



# A Guide to Small Scale Pellet Mill





Anyang Gemco Energy Machinery Co., Ltd.

## **Free Technical Guide on Wood Pellet Production**

*Professional Wood Pellet Production Advice*



***G***emco specializes in the manufacturing of commercial and residential flat die and ring die pellet mills. We are dedicated to providing the highest quality and most advanced pellet mills to our customers. Gemco has over 10 years of experience in this field and our engineers are highly qualified. From sales to design to installation, we have your needs covered. Customers in the USA, Russia, and Africa depend on our mills everyday to get the job done right. Our products meet several European standards including CCC, ISO, etc. The entire Gemco team welcomes you to become our business partner and friend.



## Content

➤ Intro: Why Choose Wood and Biomass Pellets? .....	5
✧ Price: .....	5
✧ Wide Material Source: .....	6
✧ Environmentally Friendly: .....	7
✧ Convenience: .....	7
➤ Part 1. How to Make Pellets? .....	8
✧ Pellet Plant .....	8
✧ Pellet Mill .....	11
➤ Part 2. Different Types of Pellet Mills .....	12
➤ Part 3. How to Choose the Suppliers .....	15
➤ Part 4. Free Consultation Service .....	17

*In this free technical guide, Gemco gives you a brief introduction on wood pellet production and how to choose the right pellet mill to meet your needs.*

*Gemco provides a free consultation service with 20 years study on pellet fuel industry and pellet mill manufacturers. Gemco has professional experiences on pellet mill production.*



## ➤ Intro: Why Choose Wood and Biomass Pellets?

Four advantages of Wood and Biomass Pellets have led to rising popularity in the wood pellet's market.

### ✧ Price:

Wood and biomass pellet fuel, as an alternative for fossil fuels, has a more competitive and stable pricing than does kerosene and natural gas in many countries. Supported by the green tax policy, wood pellet fuel is encouraged to be used as a countermeasure against global warming, energy security and rise of oil prices. It has proved to have a good effect. As the data shows in the following table, you can understand this point very clearly.

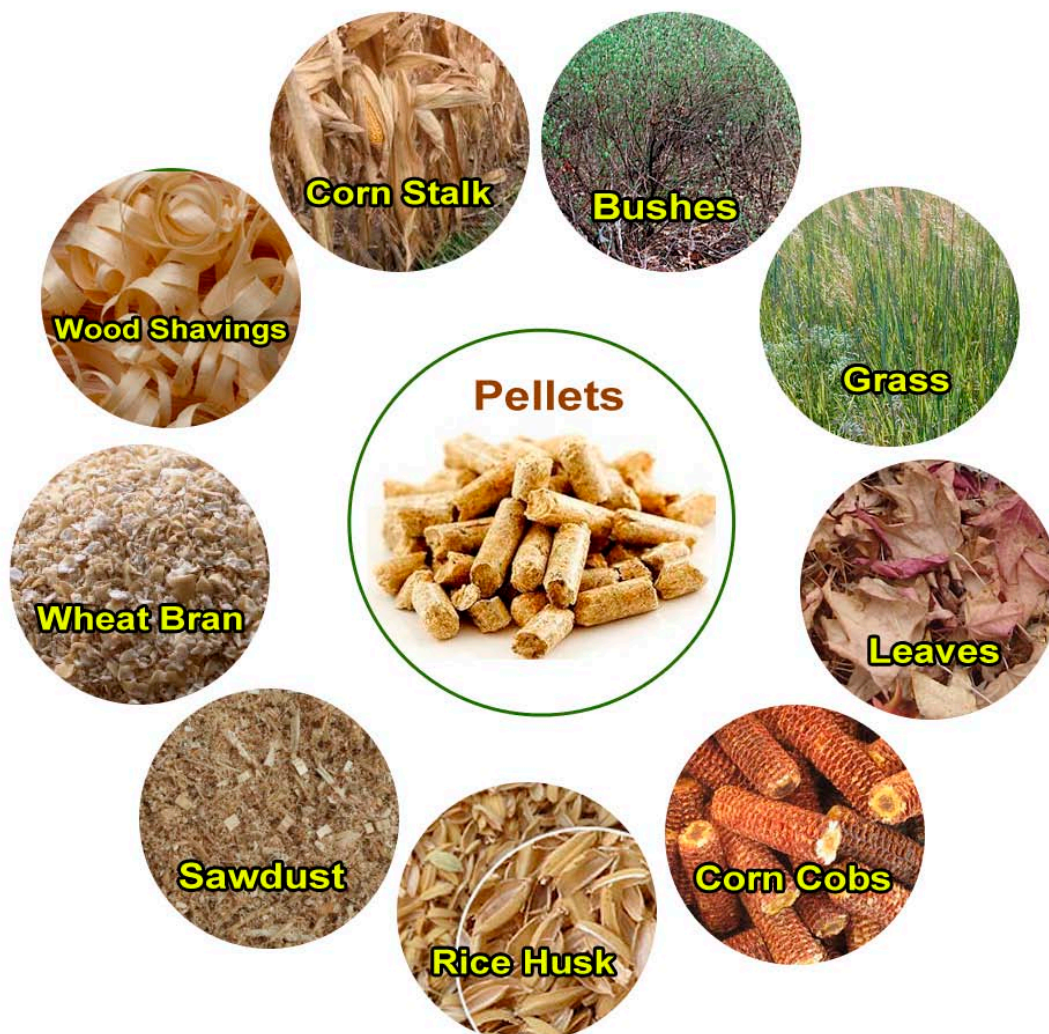
Table 1: Below data shows the comparison on home heating fuels, the values shown are international averages on 2011-1.

Item	Cost	Application Efficiency	Cost per Million BTU
<b>Pellets</b>	190USD/Ton	80%	14.48
<b>Fuel Oil # 2</b>	3.58USD/Gallon	78%	33.25
<b>Electricity</b>	0.12USD/KWH	100%	35.16
<b>Natural Gas</b>	1.39USD/Therm	78%	17.38
<b>LP Gas / Propane</b>	2.83USD/ Gallon	78%	39.72
<b>Hardwood(Air dried )</b>	200USD/Cord	60%	16.66
<b>Coal</b>	250USD/Ton	75%	10.89



### ✧ Wide Material Source:

Wood and biomass pellet fuel, has competitive and stable pricing, is clean burning and produces little pollution. The moisture content can be easily controlled during the production process. The raw material sources are very wide, such as wood waste (residual sawdust, wood shavings, wood peelings, etc.), yard debris (grass, leaves, tree sticks, forsythia, wisteria, woody bushes, etc.), farm waste (corn cobs, corn stalks, straw from plants, etc.) and other residues biomass waste. We can recycle energy from the above materials.



Traditional heating fuel and fossil fuels are expensive and can easily cause environmental pollution. Trees grow slowly and the moisture is hard to control, which are not good for stoves & boilers, and the source is very limited.

### ✧ Environmentally Friendly:



Carbon-neutral is the green image and advantage of wood and biomass pellet fuel. Burned pellet fuel only liberates CO<sub>2</sub> which is stored during the lifetime of plant, and is harmless to the environment. Burned fossil fuels will free extra CO<sub>2</sub> into atmosphere which have been stored for over a million years, accelerating global warming.

### ✧ Convenience:



Pellets are produced with uniform moisture content, shape, size, and density, matching the needs from the automated combustion systems of stoves and boilers. It also takes up less space in storage than other biomass fuels because they have higher energy content by weight (roughly 7,750 Btu per pound at six percent moisture content).



## ➤ Part 1. How to Make Pellets?

First, you should have an idea of your target production capacity, budget and application purpose. This information will help you decide which pellet mill is right for you. If your target capacity is beyond 500Kg per hour or you desire mass commercial production, you need to build a pellet plant. If your target capacity is less than the previous data and/or only for household use, a pellet mill is your best choice.

The production processes between pellet production plants and pellet mills are different in material preparation, adjustments to the machinery, detailed equipment to use, etc.

### ✧ Pellet Plant

The production process can generally be divided into 9 sections, as you can see below.

#### **1. Reduce the size of raw material into appropriate particles.**

In this section, the raw material needs to be crushed. You can choose the hammer mill, chipper or wood waste shredder in accordance with your raw material.

Based on our comparison tests for different pellet mill and common wood & biomass materials, the pellet produced from crushed raw material has better and more consistent quality than those produced from rough raw materials.

**You will find more information on different raw materials size reduction in our complete guide: <http://www.pelletmillequipment.com>**

#### **2. Dry the size-reduced material to meet required moisture content.**

The moisture content of the pellet will straightly affect the pellet quality of the burning efficiency and the clean burning (no smoke).

According to our years of study and consultation experiences, the general requirement to moisture content of wood & biomass materials is from 10% to 15%. By choosing and controlling on right moisture content, you can cut down your cost on energy consumption. In this section, a rotary drum dryer is a good





option.

### **3. Mix the dried material with the binder, lubricants or other needed material.**

Due to the different characteristics of various raw materials, the pellet quality is unequal. To improve the pellet quality or maximize the production capacity, you can add a binder (a kind of glue, e.g., vegetable oil or rapeseed cake) to help the lignin-lacked material to compress into pellets much easier. But please test and analyze the binder-added pellets, the ash rate and the clean burning performance may change accordingly.

### **4. Conditioning process to the mixed material.**

By adding dry steam into the mixed material can heat and soften the lignin. This helps the mixed material become compressed into final pellets much easier, and maintains a consistent quality of the mixed material which ensures the consistent quality of pellets. Its final purpose is to increase the production capacity.

Please note: steam conditioning process is ONLY used in some LARGE pellet mills, if your mill is a small plant, this process is not necessary, you can skip this section.

### **5. Pellet compression process.**

This process usually adopts the ring die pellet mill, also known as round die pellet mill. **Actually, this is the most important part in making pellets. We have a detail description on this process in the complete guide: <http://www.pelletmillequipment.com>**

### **6. Cool the final pellets to room temperature.**

The fresh final pellets are very hot with extra moisture which needs to be released. The unreleased heat and moisture usually makes the pellets soft, so their shape is not formed. To reach the quality requirements on surface hardness and moisture content, the cooling process becomes an important part, and a counter-flow cooler is usually adopted.



## **7. Screen the cooled pellets.**

To remove the fines or dusts from materials that failed in compression process and from some broken pellets, a vibrating screen will be very helpful.

## **8. Pack and store the screened pellets.**

Because the wood pellet will not enter into the fuel process immediately, in order to keep the wood pellet as dry as possible, to avoid the influence from water or dampness, the packing process is necessary. To reduce your cost on labor source, a pellet packing machine is recommended, you can choose a semi-auto or a completely auto one in accordance to your needs.

## **9. Common transportation machineries in pellet plants.**

Among the above sections, the materials and the pellets need to be transported between different equipments. To improve the production efficiency, you can use different machines as mentioned below:

Piping system is an infrastructure conveyor corridor in a pellet plant site, it is very popular among the above sections, such as between raw material inlet and hammer mills. A considerate design can lower your energy consumption.

The belt conveyor is another common transportation machine. It can be used in for raw material inlet transportation, etc. It is a great solution to reduce your labor cost.

The screw conveyor is another choice for material transportation. Because of its light weight, low cost, and is easy to control.

The bucket elevator is generally used for final pellet transportation in the final stage to prevent damages.

Please note, the sequence of the sections and the choosing of the machines may change in accordance with different material.



## ✧ Pellet Mill

Compared with the pellet plant, the production process of pellet mill is much simpler. It can generally be divided into 5 sections, as you can see below:

### **1. Reduce the size of raw material into appropriate particles.**

### **2. Dry the size- reduced material to reach required moisture content.**

The above two sections are still necessary. Please read the information at the same parts in pellet plant.

Please note, for a pellet mill, a rotary drum dryer is not necessary. You can use sunshine to dry your raw material or choose a hot air dryer instead.

### **3. Pellet compression process.**

For this process usually adopts flat die pellet mill.

### **4. Cool the final pellets to room temperature.**

You can put the final pellets in the open air to release heat and moisture. There is no need for any machine.

### **5. Pack and store the cooler pellets. A packing machine is still needed.**

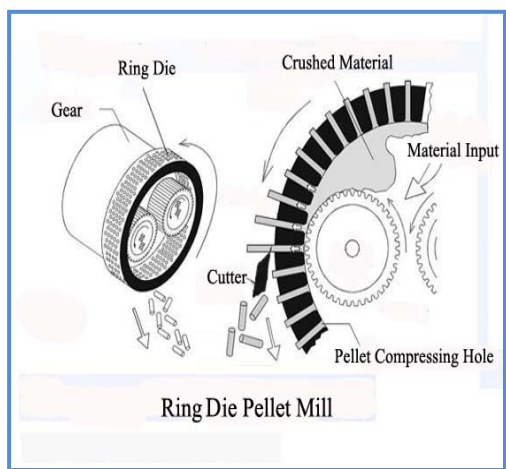
To Section 4 and 5, please read the information at the same parts in pellet plant.

**Due to the environmental protect requirement and the increasing price of traditional fuel; the wood pellet heating is becoming a trend. Making pellets by a pellet mill is attractive to most families. In this case, we devote much more words about pellet mill and pellet production in our complete guide in order to give your readers a better understanding: <http://www.pelletmillequipment.com>**

## ➤ Part 2. Different Types of Pellet Mills

In Part 1, we mentioned two different pellet mills, flat die pellet mill and ring die pellet mill.

**1. Ring Die Pellet Mill** also known as round die pellet mill. The ring die pellet mill has even wear between roller and die. The consumable cost is lower and the efficient energy saving is better; the ring die pellet mill and its die & rollers are much bigger, heavier and more expensive than flat die pellet mill (causing daily maintenance, and adjustments is quite different from flat die pellet mill). The above two reasons are why ring die pellet mill is preferred for mass commercial production.





Open the shell and you can see the ring die and rollers.

**2. Flat Die Pellet mill** is better for small production capacity and/or residential use. It has the following advantages:

- compact structure makes it small in size and lightweight;
- portable roller and die are cheaper, easier to clear and faster to change than these on a ring die pellet mill;
- Because of its design and structure, you can monitor the pelleting process directly by watching the pelleting chamber. This will help you solve your production trouble quickly. This is why you can try some indeterminate material as raw materials to make pellets, which make your available sources greater.

Generally there are two different designs of flat die pellet mill. One is with a rotating die and another is with a rotating roller.

The first type has a stationary roller with a rotating die. During the wood pellets making process, the die is rotating and the rollers are stationary. The mechanical action of the second type is completely different from the previous one, it has a stationary die with a rotating roller, when it is working the die is stationary but the rollers are rotating



**A typical flat die pellet mill**





### ➤ Part 3. How to Choose the Suppliers

The easiest and best way to get a lower price, better service and support is to locate a suitable manufacturer who can match your requirements and needs.

By getting our *consultation service and suggestions*, some clients found that their supplier can not give them satisfactory price, better service and support. Firstly because their supplier are agents or intermediaries, secondly because they need to re-sell the pellet mill by adding their own profit, thirdly because they do not know the machine in details, and lastly because they do not have experiences in pellet production and can not give you after-sale service! So do you still want to buy a pellet mill on eBay or from agents?

Here is free advice for you to locate your own manufacturer, if you wish to go directly to the suppliers or manufacturers. The best way is to identify an agent or manufacturer through a few strategic questions:

- ◆ ask for the latest photos or videos of the workshop, assembly line for pellet mill manufacturing and of customers visits.
- ◆ ask to visit the factory in person, only manufacturers will be able to accommodate your request.
- ◆ ask some professional questions which require to be replied to within a limited time, only manufacturers can give a complete answer and analysis to your questions by the support from their technical team.

### Market Analysis

Gemco is a company with years of biomass fuel marketing analysis, both in the technological and manufacturing fields. Pellet fuel technology has seen a rapid growth in recent years. After gathering data from recent surveys, we have found that there are some companies leading the way in advanced technology. Below, we have provided a list of most influential technology providers in the world:



### **Bühler, Germany**

Buhler's line uses steam and water to condition the cut straw just before pellet mill – it helps to increase the lifetime of dies and rolls and also saves the energy. Moreover, the plant in Copenhagen uses a shredding device that is able to shred and cut the straw bales of every kind (round, small and big cube bales) and is not sensitive to the moisture content. Even when this crusher technology is rather expensive and energy intense, it still can be an important advantage to secure the planned production quantity.

Reference site: Buehler pelletizing technology was used in the largest straw pelletizing plant of Europe in Koge, Denmark. With an original capacity of 100.000 tons per year it currently produces 60.000 tons of straw pellets p.a. The plant partly uses technology from other suppliers. It had severe starting problems particularly in the transport of the material between the different steps of the production process.

### **California Pelletizing Machines (CPM), California**

This technology is widely used for wood pellet production in Central and Eastern Europe. The technology requires comparatively high operation costs.

Reference site: The straw pellets plant with a yearly capacity of 3,5 tons per hour in Jelcz- Laskowice, Poland was constructed with CPM technology. Until today the plant has severe technology problems. These difficulties partly are caused through wrong strategic decisions of the investor.

### **GEMCO, China**

This Chinese manufacturer has decade's years of experience of pellet mill research and manufacture. They have their own patents of design and pelletizing devices, die and roller. Such as MZSP Series, which has been sold to many countries of the world.

8mt/h pelletizing line with drying system costs 528 000 USD FOB Tianjin J.

### **Amandus Kahl Pelletizing, Germany**

Amandus Kahl is known as a very solid and high quality technology.



Reference site: One pelletizing plant in Poland in Grudziadz was equipped with Kahl technology. The plant started operation in September 08. At the time of this analysis, the plant was still in the start-up phase, in which the utilization of low-quality raw materials resulted in low plant performance. As only this data was available, the Kahl technology was not further considered in this analysis. Today, after optimization of the raw material management by the operator, the plant reaches the required capacity and product quality.

### **Gama Pardubice, Czech Republic**

This Czech pelletizing lines producer offers production lines with capacities between 2.6 and 3.6 mt/h to very low prices. The company founded in 1994 has supplied several straw pelletizing plants in Czech Republic.

Reference site: Under investigation

### **Andritz**

Andritz does not have any reference sites of straw pelletizing. Right now they just starting with it – some investors are interested in creating one in England and the other one may rise in Poland – In Sępólno Krajeńskie the plant will be owned by Mr. Romuald Hałabuda – “Romico” company.

To be honest, if you are a wealthy family, then the German technology is no doubt the best choice. However, if you are looking to reduce your energy bill, then the price should be your top priority to consider. Since not all pellet mills are created equally, you need to choose wisely. Pellet mills from China are priced lower than the others and have equal or better performance. Therefore, if you want a quality machine at a lower price, I would encourage you to buy from a Chinese manufacturer.

## **➤ Part 4. Free Consultation Service**

We understand in this section we give you more questions than answers on how to choose the necessary equipments. It's normal, that's why we offer a free consultation service exclusively for anyone who has possession of this guide. The help is free, available five days a week our technical research team.

The most common question you may have will concern whether or not it is possible to make pellets with your specific material. Please contact our friendly



customer service [info@pelletmillequipment.com](mailto:info@pelletmillequipment.com)

**Order our complete guide to know everything about making pellets!**

**Wondering? Hesitating?**

**Opportunity not to be missed!**

You can send us an email: [info@pelletmillequipment.com](mailto:info@pelletmillequipment.com) for links or you can visit our website, click the below access to

**our complete professional guide for free**

**<http://www.pelletmillequipment.com>**