



## Wood processing from integrated farming. Pellet production

Over the last few years, alternative energy has gained more and more market segments dedicated to conventional energy, liquid and solid exhausts and pollutants. For years, emphasis has been placed on wind and solar energies, but another essential and accessible energy source, namely biomass, the most abundant on the planet, is neglected.

The diversity of product results from agroforestry systems facilitates the use of resources in an integrated way. In the case of wooded grasslands, residues from the yearly pollarding of trees have considerable potential for recycling in the agricultural system as energy usable in the farm.

Romania has a very high potential for biomass, about 50% of the potential of renewable resources, which is insufficiently exploited. This apparent disadvantage, supported by European grants, allows for greater accessibility to environmentally friendly solid fuel companies. The European Union is thus becoming a major supporter of the renewable energy scene, through its environmental policies and the funds allocated to it.

### What are pellets?

Pellets are considered an efficient source for home and water heating, wood debris representing cheaper energy than traditional fossil fuels (coal or oil). They are eco-fuels because they contain no dangerous substances and emit less CO<sub>2</sub> than coal or oil. Pellets have a calorific power of 1.5 times higher than firewood and 1 kilogram of pellets has an energy output of 4.8 kWh.

Pellet making is the process by which solid fuel is produced from agricultural and forestry materials such as sawdust, branches, wood scraps or other woody scraps, leaves, straw, sunflower or corn stalks.

## How to do it?

For this technological process to be complete we need besides fuel and the following equipments, a pellet manufacturing line.

**Shredder** - or **wood chipper** (see figure 1.) is a machine used for reducing wood (generally tree limbs or trunks) into smaller woodchips. They are often portable, being mounted on wheels on frames suitable for towing behind a truck or van. Power is generally provided by an internal combustion engine from 3 horsepower (2.2 kW) to 1,000 horsepower (750 kW). There are also high power chipper models mounted on trucks and powered by a separate engine. Tree chippers are typically made of a hopper with a collar, the chipper mechanism itself, and an optional collection bin for the chips. A tree limb is inserted into the hopper (the collar serving as a partial safety mechanism to keep human body parts away from the chipping blades) and started into the chipping mechanism. The chips exit through a chute and can be

directed into a truck-mounted container or onto the ground. Typical output is chips on the order of 1 inch (2.5 cm) to 2 inches (5.1 cm) across in size. The resulting wood chips have various uses such as being spread as a ground cover or being fed into a press during pellet making.



Figure 1. Wood residue shredder  
([www.boels.cz](http://www.boels.cz))

**Dryers** - are used to dry the chopped material which must have a moisture content of less than 30% for classical driers or less than 50% for rotary drum dryers. In the rotary drum dryer, the strong hot air feeds the chopped material into the suspension to dry it (see figure 2). Due to the high velocity of the air flow and the fact that the chopped material is suspended, the transfer surface between the air and the solid material is high, so a high rate of heat transfer results. The hot air generator is a wood-based or coal-fired furnace but can also be fitted with a gas or liquid fuel burner. The wet

chopped material is dry in minutes and is further transported by means of a centrifugal fan.



Figure 2. Rotary drum wood chip dryer  
(<http://www.uzelacind.com>)

**Presses** - can also be used in households, farms, production units, for granulation of animal feeds or for the recycling of various materials and their transformation into pellets having a higher calorific value than the raw material used or can be combined with shredders and dryers to form complete pellet product lines (see figure 3). Pellet presses are machines that use power motors that roll metal rolls that press the chopped material onto a hole mold. After pressing through these holes the raw material is compressed and forms a compact mass that takes shape, the diameter and the length of the mold hole. Due to the temperature of about 70-80 °C due to friction, the fibers in the raw material are joined together and plasticized so that the pellets have a rather tough consistency. The molds can have two

different planar and circular shapes, thus generating two different types of presses: flat-press presses and circular molds with each of these models having advantages and disadvantages.



Figure 3. Wood pellet press  
(<http://www.homemadepelletmill.com>)

**Automatic packing machines** - in plastic bags with adjustable capacity between 10 and 30 Kg or in raffia bags with adjustable capacity between 50 and 100 Kg



Figure 4. Automatic packing machine ([eaglepackmachine.en.made-in-china.com](http://eaglepackmachine.en.made-in-china.com))



## The pellet process flow

Stage I:

Working principle:

Shredder crushing wood residues, both cylindrical and rectangular, fine grinder (hammer mill) - reduces raw material to 3-10 mm. The final fraction is fully trained for production line pellets.

Stage II:

Then the raw material falls into the aerodynamic dryer humidifier, in the drying process, the cold air, with the aid of the heat generator is heated and mixed with the wet raw material. The wet raw material is dried for a few seconds. Then the dry raw material is evacuated by cyclone.

Stage III:

From the cyclone of the aerodynamic dryer, the raw material falls into the metering unit (silo) to maintain the flow rate. This hopper bunker (silo) allows us that the pelletized press work at one constant capacity in case we have the wetter raw material than in normal operating parameters an aerodynamic dryer.

Stage IV:

The raw material (wood chips) arriving in the pelleting press is pressed into the press channel by the eccentric mechanism actuated by an electric motor. As a result of the pressure exerted by the piston, the raw material is passed through the press channels and compressed as pellets.

Exercised pressure is sufficient to bake the raw material in a solid mass without the addition of binders and adhesives.

The baking process is continuous at a temperature of 110-200 ° C (depending on the moisture content of the raw material).

The pellets that come out of the press enter the cooling line (6-7m) .Depending on the setting can then be packaged.

(The process flow can be seen in figure 5)

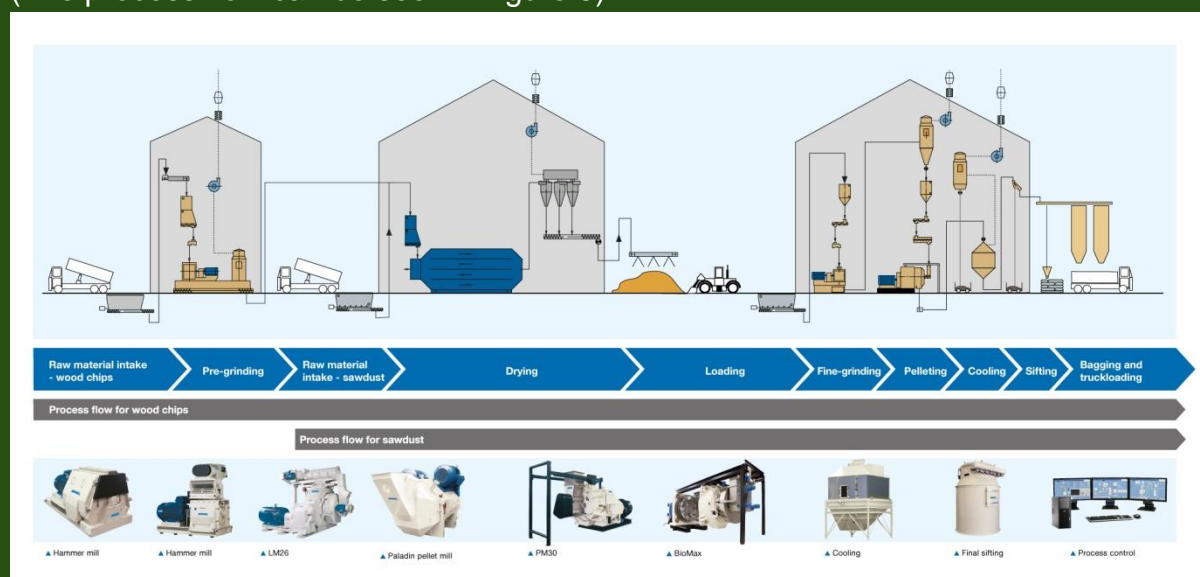


Figure 5. Biomass pellet process flow ([www.andritz.com](http://www.andritz.com))

## **Production costs?**

The price of a pellet production line is variable depending on the component equipment, the production capacity, the quality of the fuel resulting from the processing, etc. The cheapest line of production goes from 15,000 € + VAT. and can reach a value of 100,000 € + VAT or even more.

## **Some additional reading**

Infiintarea unei activitati nonagricole in zone rurale – Submasura 6.2 Plan de afaceri: Infiintare fabrica de peleti.

Prezentare linii de brichetare si/sau peletizare din resturi vegetale si beneficiile acestei activitati.

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