PFI Standards Symposium:
Developing an Internal Lab

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Why Set Up an Internal Lab?

- Assure Quality Products –
  Ref: PFI QA/QC Handbook Section 6.9: Quality Control and Quality Assurance Testing

- Not *Required*…

…but **Recommended**!

Considerations in Lab Design:

- Raw Material
- Process Control
- Production Volume
- Grade Requirements

Raw Materials (Front End)

1. Know what you are buying!
   "Garbage IN = Garbage OUT"

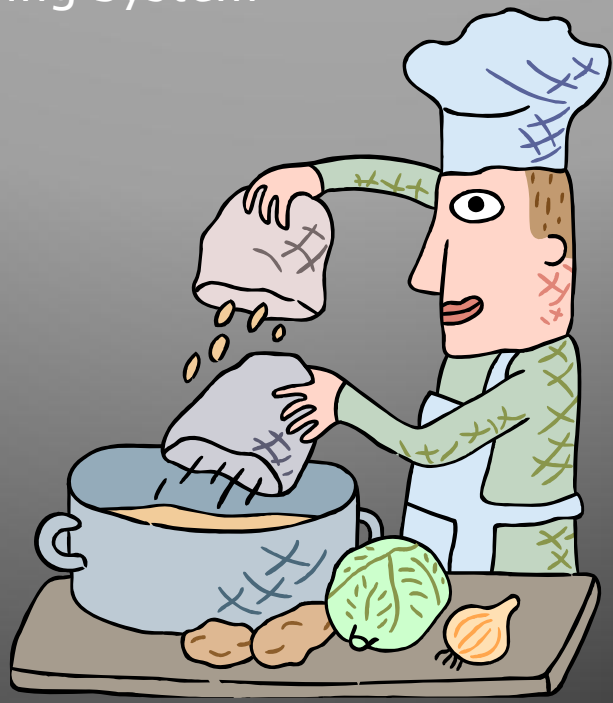
2. Know what you are Receiving
   - Sample and Test EACH AND EVERY load

3. Manage your raw materials onsite

Process Control

Manage the mix : *Follow your Recipe*

Well Engineered and Maintained Processing System



Production Volume

Consider the Investment --→ It's a BALANCING act…

Grade Requirements (GR)

Test Methods Available

-ASTM.org

-PFI Standard Specifications for Residential/Commercial Densified Fuel (table 1)

	Residential/Commercial Densified Fuel Standards See Notes 1 - 3		
Fuel Property	PFI Premium	PFI Standard	PFI Utility
Normative Information - Mandatory			
Bulk Density, lb./cubic foot	40.0 - 46.0	38.0 - 46.0	38.0 - 46.0
Diameter, inches Diameter, mm	0.230 - 0.285 5.84 - 7.25	0.230 - 0.285 5.84 - 7.25	0.230 - 0.285 5.84 - 7.25
Pellet Durability Index	≥ 96.5	≥ 95.0	≥ 95.0
Fines, % (at the mill gate)	≤ 0.50	≤ 1.0	≤ 1.0
Inorganic Ash, %	≤ 1.0	≤ 2.0	≤ 6.0
Length, % greater than 1.50 inches	≤ 1.0	≤ 1.0	≤ 1.0
Moisture, %	≤ 8.0	≤ 10.0	≤ 10.0
Chloride, ppm	≤ 300	≤ 300	≤ 300
Heating Value	NA	NA	NA
Informative Only - Not Mandatory			
Ash Fusion	NA	NA	NA

GR 1: Bulk Density – ASTM E 873

"The fuel mass per cubic foot of the fuel sample" – PFI

1) ASTM Method : 1 cu-ft box filled and dropped six inches three times and weighed

2) PFI Alternative Method : ¼ cu-ft mold filled and tapped 25 times and weighed

GR 2 : Diameter

"The average diameter of the fuel pellets in the fuel sample" – PFI

Measure the diameter using a caliper*

*Be sure to calibrate the caliper

GR 3 : Pellet Durability Index (PDI)

"A standardized parameter for specifying the ability of the fuel pellets to resist degradation caused by shipping and handling" -PFI

PFI Standard Specs Annex A.1

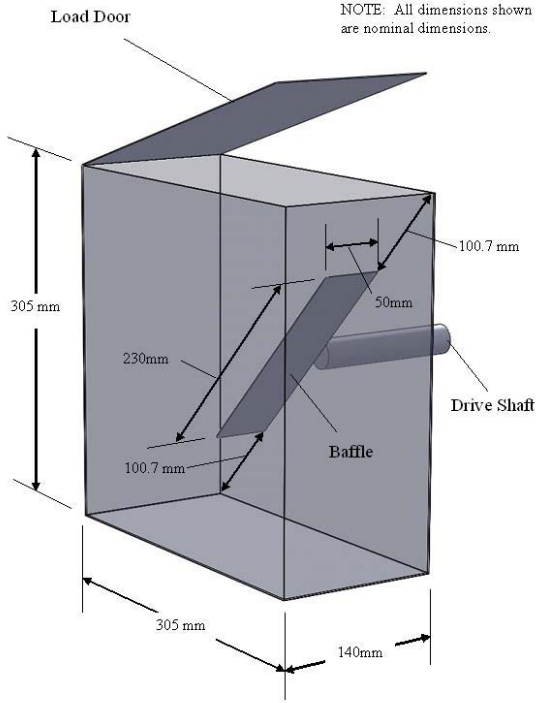


FIG 1. Pellet Durability Tester

GR 4 : Fines

"The percentage of fuel material in the fuel sample passing through a 1/8 inch screen when the fuel is sampled in accordance with the requirements of 8.1.4" – PFI

- Needs to be performed at the mill
- PFI Method 8.1.4 is time consuming…
- Alternate speed screener
- → *DEMO: Scott Lucas, Lucas Welding and Fabrication*

GR 5: Inorganic Ash – ASTM D1102

"The percent inorganic material in the fuel sample" –PFI

IMPORTANT TO CONTROL FOR GRADE!!!

- Need quality testing equipment for accurate results
- Can be avoided by good raw materials and process control
- Computrac Max – 5000
- → *DEMO: Jason Benge, Arizona Instruments*

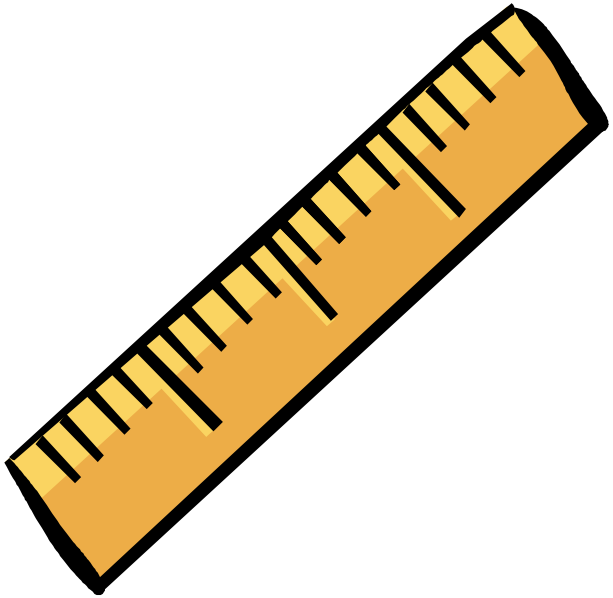
GR 6: Length

"The weight percent of pellets exceeding 1.5 inches in length in the fuel sample" – PFI

PFI Standards Specs 8.1.7

Use a caliper or measuring block*, follow the procedure

*Make sure the block or caliper is calibrated



GR 7: Moisture Control – ASTM 871

"The moisture content of the as received fuel sample" – PFI

Oven method is time consuming…

Moisture balance is quicker but more expensive

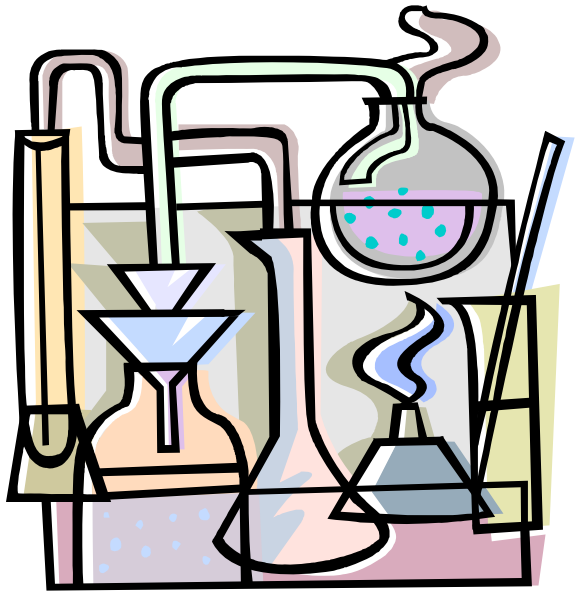
In line moisture meter for process control is continuous

GR 8/9/10 : Chloride Content, Heating Value, and Ash Fusion

Very complex and expensive equipment

Recommend outside lab testing

VERY IMPORTANT to control raw material and process for consistent compliance



General Considerations

Locate the lab away from vibration.

Keep the lab clean and organized.

Develop standard operating procedures.

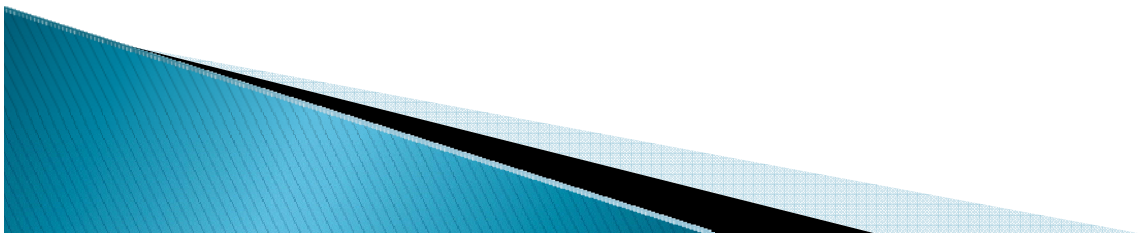
Check variability of in house/testing lab results.

Send same sample to your in house and remote testing lab.

Check variability from one shift to another.

Do multiple tests on the same sample.

Keep careful records and evaluate the testing process and results continuously.



Summary

- An in-house lab is not mandatory but it is recommended.
- Quality control begins with raw material sourcing.
- Complexity of the lab can me minimized by careful raw material and process control.
- The investment needs to be weighed against the benefits.
- Each Grade Requirement has specific characteristics that will determine the testing level needed.
- Your testing process should be considered carefully and continuously reevaluated for its effectiveness.