms. Water also becomes more mobile as water activity increases, which influences molecular mobility and increases chemical and enzymatic reaction rates. For example, browning reactions rates will be minimal at a water activity of 0.25, steadily increase as water activity increases, and reach a maximum at about 0.80 a_w.