



July 24-26, 2016

PFI ANNUAL CONFERENCE

The Omni Grove Park Inn – Asheville, North Carolina

Pellet Durability Index: What Does it Really Measure?

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Purpose

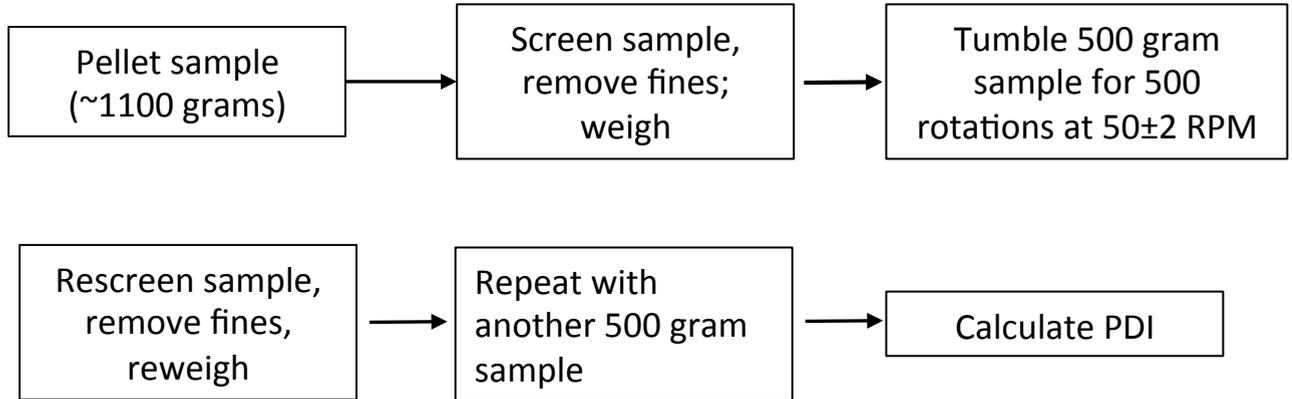
3.1.3 *Pellet Durability Index (PDI)* – a standardized parameter for specifying the ability of the fuel pellets to resist degradation caused by shipping and handling.

Kansas State University - *Mechanical Durability of Feed Pellets*, Call Number:
LD2668 .T4 1962 Y68

ASAE S269.4: Cubes, Pellets, and Crumbles--Definitions and Methods for Determining Density, Durability, and Moisture Content.



Outline of Procedure



$$PDI = \frac{\textit{Final Pellet Weight}}{\textit{Initial Pellet Weight}} \times 100$$

Methods



Common tumble box



Pneumatic, small
sample- O NORM
M 7135



European Tumbler-
EN-15012-1

Tests

- Duration of tumbling – is 10 minutes really enough to see anything?
- Effect of moisture content on durability
- Effect of moisture content on pellet strength
- Effect of furnish particle size on durability

Before We Begin:

When Does Fracturing and Breakdown Occur?



Results

Fines Generation vs Tumbling Time

Pellets After 30 Minutes of Tumbling

Softwood 0% MC (d.b.)

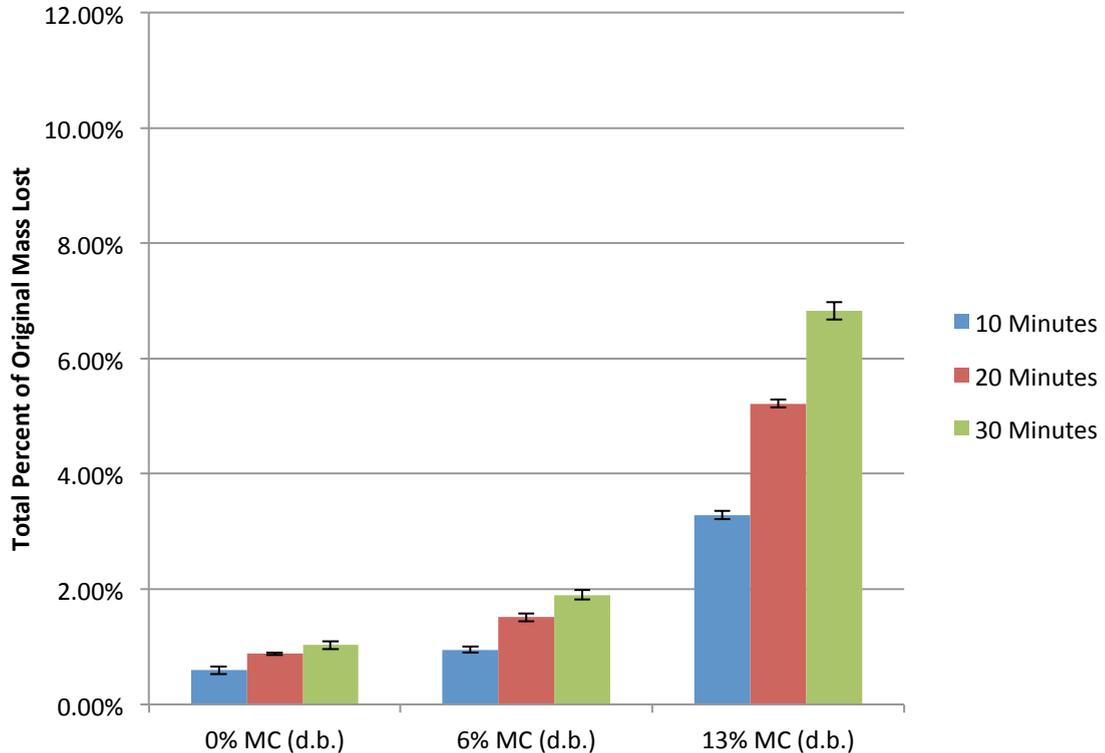


Softwood 13% MC (d.b.)



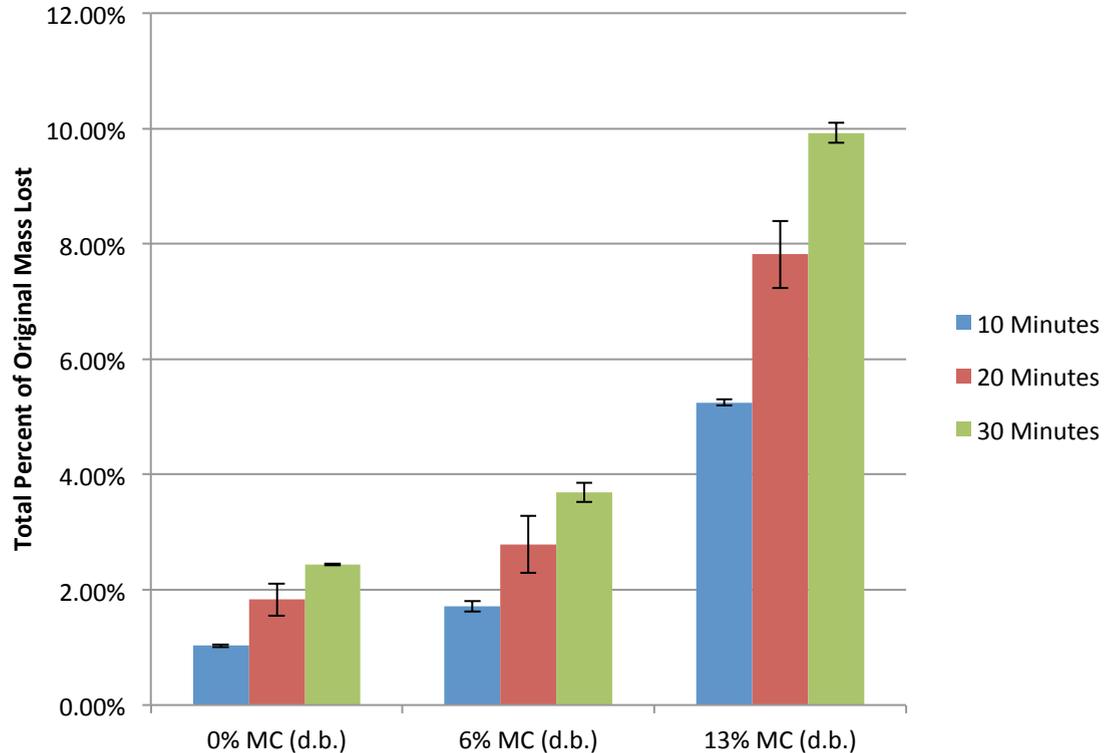
Pure Softwood

Mass Lost As Fines After Durability Test



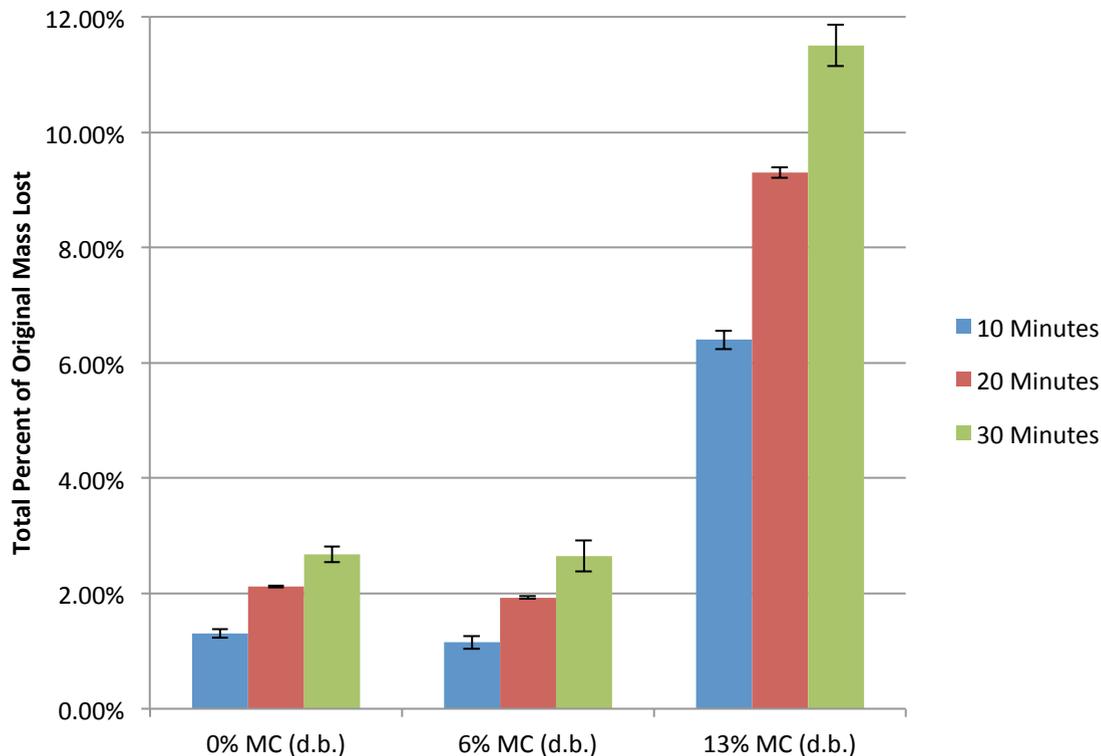
Pure Hardwood

Mass Lost As Fines After Durability Test



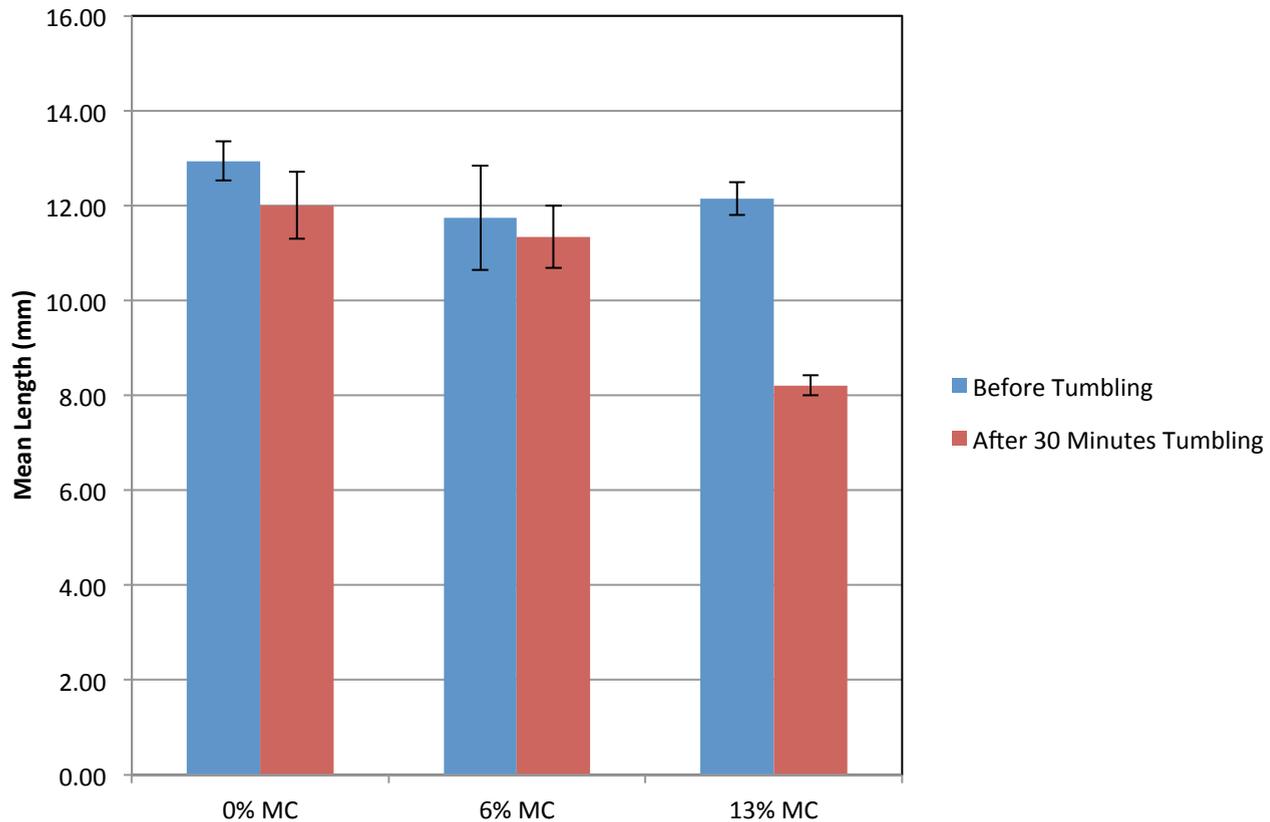
Mixed Hardwood/Softwood Blend

Mass Lost As Fines After Durability Test

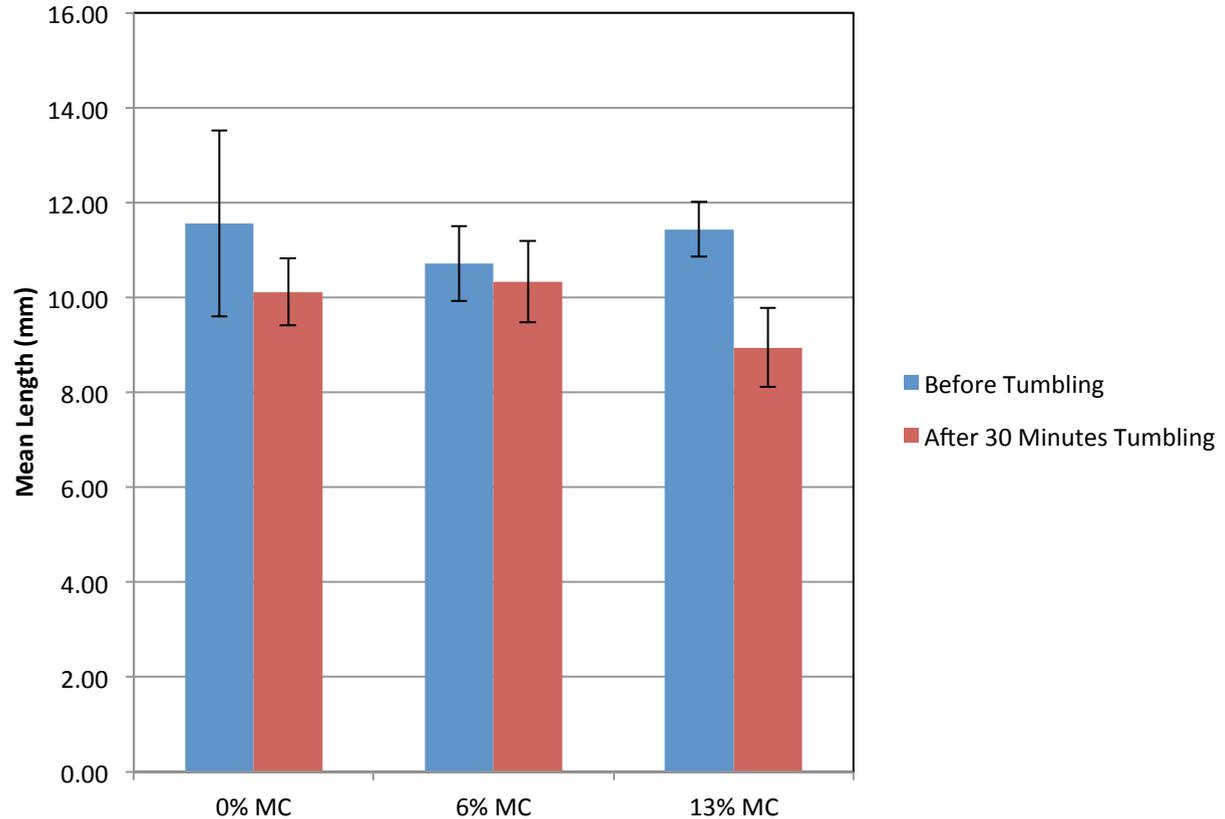


Results – Mean Length Change

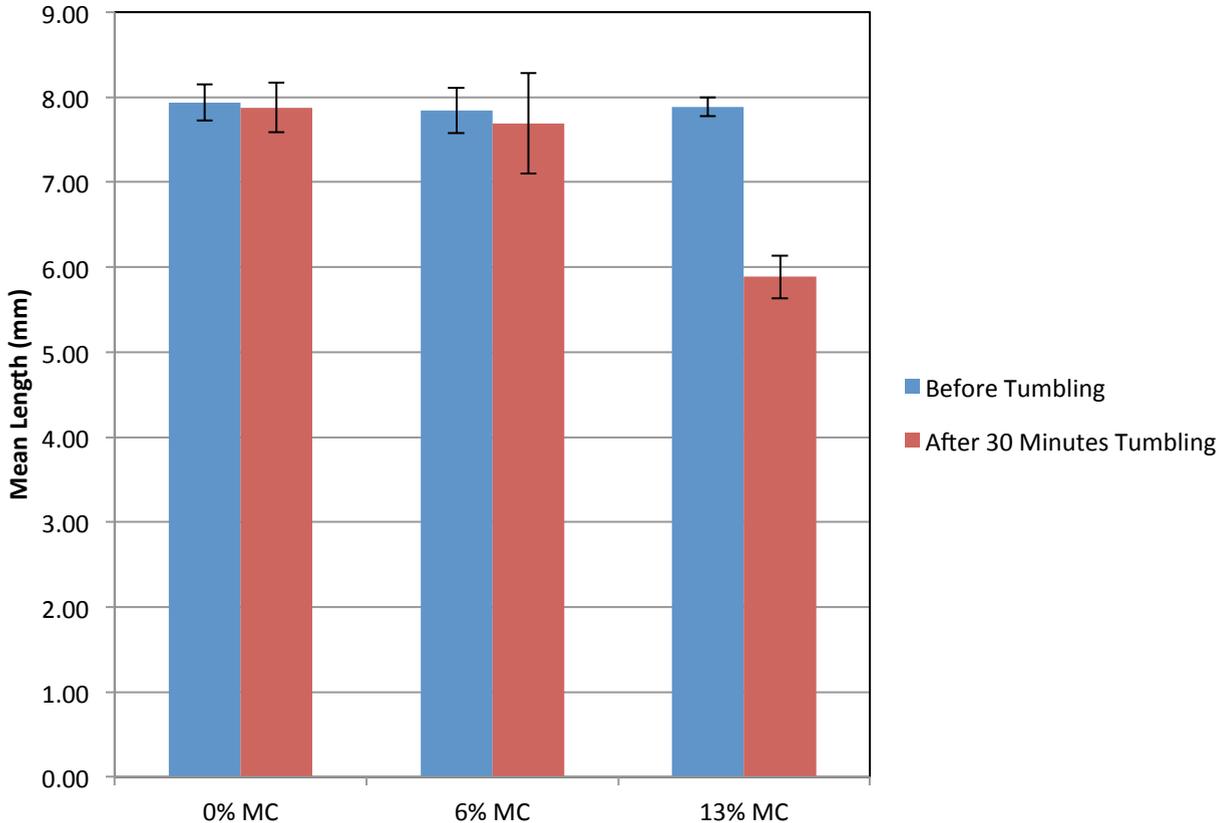
Softwood



Hardwood

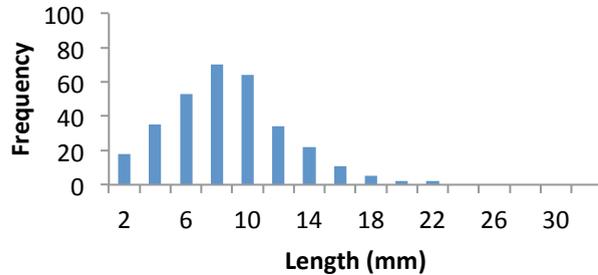


Softwood/Hardwood Blend

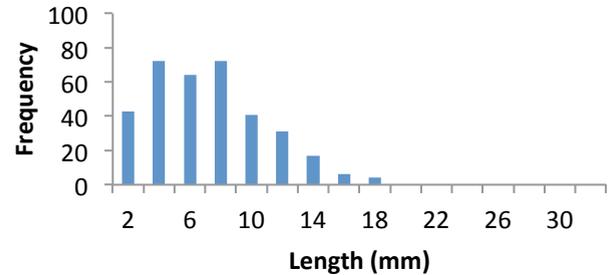


Length Distribution After Tumbling

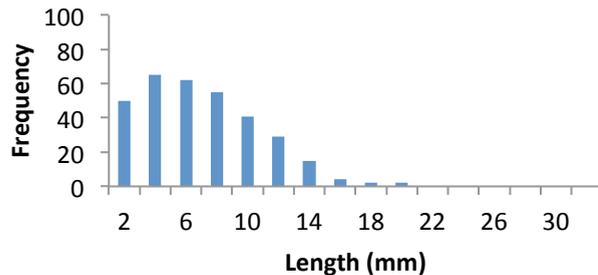
Before Tumbling



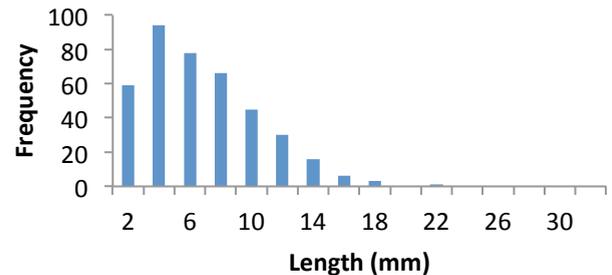
After 10 Minutes



After 20 Minutes



After 30 Minutes



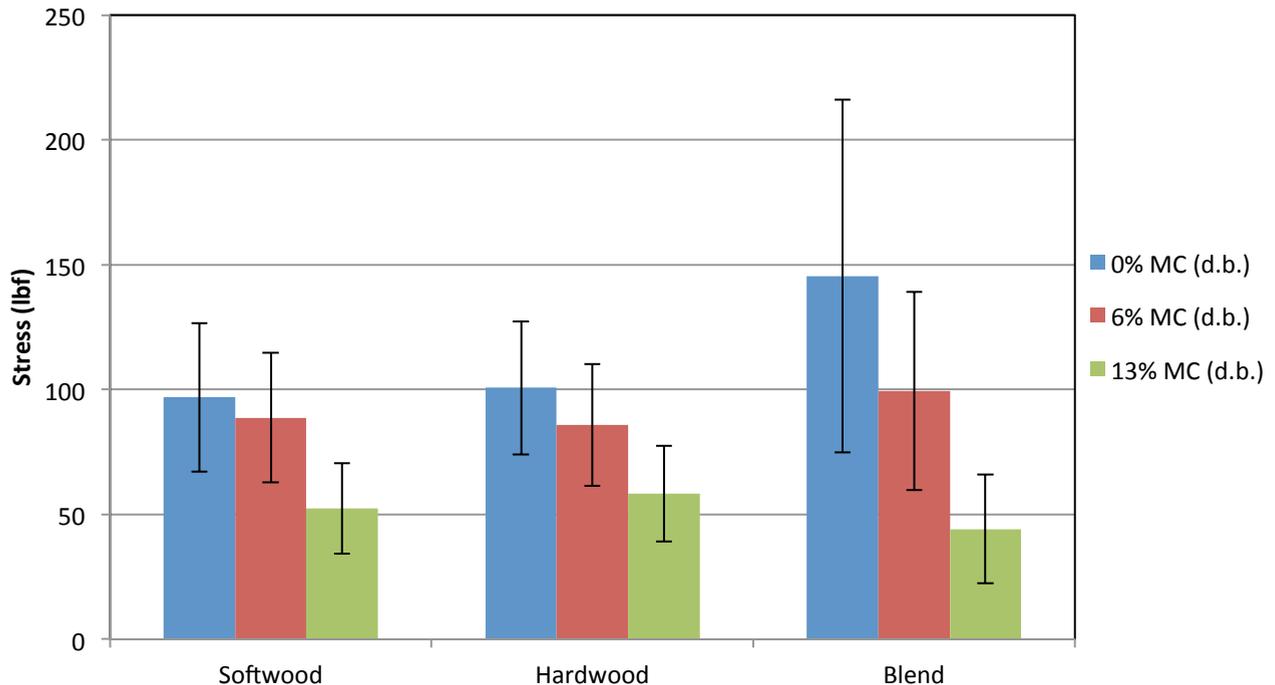
Softwood/Hardwood Blend, 13% MC (d.b.)

Compressive Strength Tests

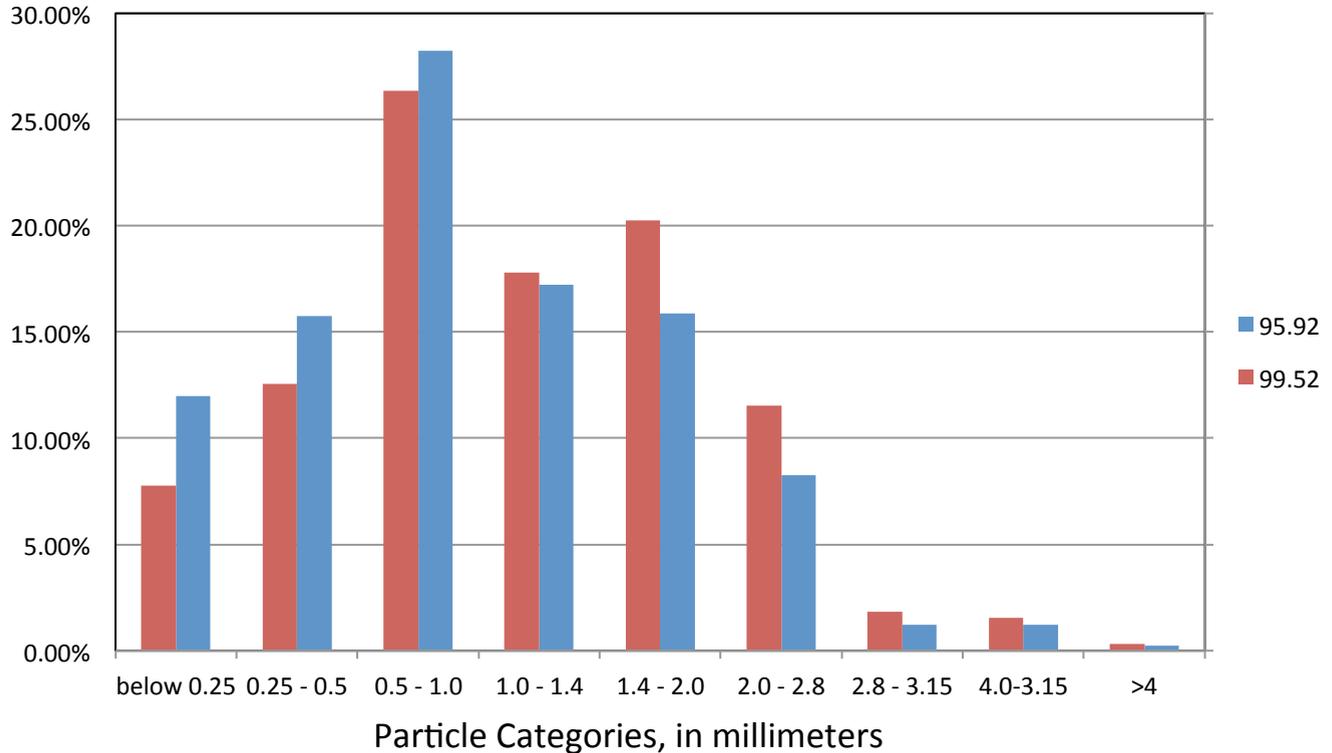
Instron Compressive Strength Tests



Results - Compressive Strength Test



What About Particle Size?



Conclusions

Conclusions

- Pellet samples of 13% MC (d.b.) show a significant decrease in durability and strength
- Pellet samples of 0% and 6% MC (d.b.) do not show a significant decrease in mean length after 30 minutes in the tumble test
- Pellet furnish size may be important

Adding water or pre-steaming

- Increases durability
- Decreases energy consumption
- Increases die life

Acknowledgements

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Thank You.



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