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MODELING OF CROP FLOW IN COMBINE CHOPPER AND SPREADER

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ABSTRACT Understanding the flow of straw in a combine chopper and spreader is an old challenge. Manufacturers typically perform field tests to measure the power requirement to chop and spread the material versus the quality of chopping (length-of-cut) and homogeneous distribution of chopped residues across the cut width. Analytical and empirical crop flow models were developed over the years to visualize the effect of chopper knife geometry (dimensions, angle of attack, knife density, thickness, speed, diameter, bevel angle, etc.) and spreader geometry (number of drums, paddles, angles, speed, exit angle, cover, etc.). Different types of models (analytical, empirical, stochastic and Discrete-Element Method) are used to model the cutting of particles by the chopper, discharging a mat of material, acceleration/ redirection and spreading of the particles on the field. The overall objective is to model various types of choppers and spreaders and create virtual benchmarks validated with physical assemblies. Special tests are made in the laboratory and in the field with high-speed cameras and field apparatus to validate the models.

Keywords: Crop flow model, combine, chopper, spreader, residue management