PelHeat

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The Benefits Of Precise Moisture Control

Only materials of suitable moisture content can be compressed into pellet form. There is a minimum and maximum range of moisture content where a pellet can be produced. However accurately controlling moisture to the ideal percentage can effect pellet quality, pellet mill productivity and energy input.

Thank You For Your Continued Interest

The Beginners Guide To Making Pellets and the previous guide on The Importance Of Particle Size should have informed you to some of the specific challenges of efficient quality pellet production. As discussed in the previous guides, only a raw material of suitable moisture content can be compressed into pellet form. However, each material does have an ideal moisture content.

1 Reducing Moisture Content Sufficiently For A Pellet To Form

Before any raw material can be used in the pellet mill it's moisture content must be reduced or increased to an acceptable level. Most virgin wood based materials will have very high moisture content in excess of 40%. Therefore drying is required. However, how dry does the material need to be? Each raw material is different, though as an average between 10% and 15% is common.

It's possible to produce a pellet within the maximum and minimum range of the pellet mill. The quality of the pellet, the productivity of the pellet mill and the energy consumption of the pellet mill will change according to the moisture content. So what is the ideal percentage of moisture?

2 How A Small Change In Moisture Can Have Dramatic Effects Within The Pellet Mill

Grain Prep is a company who produce equipment to monitor and adjust the moisture content within the pellet production process. They conducted a study to see how a small change in the moisture content of a raw material can affect the performance of the pellet mill and the quality of the pellets produced. Below is the table of results from that study.

Table 1: Summary of Data from Phase 1

Target Mash Moisture (%)	12	13	14	15	16
Untreated Mash Moisture (%)	11.95^{a,b}	11.81^{a,b}	11.51^{b}	12.44^{a}	12.02^{a,b}
Treated Mash Moisture (%)	11.64^{a}	12.65^{b}	13.80^{c}	14.77^{d}	15.94^{e}
Pellet Durability Index (PDI)	85.4	84.8	88.6	84.5	86.0
Specific Energy Use (HP/ton)	8.5	8.1	7.7	14.1	19.7
Pellet Bulk Density (lb/ft^3)	37.8	36.3	37.8	36.2	34.3
Conditioner Discharge Temp (^{0}F)	180.2	180.3	181.0	179.7	180.7
Pellet Mill Discharge Temp (^{0}F)	182.5	181.7	182.5	181.2	185.0

^{a,b,c,d,e}Values with different superscripts in a row differ (P<0.05)

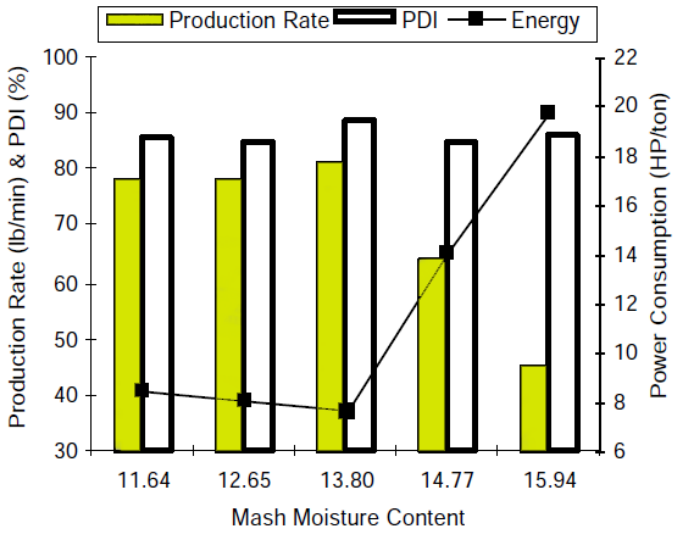
The study conducted trials on the same raw material with different moisture contents ranging from 12% up to 16%. The Pellet Durability Index (PDI) refers to the density and compression of the pellet, essentially the quality of the pellet. A higher number for the PDI means a better quality pellet. The Specific Energy Use refers to how much energy the pellet mill is consuming to produce one ton of pellets. Here obviously a lower figure is better as it means reduced production costs. To make more sense of these figures, lets look at the graph of these results.

The figures used in the graph are the exact moisture percentage figures, however to make the discussion as simply as possible I will refer to them as their rounded up figure. Therefore I will refer to 11.64% as 12%, 12.65% as 13% and so on and so forth.

Impact On Production Rate

To make the effects on production rate as clear as possible, I have highlighted production rate. As you can see there is a slight improvement in production rate with an increase from 12% to 13% moisture content. There is again a slight increase from 13% to 14%. However, the graph also shows that increasing from 14% to 15% has a profound effect on reducing productivity by roughly 25%. This decline continues from 15% up to 16%. In summary then the ideal for this raw material is clearly 14%, and moving from 14% up to 16% moisture content has seen a massive 75% reduction in productivity.

Figure 1: The Effect of Mash Moisture Content on a Pellet Mill Operation



Impact On PDI (Pellet Quality)

With the Pellet Durability Index the effects of the change in moisture content are certainly less pronounced, however still note worthy. An increase from 12% up to 13% even sees a slight reduction in pellet quality. However from 13% to 14% does see an increase in PDI and also clearly produces the highest quality pellet in the test. From 14% to 15% and then 16% shows a slight reduction in pellet quality. The important thing to note from the graph is the relationship between productivity and pellet quality. A 14% moisture content is ideal for this particular raw material in both maximum productivity and pellet quality. Next lets look at energy consumption.

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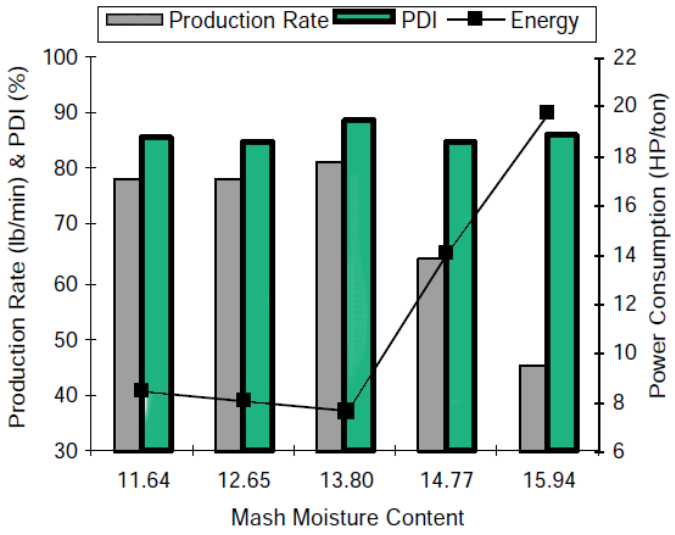
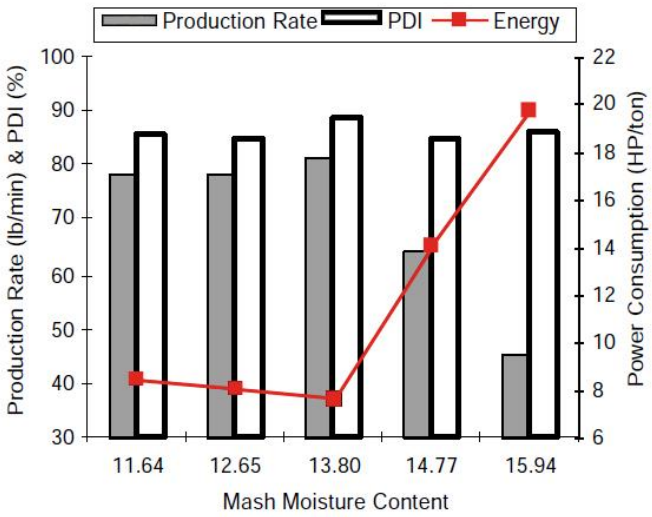


Impact On Energy Consumption

One of the most significant effects due to a change in moisture content is in pellet mill energy consumption. From 12% to 13% there is a drop in energy demand, this continues from 13% to 14% where energy consumption is at its lowest. However moving from 14% up to 15% results in a massive increase in energy consumption and likewise from 15% to 16%. Moving from 14% moisture up to 16 % is the difference between 7.7 HP per ton and 19.7 HP per ton. This is a massive increase in the amount of energy needed to compress the material into a pellet. And don't forget this also comes with a reduction in production rate and pellet quality.

Figure 1: The Effect of Mash Moisture Content on a Pellet Mill Operation



How To Monitor The Effects Of Changes In Moisture Percentage

As each material is different the above study does not indicate that 14% moisture is the ideal for all materials. As each material is different only though testing and trial and error can you find the ideal moisture percentage. Factors to monitor are obviously changes in pellet quality and pellet mill productivity. To monitor the energy demands of the pellet mill you can watch the amp meter of the pellet mill motor. If the amps increase this means the pellet mill is demanding more energy, therefore the objective is to keep the amps as low as possible. As you can see efficient quality pellet production is about much more than simply drying the raw material. To minimize production costs you need to find the best balance between pellet quality, pellet mill productivity and pellet mill energy consumption.

PelHeat Mini Pellet Mill

The Complete PelHeat Pellet Production Guide

I hope you have enjoyed this document of The Benefits Of Precise Moisture Control. 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