

# Frame Work for Checking Wood Pellets Quality & Production System

Harshal Pandya<sup>1</sup>, Dr.Dipesh Kundaliya<sup>2</sup>, Dr. Jignasa Mehta<sup>3</sup>, Mr. Jayanti Gorasiya<sup>4</sup>

<sup>1</sup>PG Student, <sup>2</sup>Asst. Professor, <sup>3</sup>Head of the Department, <sup>4</sup>Proprietor of Omega CNC Automation

<sup>1,2</sup>Department of the Mechanical Engineering, V.V.P. Engineering College, Rajkot, India

**Abstract:**This paper refers the simple ways of checking out wood pellet quality and also helping out to understand the production of wood pellets. This paper refers different important characteristics of pellet and confirms the real quality of wood pellets. This paper also helping out to prevent most problems in wood pellets. Resulting samples of different tests also helping to check quality control in production while taken out different samples. Also describing the various raw material used to finding out their durability as well as moisture content.

**Keywords:** Wood pellets, Packaging, Quality control, Moisture content, wood pellet production, hammer milling.

## 1. INTRODUCTION

Conifer Sawdust's best production are the Pellets. While producing a complicated shapes of wood pellets their internal quality control is essential & most required thing to do. Mask of dust should be worn while working in some dry sawdust areas. In a hammer-milling production line for escaping different hatchings lines should have dust explosive. As per some Technical Specifications of CEN solid Biofuels pellets are made from pressing ads with pulverized biomass or without pulverized one.

Random length of cylindrical forms is in between 5 to 30 mm & their broken ends. Also formulated for its diameter, Percentages of Ash, Contents of Moisture & Sulphur, Its Mechanical durability and some additive of nitrogen contents.

Some greatly variation you could see in the quality of wood pellets. So, when buying them preferably of various classes & specification which should be examined [1].

## 2. WOOD PELLETS RAW MATERIAL

Pellets of wood generally made of clean conifer and planer shavings. Wood must have been debarked while passing on a sawmill. Both hardwood & softwood mixed together while making of wood pellets. For creating hardness binders also used in them. Cause without them pellets doesn't sustained its hardness on a very difficult production. Pellets pressed on a wetter drying sawdust & also content less than 15% of moisture.

For Feedstock increment wood chip added on a small amount, which also performed under hammer-mill pulverization as well. Addition of debarking and chipping wouldn't allow to pass step process size of sawdust in a hammer mill.

Some fine material have to be obtained so that we could do some pressing on it. Larger drying capacitive wood shape needed supplying pelleting plant. While drying chips will also effect slower rate of the sawdust [2].

## 3. WOOD PELLETS CHARACTERISTICS

While checking or buying wood pellets some important characteristics can also examine:

- 1) Size of pellets is a most important characteristics with fueled diameter as 6 or 8mm & also 3-4 times diameter in length.
- 2) 8-10% of moisture content should also be there.
- 3) It required a very qualitative Ash contents as well which involved a very lower content below 0.7.
- 4) Almost 97.5 amount of mechanical durability required. Because sometimes pellets have been break and wear down. So Measurement of perfect pellet handling and their durability required at some stage.
- 5) Less than 1% amount of fines weight required or should be preferable, because pellets have stored in silos which can have the higher amount of fines while delivering such things.
- 6) Binding Agents also required or should be declared due to broadleaved species of material which turned conifer sawdust in a proper feedstock by using binding agents to make pellets.
- 7) Almost 650 kg/m<sup>3</sup> volume of wood pellets appointed or ordered, if it is too low then it will not helping out increasing amount of fines or the compression so bulk density is also there [1].

### 3.1 WOOD PELLETS CHARACTERISTICS BY APPEARANCE

According to the smell and visual appearance some of the things can be determined.

- 1) It has smelled like freshly cut softwood or they should smell like them.
- 2) With their layer by friction in pressing dyes, pellets have darker. But if they are made of conifer sawdust they should be in color of light brownish.
- 3) For an example here one light and long pellet we will take so that smoke should be smell like some burning wood. Which also not of any good qualitative like others.
- 4) On other example of dissolved pellets which might have been collected in a larger number to finding possible of dust in a sanding machine where pellets already added. Trying to increasing amount of contents of ash and involving sintering risk.
- 5) We have taken 1 liter of large vessel in a kitchen & filled water so as weight after reducing and in dividing some weight of pellets result should be 0.6-0.7 kg/liter in between or around preferable reading of 0.65 kg/liter. Suppose pellets have a below density of 0.6 kg/liter they can softly broke [3].



Figure 1. Smoke from a burning pellet [3]



Figure 2. Pellets dissolve in a glass water [3]

## 4. WOOD PELLETS PRODUCTION STEPS

The production of wood pellets involves:

- 1) Reception
- 2) Drying
- 3) Screening for foreign materials
- 4) Hammer-milling
- 5) Pressing
- 6) Cooling
- 7) Packaging and delivery
- 8) Storage
- 9) Quality Control of Wood Pellets[4].

### 4.1 RECEPTION

Whatever amount of incoming sawdust, it should be weigh bridged weighted & also their samples have been taken which is necessary to determine the amount of moisture content it has. There are also two kind of a sawdust available in form of wet & dry, Where in open wet sawdust have stored for a short period of time.

Even under a pretty heavy rainfalls which occurred on a base material. In this the content of moisture doesn't blown up easily or affected too badly.

Where on the other sawdust of dry one have stored indoors preventing for getting wet. For returning dust on their inside there are lot other plant of sawdust created [5].

### 4.2 DRYING

If we have considered freshly forest atmosphere or say forest residues where it has to be half of percentages of moisture content where we have a raw materials in form of wet one which has to be dried under a dryer one.

Generally content of moisture reduced 8-10%. Which is of course a rotary drum type [5].

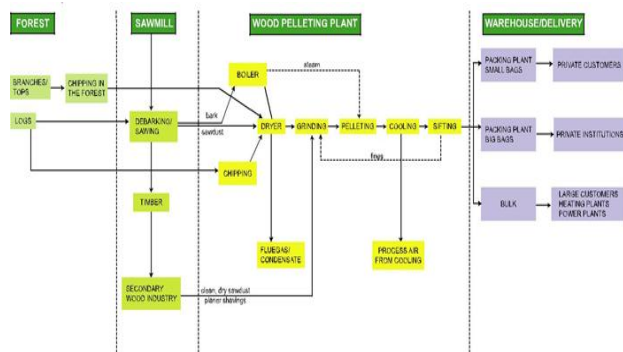


Figure 3. Wood pellet production steps[8]

### 4.3 SCREENING FOR FOREIGN MATERIALS

In a hammer-milling screening for pieces of plastics, metals & some stones been done, before sawdust came and passed through. Usually both stone so as sawdust removed opening passes over AC magnet movement in a metal and stone trap as well.

Some outsider particles trying to cause sparks in a hammer-milling and press them hard, which leads to a hard explosion in the end which is a dust explosion [5].

### 4.4 HAMMER-MILLING

Conveyor removing those outsiders on a pellet mill, where on a perforated matrix rollers action trimmed. On a knife cut off the pellet on a desired way of getting required length outside the latter. There are generally two types flat & ring die used on it.

In a flat die two or more roller rotates and holes must have been forced through as well. Where on a ring die roller pressed to the material in an inner perimeter.

Pellets common output range contributed is in between of 3-5 t/h. And service life according to the regular manufacturer of 1,000-1,500 hrs. And 10,000 tons[6].

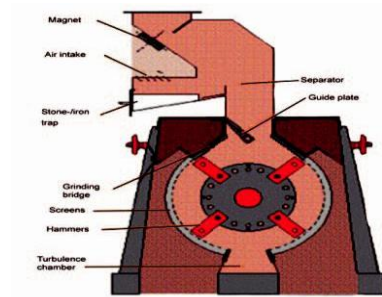


Figure 4. Hammer mill prepares the sawdust for pellet processing [8]

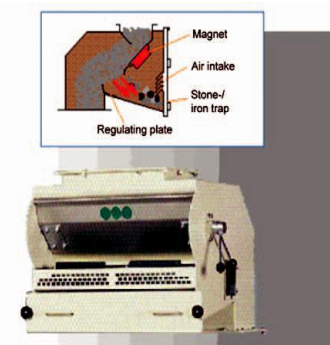


Figure 5. The separator removes foreign objects[8]

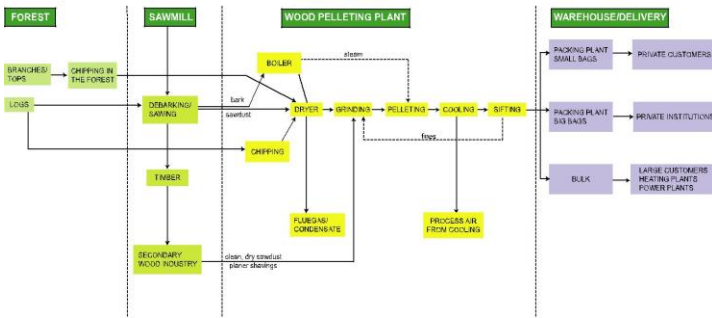
### 4.5 PRESSING

Pellet milling ensures high efficient controlling of a system and also higher amount of output as well. Also dimensioned well for higher forces and provide exchangeable wear down parts. Higher flexibility and optimum energy have been utilized while it has ensured efficient process controlling.

The remaining consumed energy to handling pellet milling required heat of 2.5-3% contents of wood energy and warming up on at 120-130°C[5].

### 4.6 COOLING

Prior of packaging and storage things a cooler have been provided for wood pellets. During the wood pelleting process additional heat and some higher energetic friction been generated in the wood pellets,



which helping to remove before sifting as well as the capacity of storage upheld.

From the surrounding region some cooled air driven through or taken. 5 to 10°C or above would be pellets temperature. The retention time and diameter or dimensioning of cooler are certainly decisive at this stage [7].

#### 4.7 PACKAGING AND DELIVERY

After removing crumbs and dust wood pellets pass through a sifter. Which firstly recirculated the process and then moved back again to the line of production. In domestic market arena they have preferred received such things in form of the bags. Sizes of 12,15 or may be 20 kg.

Delivering of smaller bags would be pretty easier thing to do so, pellets of 960 or 1 tons small bags delivered in general. Then moisture content withstand they wrapped up in a plastic material and transported usually by trucks equipped with bulky and some measure of different weight cells which has to be delivered [7].

#### 4.8 STORAGE

Constructed of wood pellets storage capacity must be side walled and should be withstand of pressure as well. Weight of 650 kg & 5-6 m considerable height of pellets cubic meter shape for some exertion of pressure in the bottom pile. Also some prevention on from condensation and pretty heavy rain and also for building of some water-tight ranging [7].

#### 4.9 QUALITY CONTROL OF WOOD PELLETS

Those readied or examined samples tested and weighted by a durability tester, during once advisable of wood

pellet quality checking in a production line. It has to be screened and weighted again which required some revolution of excess 97.5% category of pellets classified as a good pellets or say good grade one. Exceeds 1% amount of fines in a final point line of production. Some delivered declaration of incoming raw material used ash content and available of some energy which has to be given at that point of time [8].



Figure 6. (A) Good quality pellets; (B) medium quality pellets; (C) poor quality pellets [3]

#### ACKNOWLEDGMENT

I would like to express my gratitude to my guide **prof. Dr. Dipesh D. Kundaliya**, Head of the Department **Dr. Jignasa P. Mehta** Department of Mechanical Engineering, V.V.P. Engineering College, Gujarat Technological University & My External Co. guide **Mr. Jayanti A. Gorasiya** for continued support. Guidance and constant encouragement towards the project work.

#### CONCLUSION

After examined and tested various prevention steps of wood pellets frame work rule of poor qualitative work have to be ignored. Where some absolutely qualitative wood pellets work be more expensive. Also it has to take some profiled investment as they burn down on an efficient way which has to be slower one.

In this paper studied various wood pellets steps of production, flow process where loading in raw material intake the starting position of going and taken out on a final loading out control stage, essential things related with the controlling of quality check during those line of complicated production, where internal quality of wood pellet making was important.

## REFERENCES

[1] Kuokkanen et al. (2011) "Additives in wood pellets," Bio Resources 6 (4), 4331-4355.

[2]The Beginners Guide to making pellet production by PelHeat.com

[3]Article of Simple ways to check wood pellet quality by Pieter D. Kofman Product No.11. ByCoford Connects.

[4]Animal Feed Pelleting by California Pellet Mill Co. pg. 1-33.

[5]Article of Biomass Pelleting by ANDRITZ.com

[6] Article of pelletizingtechnology overview by European Biomass Industry Association.

[7]Pre-feasibility Analysis of pellet manufacturing on the former Ioring Air Force Base Site, By Randolph Hunsberger and Gail Mosey. Task No. WFD3. 1001.

[8]Article of Production of Pellets Coford Connects Product No.10 by Pieter D. Kofman.

