Production of Quality Feedstock From Forest Residues for Emerging Biomass Conversion Technologies

Derek Nelson

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U.S. DEPARTMENT OF ENERGY

HUMBOLDT STATE UNIVERSITY

For more information please visit WasteToWisdom.com

The Grant

The grant is part of the Biomass Research and Development Initiative, a collaborative effort between the Department of Energy and the U.S. Department of Agriculture that supports renewable energy research in the rural United States.

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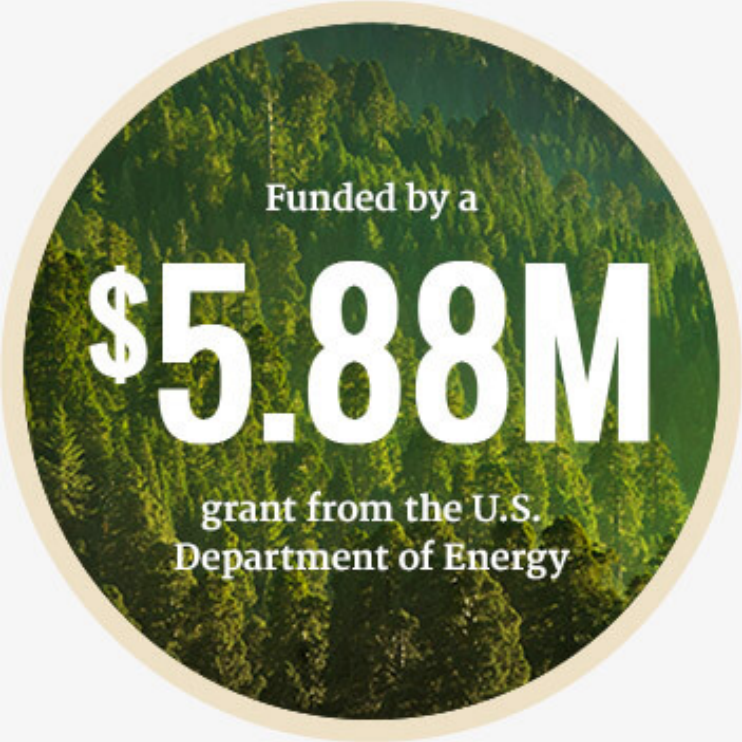
Sub Awardee (PFI) End Date: 6/30/17



About

Waste to Wisdom is an innovative biomass research project led by Humboldt State University and 15 multiple regional partners, who are building on existing research on the conversion of forest residues into renewable energy and other valuable bio-based products.

To make better use of forest residues wasted from timber harvests and thinning by using new equipment, operations, and technologies that can turn that biomass into valuable bioenergy and bio-based products.

Regional Partners Include ……..

Pellet Fuels Institute
Forest Business Network
Green Diamond Resource Company
University of Washington
Oregon State University
Bureau of Land Management
USFS Rocky Mountain Research Station
USFS Forest Products Lab
Redwood Forest Foundation
Forest Concepts
Steve Morris Logging
Peterson Pacific
Biochar Solutions

Pellet Fuels Institute

Share of the grant = $352,000

Deliverables –

Provide technical research assistance and advice

Problems - Solutions

- Wood chips, dead trees, branches, and tops left after timber harvest operations are typically burned or left on the ground to rot.
- Feds: Drought kills 66 million trees in California's Sierra Nevada Forests since 2010.
- What if you could turn all that material into energy—to fuel a jet airplane or even heat your home?
- Collecting woody biomass can also mitigate catastrophic wildfires in California, which have grown in number and severity in recent years due to climate change and forest overgrowth.

Waste to Wisdom Project Overview

Forest residuals and slash are an immense, underutilized resource.

But transportation costs are prohibitively expensive due to their low bulk density and low market value.

These economic barriers can be overcome by

1. Increasing the transportation efficiency, and/or
2. Increasing the value of the residuals

Waste to Wisdom Project Overview

Producing briquettes from forest residuals addresses both of these needs by

1. Increasing transport efficiency by increasing bulk density
2. Increasing value of residuals by producing a quality heating fuel for consumer or industrial use

Project Goals

Determine how to convert forest residuals into a quality briquette.

1. Test a briquetter with a variety of feedstocks from different comminution methods at different moisture contents.

2. Evaluate the briquettes based durability, density, ash content, etc.

3. Assess the marketability of these briquettes through real world market studies.

Testing: Phase 1

Dates: April 2015

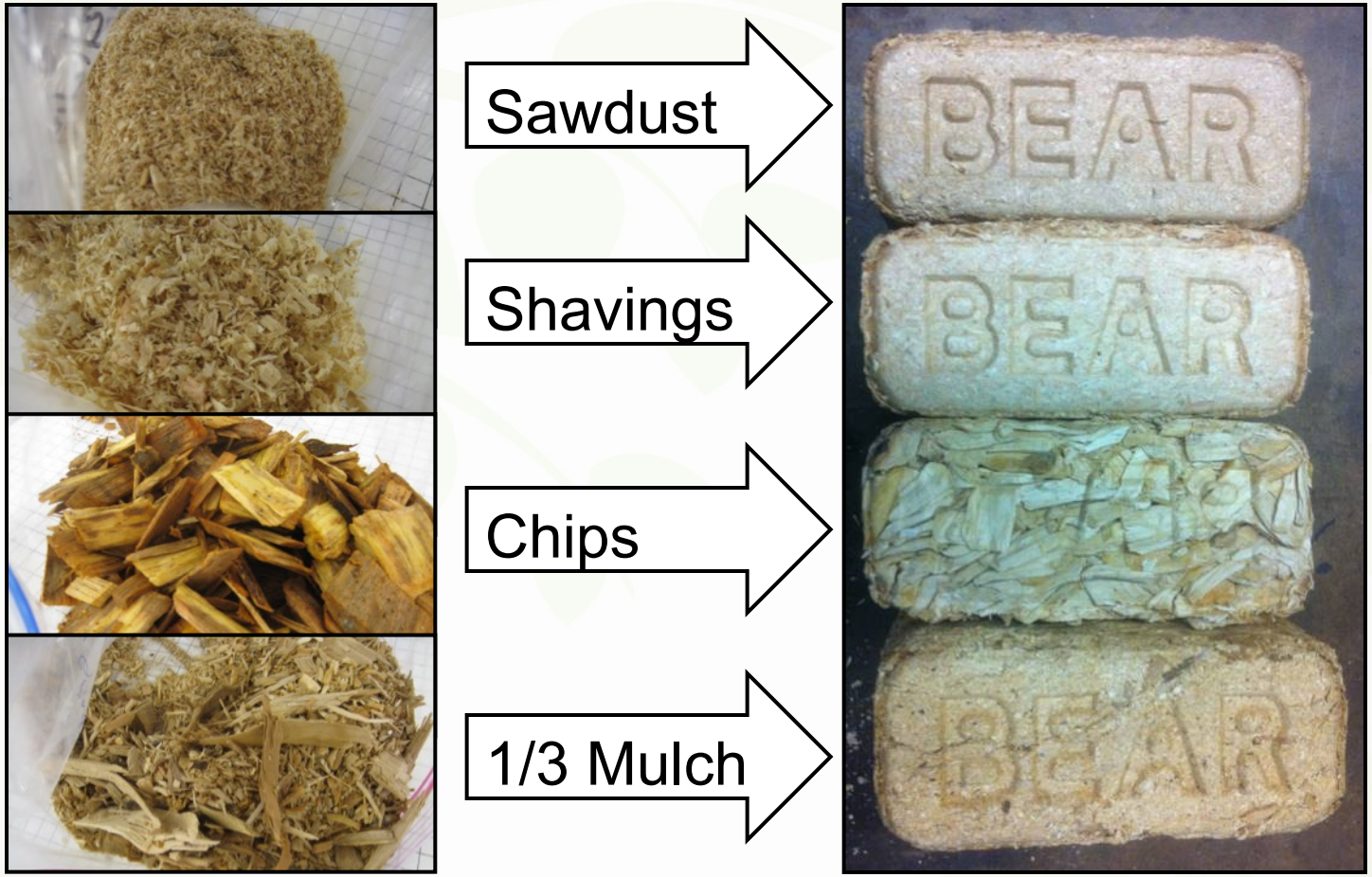
Location: Industrial Facility

Feedstocks included:

- Sawdust
- Shavings
- Mulch
- Chips
- Forest Residuals

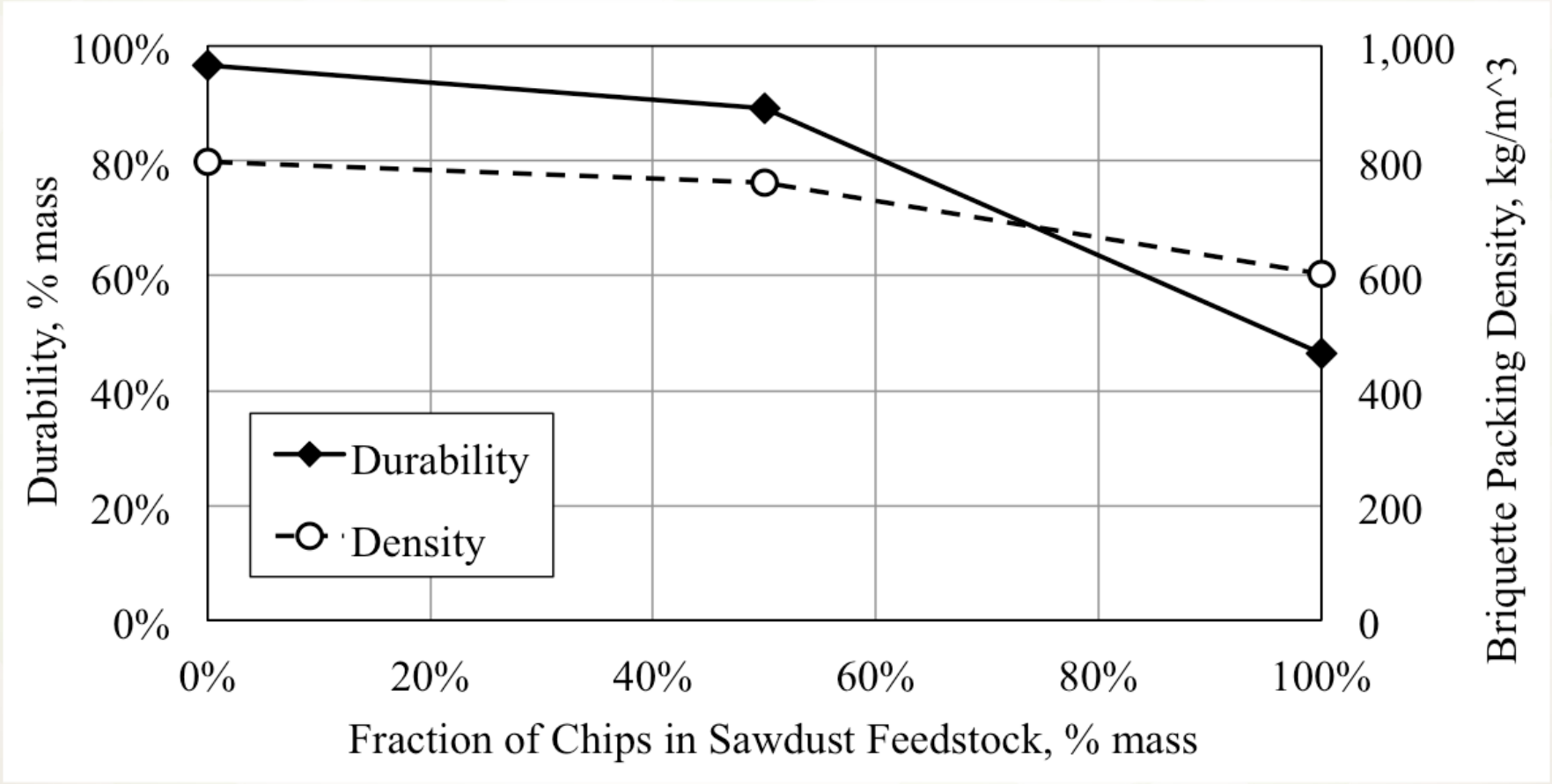
Objective: Preliminary study

Testing: Phase 1, Example Outputs



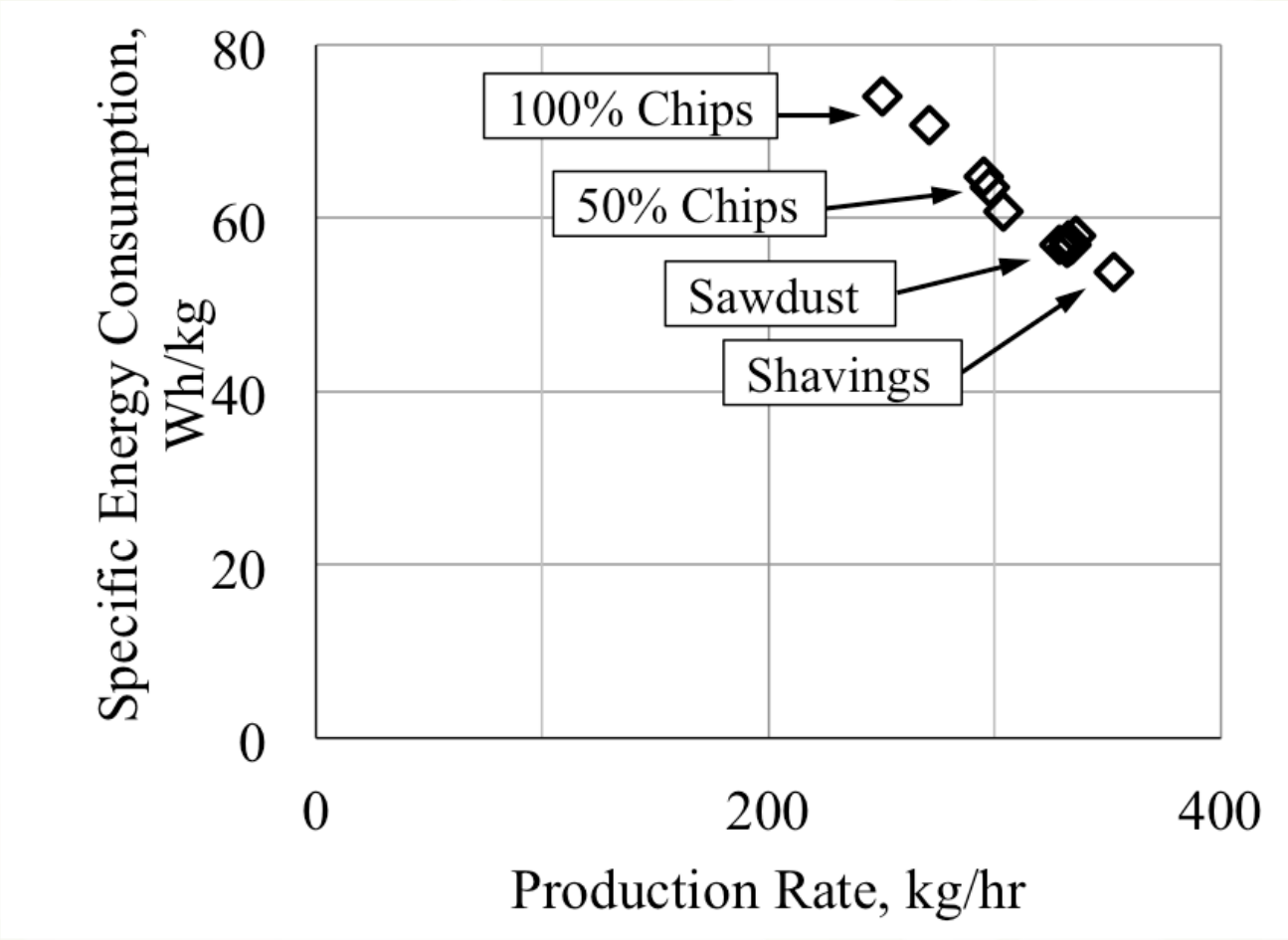
Testing: Phase 1, Results

Pure chips have low density and durability, but mixing with 50% sawdust improves both of these attributes greatly.



Testing: Phase 1, Results

Fines feedstocks (e.g. sawdust and shavings) have higher production rate and lower electricity use.



Testing: Phase 2

Dates: July 2015

Location: Field Site
Big Lagoon, CA

Feedstocks included:

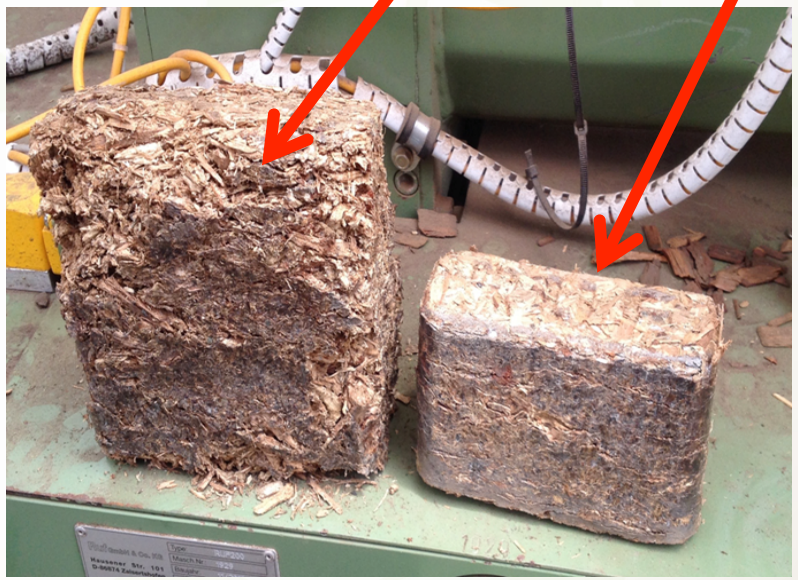
- Chipped
- Ground
- Tops
- Torrefied Biomass

Objective: Test machine in field environment

Testing: Phase 2, Observations

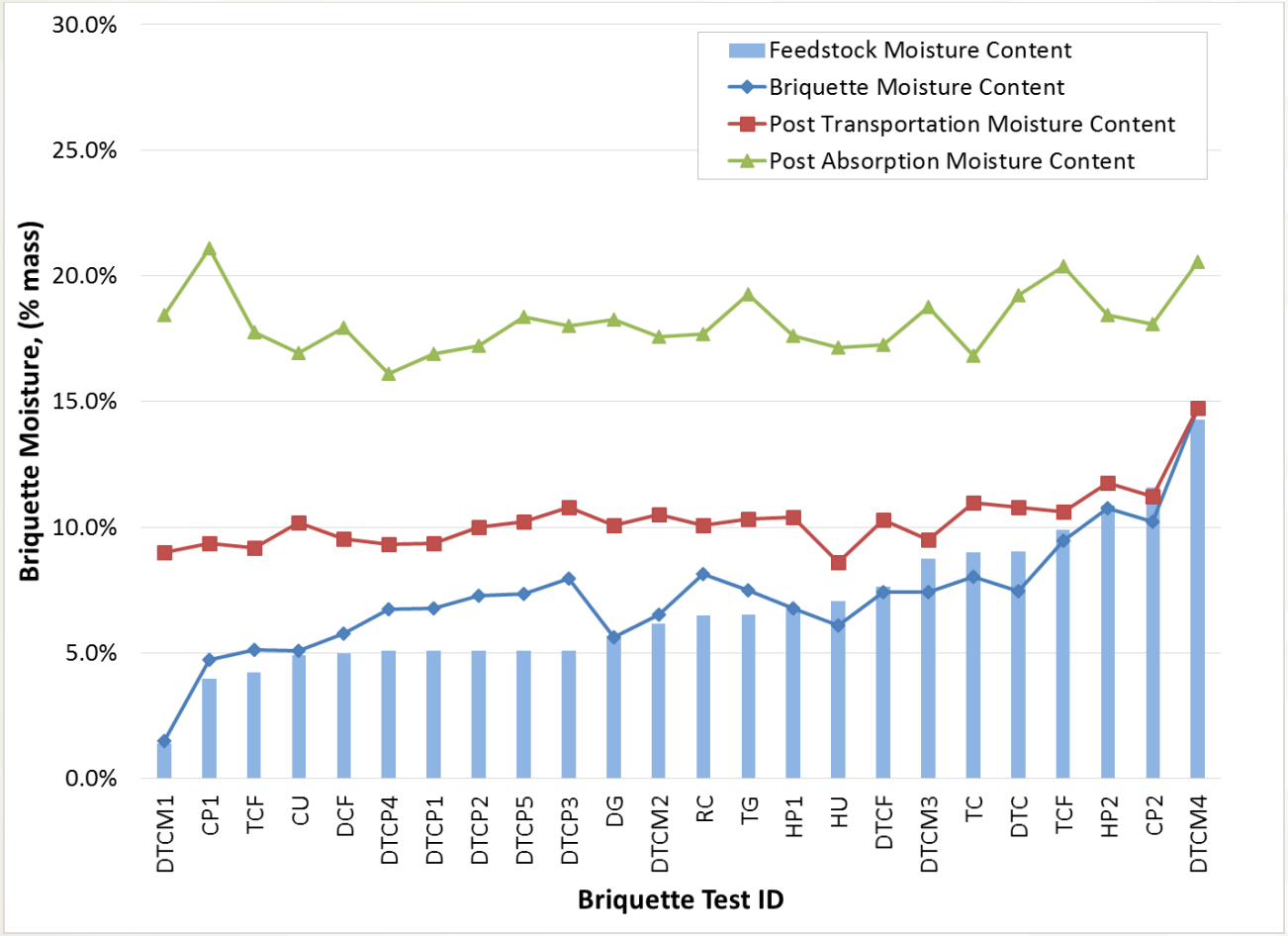
Initial Observations and Findings

- Feedstocks with moisture content above 18% makes poor quality briquettes (below right)
- Chip sizes greater than 4 inches may jam the machine (below left)



Testing: Phase 2, Results

Feedstock moisture content influences briquette moisture content, but moisture after a transportation simulation or after maximum absorption are constant across all feedstocks.



Max. Absorptivity

Post-Trans. M.C.

Briquette M.C.

Feedstock M.C.

Testing: Phase 2, Results

Impact of Moisture Content

Increasing feedstock moisture content reduced durability and density.

However, the durability after a transportation simulation is constant regardless of initial moisture content.

Testing: Phase 3

Dates: Current

Location: Field Site,
Samoa, CA

Feedstocks included:

- Hardwood
- Softwood
- 50% chips +
  50% fines

Objective: Generate samples
for marketability
test.

Testing: Phase 3, In Progress

Briquetter currently being set up.
Production begins this week.

Results forthcoming…

Thank you. QUESTIONS ?

Special thanks to John Crouch, PFI, and Michele Reeder, PFI

Derek Nelson
Forest Business Network
406-370-7100
3mmontana@gmail.com