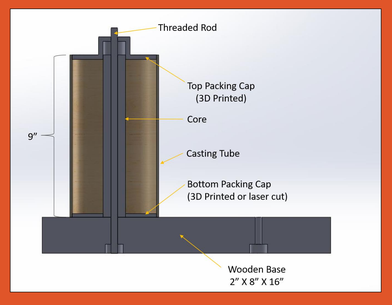
MANUFACTURING

Mixing

Mixing is the process of combining ingredients in a specific order, amount, and manner to create propellant.

Packing

Packing is the process of shaping un-cured propellant into cored cylinders called "grains". The packing fixture shown below is used to clamp down on the propellant as it cures, increasing its density.



Final Product

After curing, the propellant is soft like rubber but contains a serious amount of potential energy!

Oregon State University

ESRA 30K ROCKETRY TEAM PROPULSION: MIXING

The ESRA team intends to design, manufacture, and compete with a solid-fuel rocket that will reach 30,000 feet. The Propulsion: Mixing sub team is responsible for developing the propellant that will get it there.

TESTING & CHARACTERIZATION

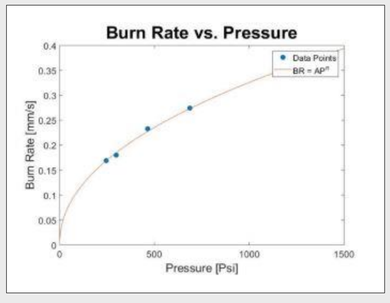
Characterization is the process of determining the burn characteristics of solid rocket propellant using data gathered from sub-scale static fires. The product of characterization is Muraour's Linear Burning Rate Law:

$$R = AP^n$$

R = Propellant burn rate
P = Motor chamber pressure
A = Constant of proportionality
n = Pressure index

R and P come from data collected at sub-scale static fires. A and n must be determined mathematically from a minimum of three tests with three different nozzle throat diameters. Once A and n are found, this equation can predict the performance of full-scale motors.

Results from sub-scale testing:



BURN RATE CONSTANTS	
A	0.0129
n	0.46749

TEAM MEMBERS
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PROJECT SPONSOR
Experimental Sounding Rocket Association (ESRA)

PROJECT STATUS

- Propellant mixing/packing methods established
- Completed all necessary sub-scale static fire testing
- Current propellant formulation characterized
- Completed all necessary full-scale static fire testing