

**PELLET
FUELS
INSTITUTE**

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STANDARDS COMMITTEE

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STANDARDS COMMITTEE

2007 Conference

Pinehurst, North Carolina

Standards

- **What is a Standard?**
 - Something established by authority, custom, or general consent as a model or example. *
 - Something set up and established by authority as a rule for the measure of quantity, weight, extent, value or quality. *
- **The authority in the case of wood pellets is *The Pellet Fuels Institute* with the general consent of it's membership.**
- **Standards can be loosely or tightly defined.**
 - *Loose standards* allow for broad variations in product quality and characteristics.
 - *Tight standards* reduce variations in product quality and characteristics.

Standards

- ▣ **The current PFI Standards are designed to define the following characteristics of Wood Pellets;**
 - Length
 - Diameter
 - Density
 - Fines
 - Inorganic Ash
 - Water Soluble Sodium (Salt)

Current PFI Standards

- ▣ **Bulk Density :** Not less than 40#'s / Cubic Foot
- ▣ **Diameter :** .25 inches to .3125 inches
- ▣ **Fines :** Less than 1/2 % by weight
- ▣ **Inorganic Ash**
 - Premium Grade less than 1%
 - Standard Grade less than 3%
- ▣ **Length :** None longer than 1.5 inches
- ▣ **Recommended in Addition :**

Sodium (salt) may cause unacceptable corrosion if present in elevated levels. Natural wood, uncontaminated with salt will have less than 300 ppm of water soluble sodium. Certain fuel made from plywood, particle board, some ag residues, some paper and other materials and wood contaminated with salt may have elevated sodium levels. Producers should identify sodium level in their guaranteed analysis.

Missing Elements of the Current PFI Standards

- ❑ In plant product quality testing is not required.
- ❑ External product quality testing is not required.
- ❑ Verification of product grade is not required.
- ❑ Clearly defined testing and measurement parameters are not provided.
- ❑ No standards enforcement mechanism for the governing body (PFI).

PFI Mission Statement

The Institute is a trade association which represents the fuel preparation and clean burning technology of renewable biomass energy sources, and is dedicated to the advancement and promotion of densified fuel technology that will help solve global ecological problems through the utilization of locally renewable energy sources. The organization exists to;

PFI Mission Statement

- ▣ Create and represent the ultimate expertise in the residential and commercial (fiber and pelletized) fuel industry and technology;
- ▣ Coordinate and integrate the needs of raw material sources, pellet equipment suppliers and consultants, fuel producers, appliance manufacturers and distribution entities;
- ▣ Educate, disseminate and promote the economical and environmental advantages and benefits of fiber fuel technology;

PFI Mission Statement

- ▣ Establish and maintain densified fuel standards, and;
- ▣ Provide information and technical support to facilitate the safety, efficiency, emissions standards and test procedures specifically designed for densified fuel technology.

Problems Associated with the Current PFI Standards

- The current fuel grade classifications are too broad resulting in wide variation of appliance performance.
 - The solution is to narrow the scope of the fuel grades so that the appliance performance will be predictable.
- Standards are confusing and poorly defined.
 - The solution is to define how samples are collected, where the collection points should be, how these samples are tested and how these test should be performed.

Problems Associated with the Current PFI Standards

- Standards have little or no intrinsic value to the consuming public.
 - The solution is to provide graphical displays on each bag of fuel and each appliance of the key standards elements which impact the consumer.
- What guarantee does the consumer have that the product in the bag, is as claimed?
 - The solution is a defined Quality Control / Quality Assurance Program backed by the PFI.

Problems Associated with the Current PFI Standards

- Standards are unenforceable.
 - The solution is the creation of a PFI Standards Compliance Review Board that ensures that all producers are properly grading their products and following their approved Quality Control / Quality Assurance program.

Reasons Why the Current PFI Standards Must be Improved

- ▣ Our industry is growing.
 - New pellet producers
 - New pellet consumers
- ▣ Pellet burning appliances are changing
 - New appliances are more fuel tolerant
 - Old appliances are still in the market
- ▣ Our industry is getting governmental recognition.
 - If we don't police ourselves, in time, the government will impose regulations upon our industry.
 - RESA (Renewable Energy Security Act)
- ▣ To better serve our customers.

Proposed Standards Revisions

- ▣ Proposed Standards
 - PFI Fuel Grade Classifications
- ▣ Defined Sample Collection Points
- ▣ Revised Analysis (test) Parameters
- ▣ QA/QC Program
- ▣ PFI Standards Compliance Review Board
- ▣ Implementation Schedule

Proposed Standards Fuel Grade Classifications

▣ **Super Premium**

- Tighter inorganic ash and moisture requirements.

▣ **Premium**

- Very similar to the current standards for premium.

▣ **Standard**

- Looser standards than current, except for the tighter requirement on inorganic ash.

▣ **Utility**

- Loosest standards of all grades

Please reference "Proposed New PFI Fuel Standards" page in your handout.

Super Premium

Grade Classification

- Bulk Density : **40 to 46 lbs / Cubic Foot**
- Diameter : **.25 inches (6.35 mm) to .285 inches (7.25 mm)**
- Pellet Durability Index : **Greater than or equal to 97.5**
- Fines Percent in the bag at the plant : **Less than .5%**
- Inorganic Ash Percent : **0% to 0.5%**
- Length, % greater than 1.5 inches : **Less than 1%**
- Moisture Percent : **Less than or equal to 6%**
- BTU's : **As Received Basis \pm 2 Standard Deviations**

Premium Grade Classification

- Bulk Density : **40 to 46 lbs / Cubic Foot**
- Diameter : **.25 inches (6.35 mm) to .285 inches (7.25 mm)**
- Pellet Durability Index : **Greater than or equal to 97.5**
- Fines Percent in the bag at the plant : **Less than .5%**
- Inorganic Ash Percent : **0% to 1.0%**
- Length, % greater than 1.5 inches : **Less than 1%**
- Moisture Percent : **Less than or equal to 8%**
- BTU's : **As Received Basis \pm 2 Standard Deviations**

Standard Grade Classification

- Bulk Density : **38 to 46 lbs / Cubic Foot**
- Diameter : **.25 inches (6.35 mm) to .285 inches (7.25 mm)**
- Pellet Durability Index : **Greater than or equal to 95**
- Fines Percent in the bag at the plant : **Less than .5%**
- Inorganic Ash Percent : **0% to 2.0%**
- Length, % greater than 1.5 inches : **Less than 1%**
- Moisture Percent : **Less than or equal to 8%**
- BTU's : **As Received Basis \pm 2 Standard Deviations**

Utility

Grade Classification

- Bulk Density : **36 to 46 lbs / Cubic Foot**
- Diameter : **.25 inches (6.35 mm) to .285 inches (7.25 mm)**
- Pellet Durability Index : **Greater than or equal to 95**
- Fines Percent in the bag at the plant : **Less than .5%**
- Inorganic Ash Percent : **0% to 6.0%**
- Length, % greater than 1.5 inches : **Less than 1%**
- Moisture Percent : **Less than or equal to 10%**
- BTU's : **As Received Basis \pm 2 Standard Deviations**

Residential / Commercial Corn Fuels

Premium

- Diameter : **0% over 5/8 inches**
- Fines Percent in the bag at the plant : **Less than 1.0%**
- Moisture Percent : **Less than 12%**
- BTU's : **As Received Basis \pm 2 Standard Deviations**

Standard

- Diameter : **0% over 3/4 inches**
- Fines Percent in the bag at the plant : **Less than 3.0%**
- Moisture Percent : **Less than 15%**
- BTU's : **As Received Basis \pm 2 Standard Deviations**

Requirements of All Grades

- ▣ It is *required* that PFI manufacturer members label their product as to which grade of material is in the bag and that they disclose the types of materials (e.g. oak, maple, cedar, fir, corn, wheat straw, etc...) as well as all additives being used, and if there are any chemically treated materials.
- ▣ It is *recommended* that manufacturers include on their bags the membership logo and in the printed block the guaranteed analysis.

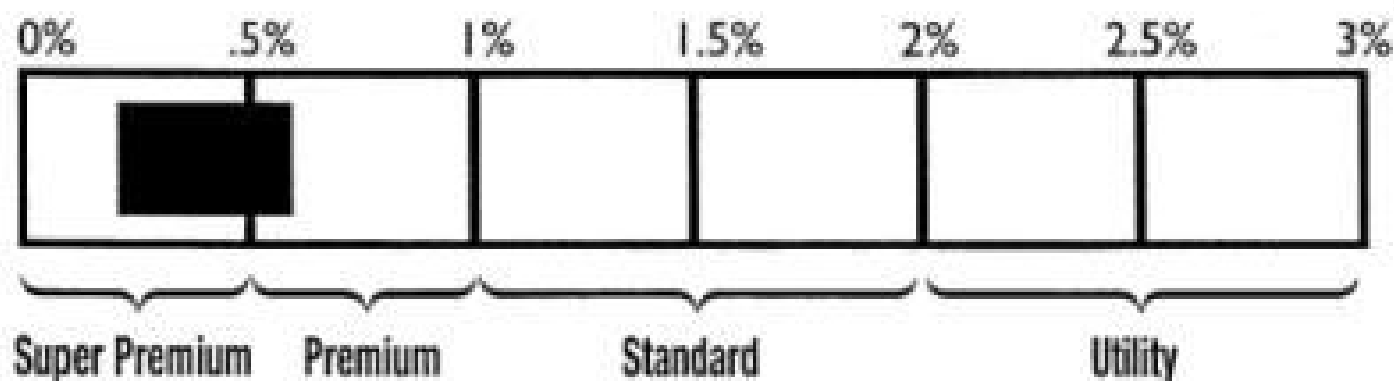
Requirements of All Grades

- ▣ It is *recommended* that all residential / commercial fuels limit chloride content below 300 ppm.
- ▣ It is *recommended* that all feedstock materials be evaluated initially for ash fusion properties and then periodically thereafter if ash fusion problems arise to minimize problem with ash fusion in the appliances.
- ▣ PFI *prohibits* the use of seed corn that has been chemically treated with insecticides in residential / commercial appliances.

Bag Graphics Sample Ash Content

Proposed Ash Rating Scale Version 1

ASH CONTENT SCALE



To learn more about this Ash Content Scale as well as other information on pellet heating, please visit www.pelletheat.org

PFI's Proposed QA/QC Program

- ▣ This program is applicable to :
 - All PFI pellet fuel manufacturer members
 - All PFI wholesale bagging operations

Major QA/QC Program Components

- ▣ Requires a written QA/QC program.
- ▣ Requires an in-house laboratory.
- ▣ Requires routine evaluation of final product by an outside laboratory.
- ▣ Requires the use of specific test methods.

Major QA/QC Program Components

- ▣ Includes a Proficiency Testing Program.
- ▣ Includes a Data Evaluation Program.
- ▣ Includes a Registration System.
- ▣ Includes a Certification of Compliance.

Minimum Requirements for a QA/QC Program

- ▣ **Quality Control Program Basics**
 - The program must be written.
 - The program must be verifiable.
 - There must be a person in charge of the program with the authority to carry the program out.
 - The plan must have a reasonable chance for success.

- ▣ **Quality Assurance Program Basics**
 - An auditing process that ensure the Quality Control program is carried out and provides confidence that the quality was in fact achieved.

Drafting a Written QA/QC Program

- ▣ The Standards Committee recommends the use of MIL-I-45208 as the basis for a Quality Control program.
 - Old military QC program utilized until 1996.
 - Widely used in industries today.
 - Recognized by the Federal Government.
 - Entry level QC program.
 - Approximately three week implementation period.
 - Can be used as a stepping stone to ISO standards.

Required QA/QC Program Components

- ▣ Each independent product stream must have it's own QA/QC Program.
- ▣ In-house lab for internal analysis of :
Minimum Requirements:
 - Bulk Density
 - Fines
 - Pellet Length
 - Moisture
- ▣ Routine use of an outside lab for QA analysis.

Quality Assurance Lab Analysis

- ▣ The QA Lab Analysis is used as the basis for :
 - Grading pelletized fuels
 - Provide the guaranteed analysis values on the bag
- ▣ Sample Frequency and size
 - Samples submitted once per week or once per 1,000 tons of pellet produced, whichever yields the greater number of samples.
 - Analysis sample consist of one (1) 40 pound bag of product taken directly from the bagging operation.

Quality Assurance Lab Analysis

The QA Lab will provide an analysis for all PFI listed parameters which include;

- Bulk Density
- Diameter
- Fines
- Durability
- BTU's
- Inorganic Ash
- Length
- Moisture
- Chlorides
- Bag Weight

Quality Assurance Lab Analysis

- ▣ Data Evaluation
 - Grading is based on one (1) year of data
 - Grading is based on mean \pm 2 Standard Deviations
 - Confidence Interval is 95.4%
 - Control Charts
 - PFI's Data Evaluation Program

PFI Data Evaluation Program

- ▣ Data submitted quarterly to a data collection entity.
- ▣ Data collection entity analyzes the data and forwards the “blind” data with an identification key to the PFI staff.
- ▣ PFI staff forwards blind data to the Review Board without identification key.

PFI Data Review Board

(Appendix F)

- ▣ Composed of pellet producers, appliance manufacturers and retailers.
- ▣ Receive “blind” data from PFI staff
- ▣ Compare current data against the demonstrated grade standards to verify grade compliance.
- ▣ Issues recommendations to PFI staff
- ▣ PFI staff to contact the applicable pellet producer.

Wholesale Storage Facilities

- ▣ Do NOT need a QA/QC program if :
 - QA/QC testing has already been conducted by the producing pellet mill.
 - The bags are palletized and wrapped at the producing plant
 - The pallets are stored inside.

Wholesale Bagging Operations

- ▣ MUST have their own QA/QC program :
 - If producing mill follows PFI QA/QC program, then conduct re-verification analysis at one (1) sample per 1,000 tons (bulk loose) of product bagged.
 - If producing mill does not follow PFI QA/QC Program, then the facility will need to implement all components of the PFI QA/QC program and conduct QA analysis at the rate of one sample per week or one sample per 1,000 tons of product bagged, whichever yields the greater number of samples.

PFI Proficiency Testing Program

- ▣ Consist of one large sample split between numerous organizations and the data is compared between the organizations.
- ▣ All QA labs are required to participate.
- ▣ Pellet mills may also participate.

Analysis Methods

- All mills and labs would be required to conduct all analysis in accordance with the following PFI approved test methods and standard operating procedures
 - **Bulk Density** - ASTM E 873-82(2006)
Revised to utilize a $\frac{1}{4}$ cubic foot container tapped 25 times from one (1) inch.

Analysis Methods

- **Diameter** - Select 5 pellets at random out of the pellet sample being evaluated and measure the diameter with a calibrated caliper. Report the average diameter and the range of measurements.
- **Length** - Hand sort 2.5 pounds of pellets, identify all pellets over 1.5 inches in length using a caliper or measuring block. Report the weight % of all pellets over 1.5 inches. Identify the longest pellet and report the maximum length.

Analysis Methods

- **Fines** - Hand sieving technique utilizing the standard operating procedure provided (Appendix A). Uses a 1/8 inch wire cloth sieve.
 - For compliance purposes, fines are reported at the factory gate.
- **Durability** - Kansas State Method, slightly modified.
 - Analyze per standard operating procedure (Appendix B)

Analysis Methods

- **Moisture** - ASTM E 871-82(2006)
 - Reference method used by QA labs
 - Moisture balances used by mills
- **Ash** - ASTM D 1102-84(2001)
- **Chloride** - Labs may use any of the following methods;
 - ASTM E 776-87(2004)
 - ASTM D 4208-02e1
 - ASTM D 6721-01(2006)
- **BTU's** - ASTM E 711-87(2004)

Sample Preparation

- ▣ See “Appendix C” of your handout

Product Registration

- ▣ See “Appendix D” of your handout for complete Information.

All mills will provide initial registration such as;

- Mill Name
- Mill Location
- Grades Produced
- Initial Data
- Written QA/QC program
- Certification of Compliance

Product Registration

- ▣ Registered products are posted on the PFI website for reference by retailers, appliance manufacturers, consumers, etc...
- ▣ Registration information updated when needed or when changes are made.
- ▣ Registration may be revoked if data demonstrates non-compliance

Certificate of Compliance

- ▣ Requires mill owner / operator, quality manager and the QA lab to sign off indicating true, accurate and complete compliance with the PFI program.

Estimated Cost Involved QA/QC Program

▣ One Time Cost

- Basic Test Equipment (Estimated) \$6,400
(Appendix G)
- Optional Test Equipment
 - ▣ Durability Tester
 - ▣ Ash Test
- MIL-I-45208 Cost \$197
- Program Initial Registration \$500 - \$800

Estimated Cost Involved QA/QC Program

▣ **Recurring Cost**

- **Outside Lab Test Minimum 52 Samples /year at \$200 per sample equals \$10,400/year.**
- **PFI program maintenance annual cost \$200 - \$500**
- **In-Plant Labor Cost (Varies by plant and amount of testing)**

Implementation Schedule Proposed

- ▣ **July 20th** Presentation of Program - Pinehurst, N.C.
- ▣ **July 20th - Aug. 31st 2007** Membership feedback period
- ▣ **Sep. 2007** Incorporation of membership feedback
- ▣ **Oct. 2007** Final PFI Board approval
- ▣ **Nov. 2007** PFI Membership approval
- ▣ **Jan. 2008** Phase 1 - Begin Testing to new standards.
- ▣ **Jan. 2009** Phase 2 - PFI Approved Fuel Grade and Graphics on bags.

Closing Comments

- ▣ Review the program details in your handout.
- ▣ Attend the Question and Answer session.
- ▣ Give us (your Standards Committee) feedback.

End of Presentation