

## Thesis Defense



Tian Lan, born and raised in Zhejiang Province, China, earned his BS in Biosystems Engineering, from Zhejiang University in May, 2009 in the city of Hangzhou, China. He came to Purdue University in August, 2009 in the MS program at Department of Agricultural & Biological Engineering and worked as a graduate research assistant.



**Speaker:** Tian Lan

**Title:** Evaluating Energy Efficient Strategies and Product Quality for Distillers' Dried Grains with Solubles (DDGS) in Dry-Grind Ethanol Plants

**Major Professors:** Dr. Klein E Ileleji

**Date:** April 19, 2011

**Time:** 4:00 pm

**Place:** ABE 301

### Abstract:

Distillers' Dried Grains with Solubles (DDGS) is the main coproduct in dry-grind ethanol plants, which account for about 82% of the fuel ethanol production plants. The DDGS drying utilizes about 30% of the total energy required for dry-grind corn processing, improving energy efficiency could have significant impact on the economics of the dry-grind corn-to-ethanol process. Studies have shown that physical and chemical properties of DDGS vary within batches in a plant and from plant to plant. Therefore, DDGS quality improvement is also one of the main market barriers to use as a livestock feed ingredient commercially. A bench-scale rotary drum dryer was used to manufacture DDGS around 10-12% by blending condensed distillers solubles (syrup; CDS) with distillers wet grains (DWG) at 60-65% moisture content and dried in the dryer. Effect of drying process variables on energy performance and products quality were determined.

Results from the experiments indicated that among all 16 drying groups, 10% CDS content and 60% DDGS add-back achieved the least SPC while 40% CDS content and 20% DDGS add-back group had the highest SPC, the energy efficiency and drying efficiency in both dryer I and dryer II presented similar trends as process parameters changed. CDS content had more influence on the energy performance during DDGS drying process while percent DDGS add-back had more impact on the SPC given a constant CDS content level. The DDGS physical and chemical composition analysis of bench-scale and plant-scale tests demonstrated similar trends.