

Earned a B.S.E. in Chemical Engineering from the University of Michigan-Ann Arbor in 2010. Will be starting work at General Mills in Research and Development in June of 2012.



Thesis Defense

Speaker:Sven PatrickTitle:Characterization of operating
parameters for a mini-extruder used for
processing of soybeans

| Major Professor(s): | Dr. Martin Okos |
|---------------------|------------------------------|
| Date: | Friday, May 11, 2012 |
| Time: | 10:00 am |
| Location: | NLSN 2187 – Morgan Boardroom |

Abstract:

Heat treatment of soybeans via a prototype mini-extruder was performed, in order to inactivate antinutritional factors naturally present in soy. The level of heat treatment in soy protein products is typically determined by assay of the activity of an indicator enzyme, urease. However, the relationship between the thermal inactivation of Trypsin Inhibitors, a key antinutritional factor in soy, and urease, a thermal inactivation curve was determined for extrusion cooking, showing the relationship between extruder die temperature and deactivation. Results show that there is a difference between Trypsin Inhibitor activity and urease activity at extrusion temperature of 130 165 C. It was found that a die temperature of 160 C was necessary to achieve 90% inactivation of Trypsin Inhibitor activity, a common standard for full-fat soy flours.

In addition, it was found that adjustment of the soybean feed moisture content had a linear effect on die temperature in the extruder, due to increased friction and shear in the extruder. A study of rheological characteristics of soy within the extruder was also performed. The upper operating limit of apparent viscosity in the extruder was approximately 3900 Pa*s. By this observation, a method for achieving operating temperatures above 145 C was developed.

Application:

Mini-extrusion technology is particularly suited for use in developing countries or remote areas, where traditional large-scale processes are infeasible due to either cost or practicality. As a high-temperature, short-time process, extrusion can yield a nutritious soy flour product with high efficiency and control.