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## W214 Wood Products Information - Wood Pellets - An introduction to their production and use

The University of Tennessee Agricultural Extension Service

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# WOOD PRODUCTS INFORMATION

## Wood Pellets – An introduction to their production and use

David Jones, Assistant Extension Professor - Mississippi State University

David Harper, Assistant Professor and Adam Taylor, Assistant Professor - Forestry, Wildlife and Fisheries, University of Tennessee

### Introduction

Wood pellets are compressed wood particles that are used as fuel. Pellets are already commonly used in some areas of the country, but they are growing in popularity as the cost of primary fuels increases and concerns about global climate change build.

This fact sheet is a short introduction to wood pellets and will be helpful to those who are interested in using or producing wood pellet fuel. The advantages of wood pellets and how pellets are made and used are discussed.

### Advantages of Wood Pellets

Because pellets are made from wood, they have the same advantages as firewood – they are a local, renewable, low-cost fuel.

Wood pellets are very low in moisture (water) and ash content, so they burn hot and cleanly. Fuel pellets are limited to 1 percent (Premium-grade) to 3 percent (Standard) ash. Regular firewood has more ash due to the presence of bark.

Wood pellets are also small and easy to handle. They are generally available in 40-pound bags, but in some areas they are available in bulk. There is very little dust and no bark. Many pellet-burning stoves have hoppers with feed screws that automatically feed the pellets into the fire when fuel is needed. Larger furnaces are available that have larger storage silos that also automatically feed fuel into the furnace when needed. Both systems require little maintenance because the pellets burn very cleanly.

Pellets have a number of “environment-friendly” attributes. Pellets are usually made from wood-processing byproducts (e.g. sawdust), so a valuable product is made from a potential waste material.

More recently, low-quality trees from forest thinning and salvage operations are also being used. Pellets contain much less water and are denser than firewood, so they are more efficient to transport.

Wood and wood pellets are “carbon-neutral” in terms of their contribution to global climate change—All the carbon dioxide that is released when wood is burned was captured from the atmosphere when the wood was grown in the tree. This characteristic is an important advantage, especially in some countries in Europe where there are restrictions on carbon emissions.

Pellet-burning stoves are more expensive than wood-burning models (\$1,600 to \$3,000), but require



*Pellets are a clean and convenient form of wood fuel.*

less maintenance, create less mess and are easier to operate. There are generally the same, or fewer, building code requirements for the installation of pellet stoves because of a more complete combustion of the fuel. However, local codes should be reviewed before installation. The availability of appliances and fuels may be limited in some areas. Pellet stoves also require electricity to operate and will not work when there is a loss of power.

1 ton of pellets is equal to	
120 gallons of heating oil	16,000 ft <sup>3</sup> of natural gas
170 gallons of propane	4,775 kilowatt hours of electricity

Wood is inexpensive compared with most fuel options. Pellets are more expensive than some other forms of wood fuel (sawdust or firewood), but they are usually cheaper than oil, natural gas or electricity. Currently, pellets sell for about \$200-\$250 per ton. In terms of cost per unit of energy, paying \$200 per ton for wood pellets is equivalent to paying 4.9¢/kwh or \$1.06 per gallon of propane. Fuel cost comparisons of pellets with other fuels can be made by using the spreadsheet on the following Web site:

[www.fpl.fs.fed.us/documnts/techline/fuel-value-calculator.pdf](http://www.fpl.fs.fed.us/documnts/techline/fuel-value-calculator.pdf)

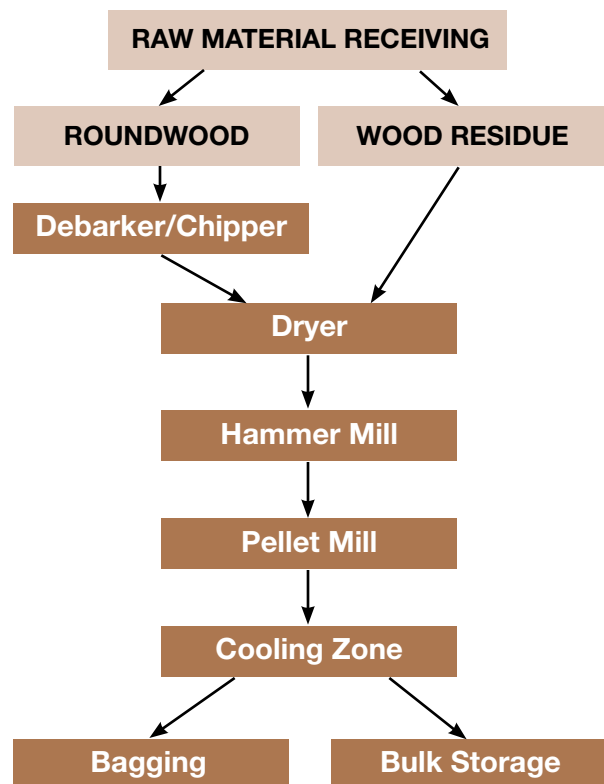
## How Pellets Are Made

### Raw Material

The production of wood pellets begins with the generation of the raw material. In most cases this raw material is a byproduct of some other wood processing operation. Hardwood flooring mills are one example: They produce large quantities of clean (no bark or dirt), dry sawdust and small scrap blocks in their operations. This byproduct makes an ideal raw material for pellet production; however, as the interest in pellet production grows, some mills are generating pellet-making raw materials directly from trees (i.e. "roundwood").

### Drying

The pellet raw material must be uniformly dried to a low moisture content feedstock (below 4 percent on a dry-weight basis). Because of the high temperatures and pressures in the manufacturing process, excess moisture can cause problems – for example, poor consolidation of the pellet (resulting in dust in the final product). However, this low moisture



*The manufacturing process for wood pellets is similar to that for pelletizing animal feed.*

content is also the main reason that wood pellets burn so well.

### Processing Material

Once the feedstock has been dried, it is fed into a hammer mill to produce wood particles that are a consistent size. This process helps make the pellets a uniform density so that they provide a consistent heating value.

### Formation of the Pellets

Pellets are extruded using special dies. High pressure (45,000 PSI) and temperatures (200 F) are generated in this process, which softens lignin in the wood and binds the material in the pellet together. No additional adhesives are required, although sometimes small amounts of lubricants may be added to improve processing.

Pelletizing machines are relatively inexpensive (approximately \$50,000) and can produce 5-10 tons of pellets per hour. However, complete manufacturing facilities can cost in excess of \$3 million and require considerable operating expenses and labor inputs.

It takes 1.1 MBTUs of electrical energy to produce a ton of delivered pellets. The finished pellets contain nearly 15 times that amount of potential heat energy; however, depending on the source of electricity, this processing energy can be an important factor in the energy, cost and environmental impact budget.



*In a pellet mill, large electric motors compact wood particles and extrude them as pellets through small openings in steel dies.*

### **Bagging and Storage**

Once the pellets are formed and cooled, they are packaged in bags or stored in bulk. Most residential pellet users buy pellets by the ton, which consists of 50 40-pound bags packed on a pallet. The pellets may also be placed in small silos outside of the user's home by a delivery truck. Pellets can be stored indefinitely but they must be kept dry to prevent deterioration.



*Wood pellet stoves are very efficient – they can capture almost 95 percent of the heat energy contained in the pellets.*

### **How Pellets Are Used**

Wood pellets are generally burned for heat, although they may also be used to generate process steam and/or electricity. The stoves to burn pellets can range from large commercial boilers to small, residential heaters. Many pellet-burning stoves have hoppers (storage bins) and thermostatically-controlled augers that push pellets into the fire automatically. These stoves have to be loaded less frequently than traditional firewood-burning appliances.

In smaller operations, once the pellets are burned the remaining ash must be removed periodically (about once per week) from the stoves. The amount of ash is low compared with traditional firewood that has bark. Well-formed pellets will create very little dust or debris. All these factors make burning wood pellets a clean and convenient way to heat compared with traditional wood fuels.

### **Markets for Pellets**

The Pellet Fuels Institute, an industry association, reports that more than 80 pellet mills in North America currently produce in excess of 1 million tons of pellets annually. Markets for wood pellets are well-established, especially in the northeastern United States.

Rising prices for fossil fuels such as fuel oil and natural gas are leading to increased interest in wood pellet heating. Concern over global climate change is also stimulating interest in wood pellets and other "carbon-neutral" energy sources.

In many European countries wood pellets are used in cogeneration, where steam is produced to turn turbines to generate electricity and to heat homes and offices in the winter.

For more information, visit the following Web sites.

The Pellet Fuels Institute  
[www.pelletheat.org/2/index/index.html](http://www.pelletheat.org/2/index/index.html)

The Hearth, Patio and Barbecue Association  
[www.hpba.org](http://www.hpba.org)

