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# Pellet Binders And Lubricants

Pellet compression is a complex relationship between various factors. The properties of the raw material can be altered using binders and lubricants. The potential benefits can be improved pellet quality, improved pellet mill productivity, improved life of consumables and reduced energy consumption.

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# Thank You For Your Continued Interest

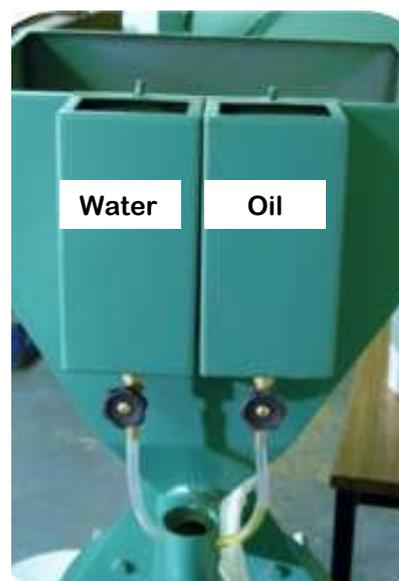
The other guides show how controlling the particle size and moisture content of your raw material can have real effects on the pellet production process. Adding a binder or lubricant can also change the properties of the raw material. A binder or lubricant can help the raw material to improve its performance within the pellet mill. However, a binder or lubricant can have negatives for fuel pellets.

## 1 Water And Vegetable Oil Are The Most Basic Forms Of A Pellet Binder Or Lubricant

At PelHeat we have experimented with many different raw materials and with many different binders and lubricants to measure their effects and possible positives and negatives. As stated in previous guides each raw material is different, and what works for one may not work for another.

### The PelHeat Mini Pellet Mill With Water And Oil Drip Feed

The image you can see to the right is of the PelHeat Mini Pellet Mill. On the back of the raw material hopper there are small tanks to hold water and vegetable oil. Each tank has a drip feed for control. The conditioner then blends the material and water/oil together.



### Adding Additional Water Into the Raw Material

Now water it's self is not actually the binder, the binder is the natural lignin within the raw material. However, by adding additional water into the raw material can have two effects. Firstly it can help to spread the natural lignin within the pellet, increasing the bond within the pellet. Secondly it can also increase the pressure of the raw material within the die hole. This increase in pressure can aid pellet compression, producing a higher quality pellet as a result. Finally to a certain extent adding water can act as a lubricant to aid the material through the die holes. However if you add too much water you can reverse this effect, and even block the pellet press die.

### Adding Vegetable Oil Into the Raw Material

Again to an extent vegetable oil can be used as a binder, however it is used more as a lubricant to reduce resistance as material passes through the die. Say for instance when pelleting wood in some pellet mills vegetable oil maybe added to improve material flow through the die. However, by doing this there is a potential cost to pellet quality. But in some cases a small amount of oil will help.



PelHeat Mini Pellet Mill

## 2 What Are The Potential Negatives To Fuel Pellets By Using Too Much Water / Oil

The quality of fuel pellets has a direct impact on how well the pellet burns in a pellet stove or pellet boiler. So what are the key attributes all quality biomass and wood fuel pellets should have?

- The pellets should have a high density for maximum combustion efficiency
- The moisture content of the pellets should be as low as possible for maximum combustion efficiency

Therefore, if you add too much vegetable oil you will lower the compression of the pellet and reduce its density. This will mean the pellets may burn poorly and produce less heat and more ash. Likewise, if too much water is added to the raw material it will reduce the combustion efficiency of the pellets.

Trying to produce a low moisture content high density pellet can be a tricky task, especially while trying to keep pellet mill productivity as high as possible and also reduce pellet mill energy consumption. Just seeing a pellet emerge from a pellet mill is not enough. You need to be truly in control of the process to produce not just pellets, but quality pellets with minimum production costs.

## 3 The Tricks Of The Trade, How To Make A Pellet Mill Appear More Capable Than It Really Is

If you recall back the Beginners Guide To Making Pellets, we discussed the small flat die pellet mills produced in China for animal feed that are now sold all over the internet as a 'Wood Pellet Mill!' Don't just look for pellet mills that look exactly like the image below as some are in different colours, some put different motors on and some are larger. However they are fairly easy to spot if you look at the actually castings used on the pellet mill. Practically all flat die pellet mills sold on the Internet were either made in China or use Chinese parts.

### Using Binders and Lubricants To Make Wood Pellets

What you will often see is the seller of the pellet mill stating that a binder will need to be added to make wood pellets. This is for a few reasons, firstly the Chinese pellet mills struggle to get up to the necessary temperature to melt the natural lignin within the wood and use it as a binder. Secondly the holes of the die are not finished to a high enough standard and block when trying to process wood into pellets. I have owned a Chinese pellet mill, and these are just a few of the potential issues, including a lack of power.

Therefore almost always any videos you see of these pellet mills producing "wood pellets" its wood mixed with a binder to make it form a pellet. However as stated this often means the pellets are of a poor quality. Also the productivity of the pellet mill will appear quite high, but this is misleading.



Chinese Flat Die Pellet Mill

## 4 What Other Materials Maybe Added To Help A Material Form A Pellet?

Adding water and vegetable oil with the wood will not be sufficient to help one of the standard Chinese pellet mills produce a quality wood pellet. You may come across pellet mill re-sellers encouraging using flour, dried distillers grain, rape cake and generally any waste from oil production.

The problem with these materials is to prove effective as a binder / lubricant the percentage used has to be quite high, between 10% and 30% are commonly used. This can make the cost per ton of pellets quite expensive in some cases, for example rape cake is also used as animal feed and has a high value. Again the quality and density of the pellet is compromised. A pellet with a low density will burn very poorly creating excess smoke and more ash. There is also the question of how the material which has been added as a binder will burn?

## 5 What Are The Binders Used In Professional Pellet Production?

Sometimes a binder is worth considering. There is a range of companies producing binders in liquid and powdered form. As these are highly concentrated they are only used in a very low concentration, for example 1-3% inclusion. Below are a few examples of binders:

### Matam Wood Pellet Fuel PelletBond

Matam produce a modified cornstarch pellet binder specifically designed for the wood pellet industry. PelletBond is designed to be both a pellet binder and pellet mill lubricant. Some of the benefits include:

- Natural product which is odor free
- Clean burning and does not increase ash content
- Lowers pellet mill energy consumption
- Increases pellet mill productivity



PelletBond has a low inclusion rate of only 6-10 lbs per ton.

### Borregaard LignoTech Pellet Binder Borregaard

Borregaard's lignosulphonates are large water-soluble biopolymers which possess both hydrophobic (water fearing) and hydrophilic (water loving) regions. With the addition of water the molecule can move and adjust itself to its surroundings. Binding in the wet stage is weak, but measurable. This is because lignosulphonates remain free to move on or off of the surfaces they are attached to when water is present. However, as drying occurs the connections between the lignosulphonate and the surfaces that it is adjacent to become much stronger. LignoTech is mainly used for the production of animal feed pellets and may not be suitable for the production of fuel pellets due to burning results.

## Kiotechagil Mastercube

**MASTERCUBE** is a low inclusion binder for cost effective improvement of pellet quality. In the pellet mill it allows us to replace work done with energy by work done chemically. This is a significant benefit as energy costs continue to rise.



### THE PRODUCT:

**MASTERCUBE** combines the binding properties of plant gums with a mineral hardener. All the ingredients are natural products.

### MAJOR BENEFITS:

- **MASTERCUBE** achieves a harder and more durable pellet.
- **MASTERCUBE** delivers a consistent pellet quality
- **MASTERCUBE** is low inclusion

## 6 Conclusions On Pellet Binders / Lubricants

Professionally prepared binders definitely have their place, particularly in the animal feed industry when you are trying to pellet a material that has insufficient natural binder. However in the fuel pellet industry many of the pellet binders used for animal feed will effect how the pellets burn. The Matam PelletBond could be worth considering, however its not a magic potion. To be able to make biomass fuel pellets and particularly wood pellets you need a pellet mill with a high quality die and sufficient power. The Chinese pellet mills have serious issues with the quality of the dies, however as stated in the Beginners Guide To Making Pellets they also lack the correct gearing and power to compress wood into pellet form with sufficient density to burn efficiently.

## The Complete PelHeat Pellet Production Guide

I hope you have enjoyed this document on Pellet Binders and Lubricants. To learn more about the complete process, we have produced The Complete Pellet Production Guide. Remember, we do offer a 60 money back guarantee. If you are not completely happy with your purchase I will provide you with a 100% refund, no questions asked.

Thanks for reading!

Chris