

Background

- Three billion people around the world use wood burning stoves made from brick for cooking.
- Carbon monoxide released as emissions can be harmful.
- People are dying at an earlier age due to lung problems and other factors such as cancer.
- Mixing organic materials into brick recipes increases their insulative properties, however it also decreases their overall strength.



Improving Cook-Stove Bricks with Organic Materials

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Objective:

Determine which organic additive generates the strongest and most insulative brick.

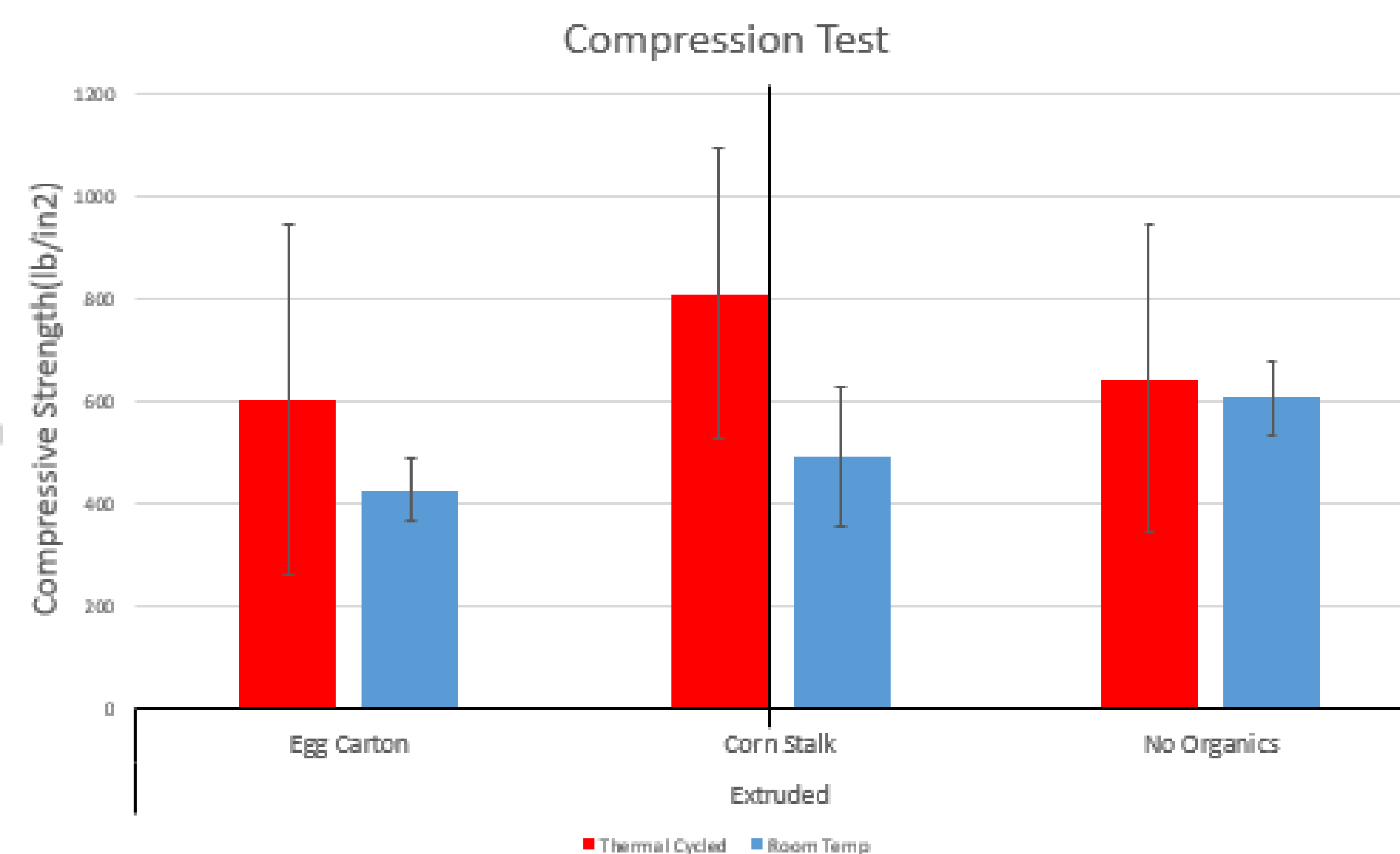
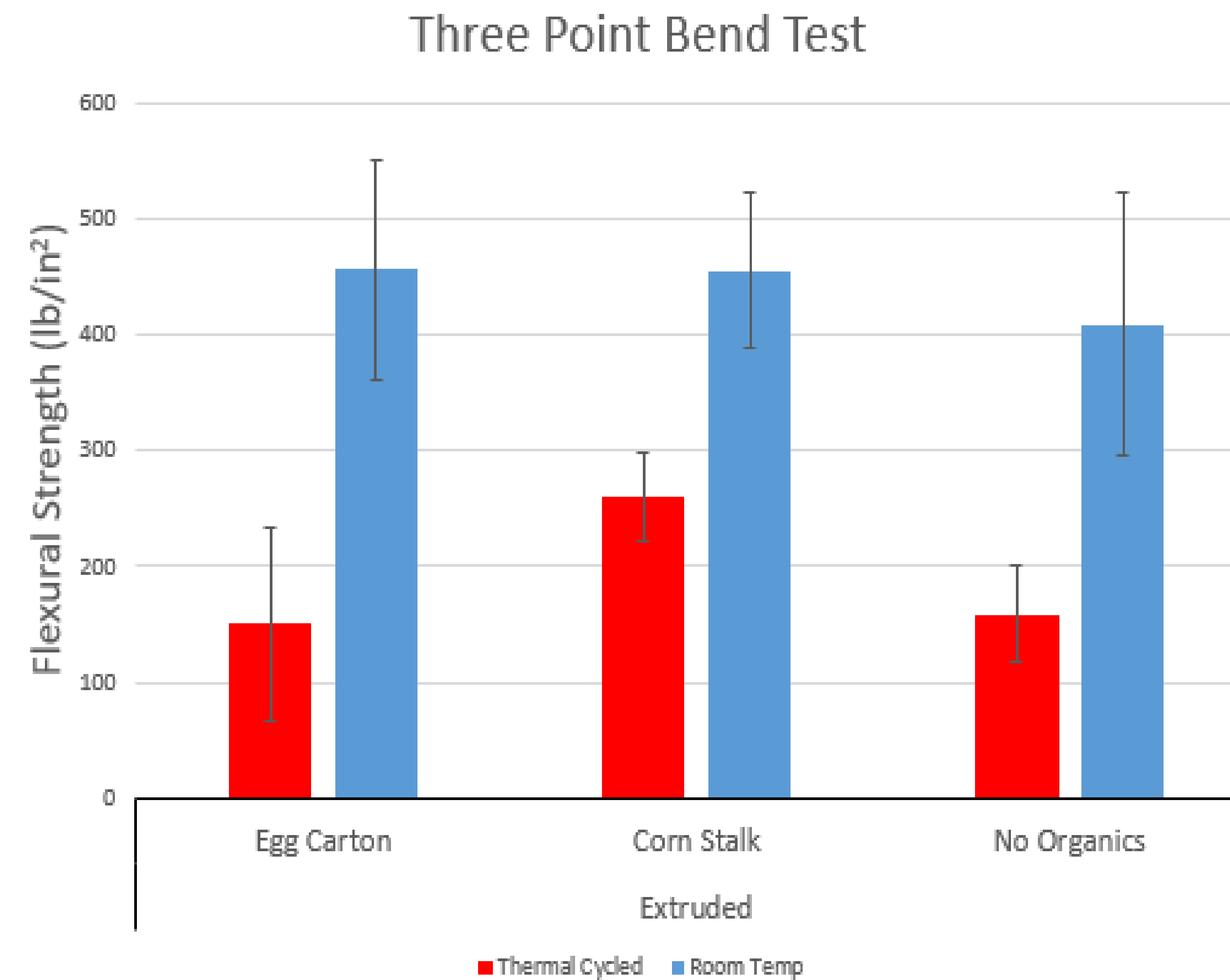
Conclusion

- The corn stalk brick was found to have the best overall performance
- The bricks were found to have a better compressive strength but a lower flexural strength after thermal cycling.
- The porosity tests were inconclusive

Recommendations

- Revise molding process
- Consider increasing thermal cycling temperature
- Test thermal capabilities of materials
- Consider evaluating microstructures
- Increase sample size

Results



References

- ¹ASTM International. *ASTM C1171-16 Standard Test Method for Quantitatively Measuring the Effect of Thermal Shock and Thermal Cycling on Refractories*. West Conshohocken, PA: ASTM International, 2016. Web. 16 Oct 2017.
- ²Bryden, Dr. Mark, et al. *Design Principals for Wood Burning Cook Stoves*. Aprovecho Research Center.
- ³Zhang, J., et al. "Carbon monoxide from cookstoves in developing countries: 1. Emission factors." *Chemosphere-Global Change Science* 1.1 (1999): 353-366.

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Test Methods

3 Point Bend Test
(ASTM: C133-97)

Compression Test
(ASTM:C126-16)

Baseline

Thermally Cycled
[2 cycles, 15 mins, @1100F]

Baseline

Thermally Cycled [2 cycles, 15 mins, @1100F]

Method	Extruded	Test Methods			
		3 Point Bend Test (ASTM: C133-97)	Thermally Cycled [2 cycles, 15 mins, @1100F]	Compression Test (ASTM:C126-16)	Thermally Cycled [2 cycles, 15 mins, @1100F]
	Control	4	4	5	5
	Egg Carton	4	4	5	5
	Corn Stalk	4	4	5	5

Porosity testing was used as a measure of insulative properties.

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