



Corn Stover Fractions from Different Harvest Conditions

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Changing the World's Energy Future

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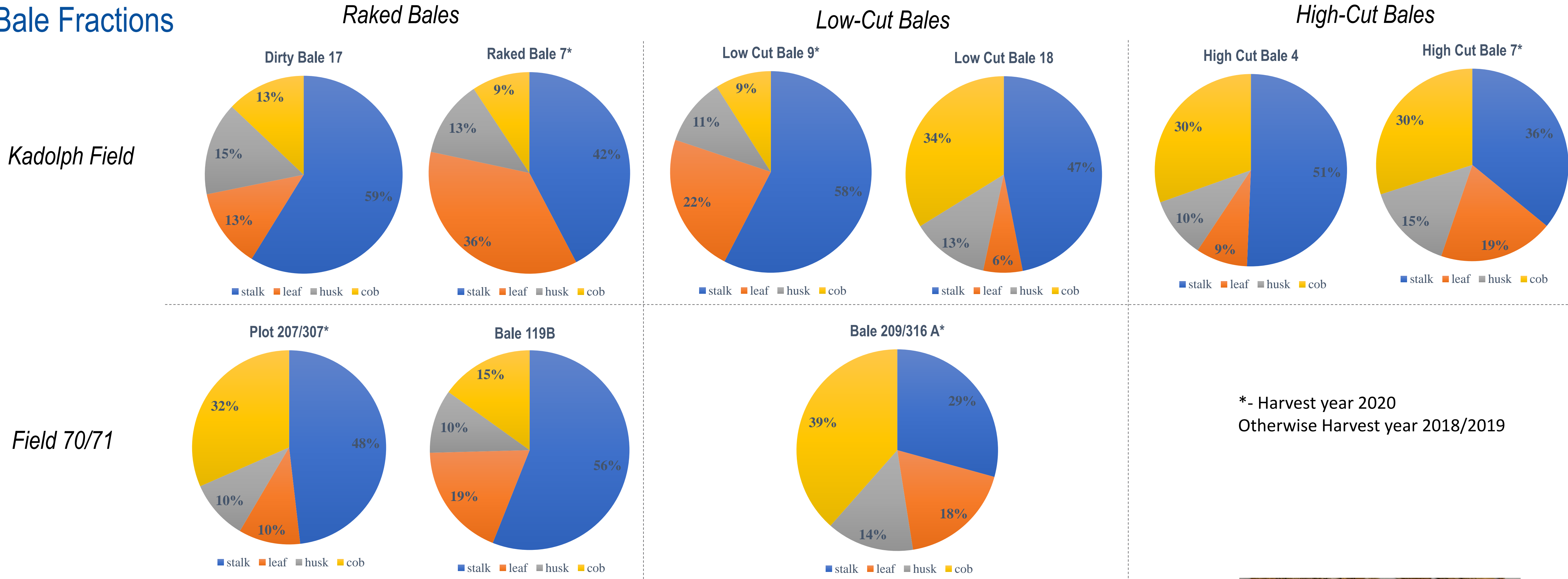
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Introduction

There is a lot of variability in biomass. This variability can make it difficult to process the biomass into a consistent format for handling and conversion. As a result, bioenergy feedstocks are often under- or over-converted. Corn stover in particular can be harvested in different ways, baled in different ways, and has significant intrinsic variability due to its very different anatomies. These factors could cause variability in the fractions of corn stover. The fractions of corn stover are leaf, husk, cob, and stalk.

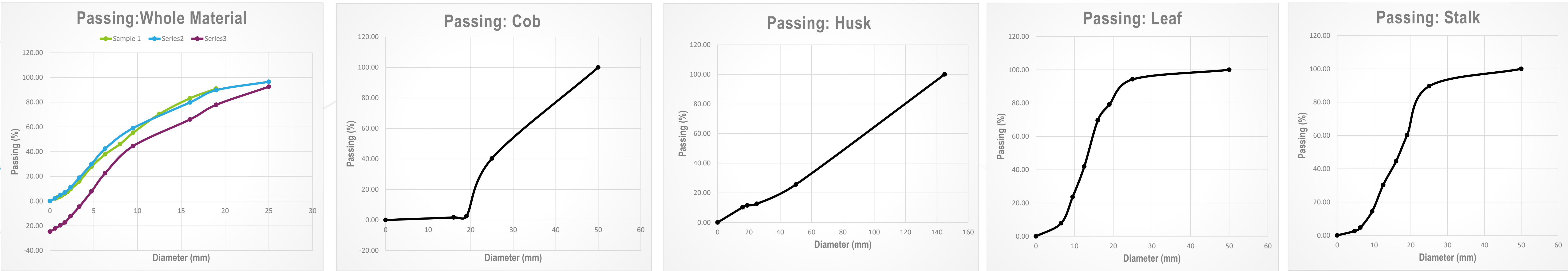
Bale Fractions



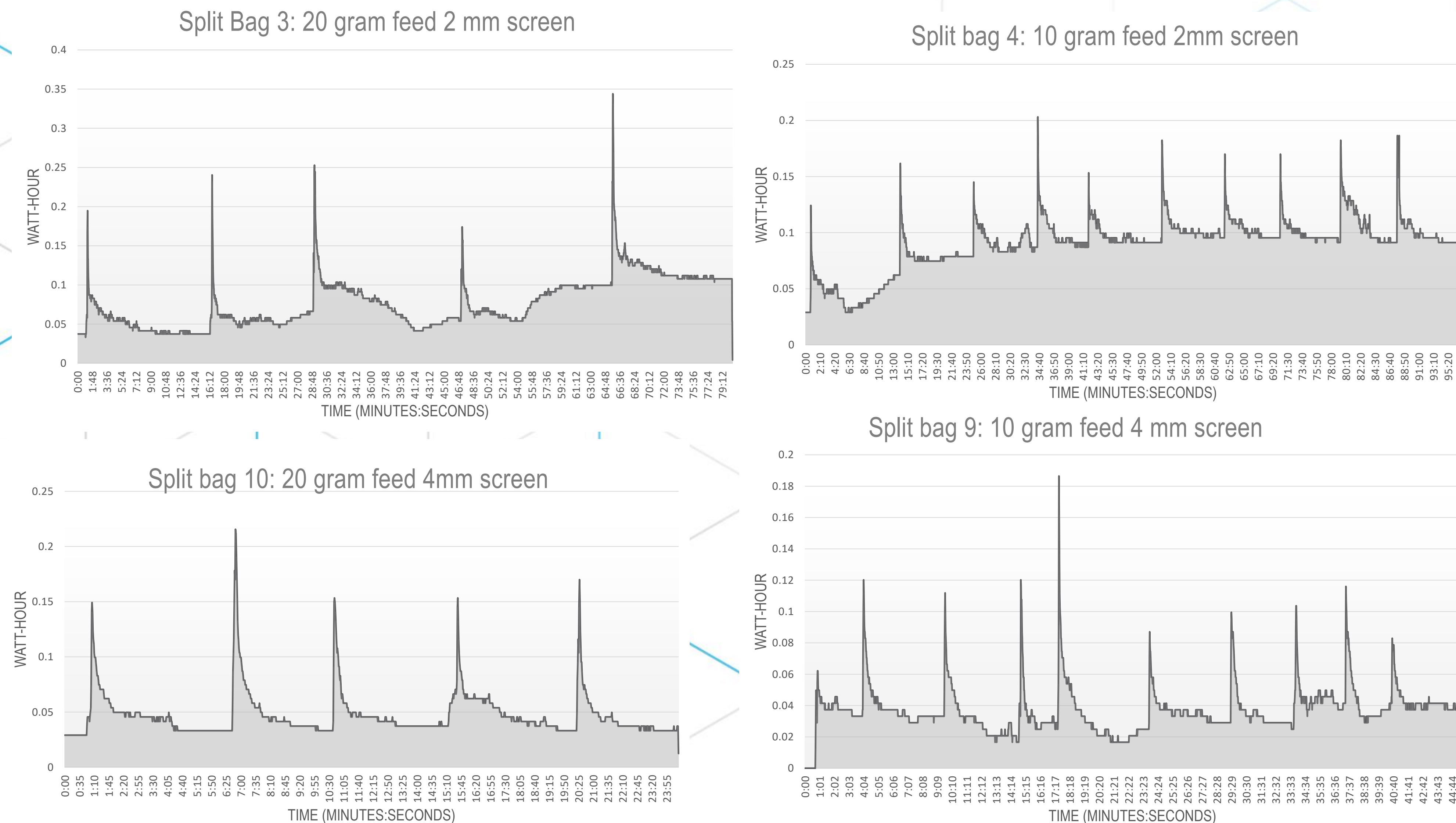
First, we look at the fractions of each bale. We are looking at material from two different fields, three different harvest methods, and from two different years. Each bale is labeled to the left with the percentage of each fraction in the bale. Each bale seems to have a variation of each fraction.



Size Distribution of each Fraction



Grinding Study Feed Amounts



The grinding studies shown above used whole material from Low Cut Bale 9. The moisture content of the whole material is around 6.90%

Bale Information

Field	Harvest Method	Year
<ul style="list-style-type: none">Kadolph70/71	<ul style="list-style-type: none">RakedHigh-CutLow-Cut	<ul style="list-style-type: none">2018/20192020

Discussion

For the grinding studies we have a sample of around 100 grams and we have to feed the 100 grams into the grinder. We want the feed amount to be large enough that we can see a spike of energy when the material enters the grinder, but we also want the amount to be small enough that it will not plug up the grinder. We tested 10 gram feeds and 20 gram feeds to test if that amount will work for our studies. In the tests we used material right off the bale which is a lower moisture content than what we will have in our studies. We found that the 10 gram feed does not plug up the grinder for whole material, and we can see the energy spike.

In the graphs to the left you can see how the 2mm screen uses more energy than the 4mm screen, and the 20 gram feed uses more energy to grind than the 10 gram feed.

Future Work

- Test the feed rate of whole material with a moisture content of 10%,20%, and 30%.
- Further studies of feed rates for the corn stover fractions.
- Further studies will include density and flowability measurements of ground material at INL, organic composition at INL, and convertibility at SUNY.
- Air classification (commercially relevant) will be used to generate fractions rich in the various anatomies (>80% wt), and the studies will be repeated.
- Determine if mechanical preprocessing is worthwhile.