

THE DEBALERS 2.0: HOPE DE AVILA, NATHAN STOUT, BENJAMIN ZIMMERMAN, EVAN ALLEN

Objective

To improve the current debaler prototype by making the system automated, i.e., a bale is loaded into the machine and can be fully debaled to loose material with minimal human interaction.



Original Prototype

Background

I The Fundamental Question: How can we effectively and efficiently turn baled material back into the loose material and feed it onto a conveyor for subsequent milling and processing?

I Forest Concepts needs a debaling mechanism to break down large square bales of stover, switchgrass, and similar materials into uniform streams that can be conveyed into their Crumbler® rotary shear comminution systems.



Key Requirements

- I** Baled material must be able to be transported automatically to debaling head
- I** Processed material needs to be fluffed with minimal or no fines.
- I** Debaler can be controlled from a safe location during operation
- I** Machine can be quickly shut down with an Emergency stop



Current Prototype

Final Design

- I** Infeed conveyor with variable speed that can support two 140 lb bales
- I** New 1.5hp 3-phase Header motor controlled with VFD
- I** Fwd/Stop/Rev switches for controlling both the Infeed conveyor and Header are located for safe operation while machine is running
- I** Header Shroud to contain and funnel debaled material into outfeed chute
- I** Protective chain covering



Debaled material

Recommendations

- I** Replace chain drive on header with a belt drive system to reduce possibility of motor damage.
- I** Increase header finger length to allow debaling head to process material more efficiently
- I** Tilt infeed conveyor downward so that baled flakes do not fall into debaling head.
- I** Create feedback loop so that the debaling process could be run with no human interaction.

Acknowledgements

Thank you to:

- I** Forest Concepts for funding the project.
- I** Dr. Brian He, Dr. Dev Shrestha, Dave Lanning, and Cobi Brower for your mentorship and guidance.
- I** The U of I Beef Center for supplying the bales we used for our final testing.

