

**2022 Granular Materials Committee  
Student Competition Winner**

**ABHISHEK PAUL**

Purdue University, West Lafayette, IN, USA



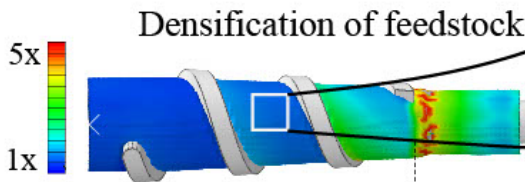
**Title:** *“Continuum modeling of corn stover feedstock through a compression feed screw”*

**Statement from judges:**

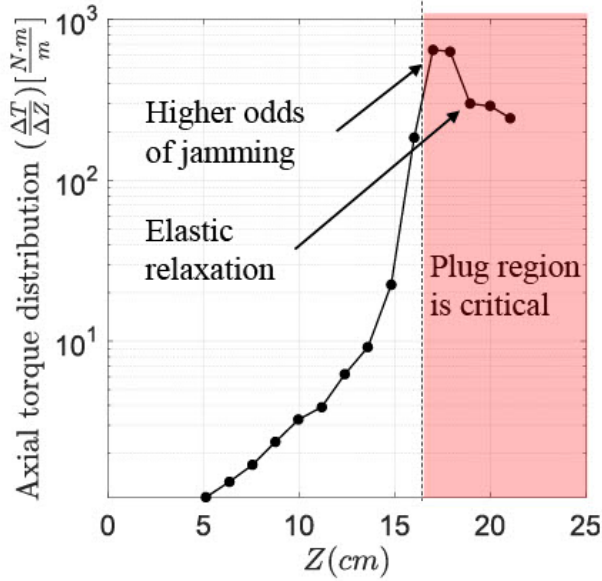
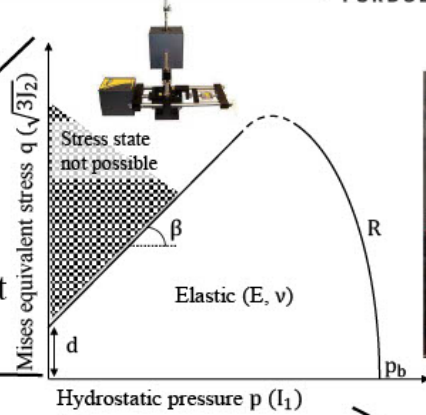
“The author developed a continuum simulation of the first stage of an industrial process that converts a biomass granular material into bio-ethanol, a stage that, if conducted improperly, results in disruption and downtime. The challenge was to model an apparently discontinuous and fibrous granular material as a continuum so that FEM analyses could be conducted of the continuous-feed process. The fundamental parameters of a Drucker-Prager Cap model were extracted from laboratory experiments, along the effect of moisture content on the parameters. The model was used to determine the source of the torque required to push biomass through the feeder, to locate the components of the feeder at which plugging and blockage occurs, and to intuit better designs of the feeder system. The author is commended for demonstrating the capability of material mechanics and continuum analyses to develop improved industrial processes.”



- Feedstock jamming
- Operation hazard
- Plant shutdown
- Economic loss



Rate independent Elastoplasticity



Feedstock variables influence feeder performance

