

## Control of Moisture Content in Bagasse by Using Bagasse Dryer

J.SUDHAKAR<sup>#1</sup>, P.VIJAY<sup>\*2</sup>

<sup>#1</sup> Mechanical Department, KL University Guntur

<sup>#2</sup> Asst professor Mechanical Department, KL University Guntur

**Abstract**— Sugar mill wet bagasse is used as a fuel in sugar industry worldwide. The moisture content on the bagasse is effort on the calorific value (CV) of bagasse and boiler efficiencies. Industries and research institutes have been working to reduce the moisture content of mill wet bagasse. The average moisture content in the bagasse is 51.5%. Then the bagasse dryer was installed. Around 45% of wet bagasse was routed through the dryer. This paper discusses about the bagasse dryer installation and operation

**Keywords**— Boiler efficiency, moisture in bagasse, gross calorific value, fuel gas temperature, bagasse dryer, mechanical methods, direct and indirect method.

### I. INTRODUCTION

Typically the mill wet bagasse contains around 48% to 52% moisture with a gross calorific value (GCV) of around 2270 Kcal/kg (~9500 kJ/kg). Normally the bagasse is directly fed to the boiler to generate steam and surplus bagasse is stored in the bagasse yard. The boiler installed in the plant are designed to burn bagasse with this moisture.

It is a known fact that GCV of bagasse is largely dependent upon its moisture content. Higher moisture content in bagasse reduce its GCV and also results in higher energy loss because the fuel moisture carries that latent heat of vaporization up the stack.

The GCV of bagasse can be determined can be determine by the following equation –

$$GCV^{(1)} = 196.05 \times (100 - W_w \% - W_A \%) - 31.14 \times W_{RDS} \dots KJ/kg$$

Where,

$W_w$  - is the moisture content

$W_A$  - is the ash content

$W_{RDS}$  - is the Brix

As can be seen from the above equation, the GCV of bagasse shows a decrease of 196KJ/kg (47Kcal/kg) for every 1% increase in moisture. Fig 1 shows variation of GCV with bagasse moisture for a typical bagasse sample with 2.75% ash on air dried basis.

In this Figure the x-axis is represented by moisture content in percentage (%). And the y-axis is represented by GCV in Kcal/kg.

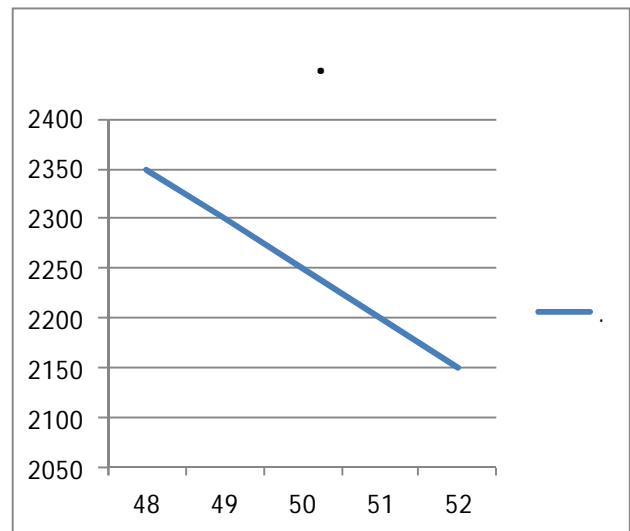
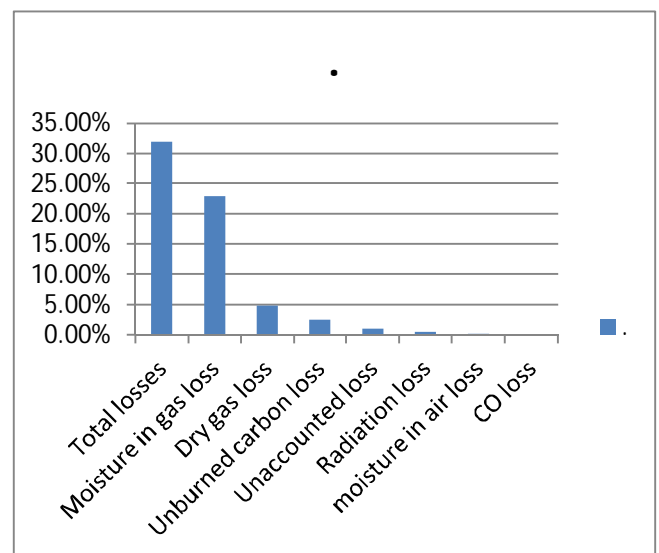


Fig 2<sup>[1]</sup> below the typical losses for a bagasse fired boiler calculated as a percentage of unit mass of bagasse with 52% moisture.



The above results indicate that more than 90% of losses from the boiler are stack losses and out of these losses the moisture loss is the most significant. Therefore by reducing the moisture content in the bagasse, the efficiency of the boiler

can be improved and extra bagasse saved will be available for other use.

The stack losses are related to the fuel gas temperature and the extent of loss is directly proportional to the final fuel gas temperature – higher the exit temperature, higher are the losses.

Most boilers have economizer and air heaters which substantially reduce the fuel gas temperatures. Typically the fuel gas temperatures vary from 150 to 165 deg C. Further reduction in the fuel gas temperature will require additional heat exchanger in the economizer / air heaters.

Passing the fuel gas through a bagasse dryer rather than adding heating surface is an effective way of reducing both the bagasse moisture and the final fuel gas exit temperature.

II. THE BAGASSE DRYER OPTIONS AVAILABLE WERE –

1. Indirect method dryer
2. Direct contact dryer - Stationary / Rotary

In stationary type dryers two arrangements were available – parallel arrangement and sequence arrangement as shown in Fig 3a and 3b<sup>[2]</sup>.

FIG 3A – BAGASSE DRYER – PARALLEL ARRANGEMENT -

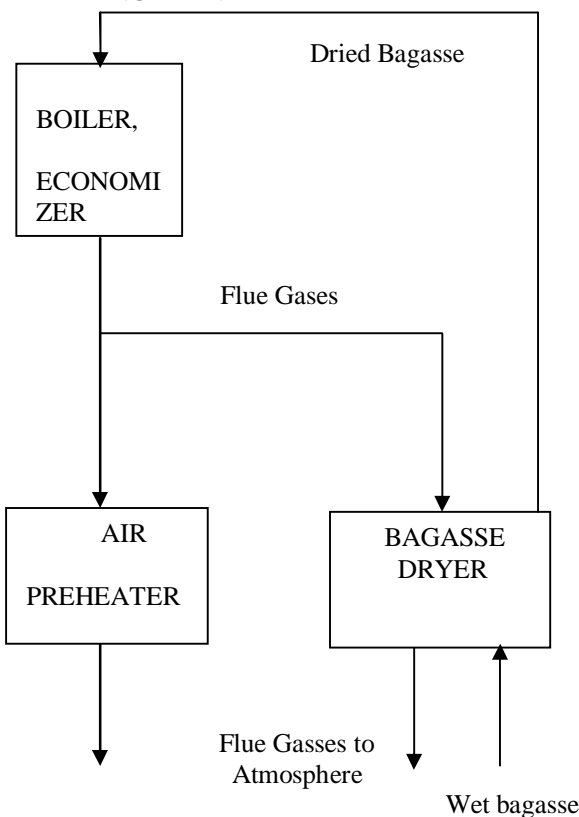
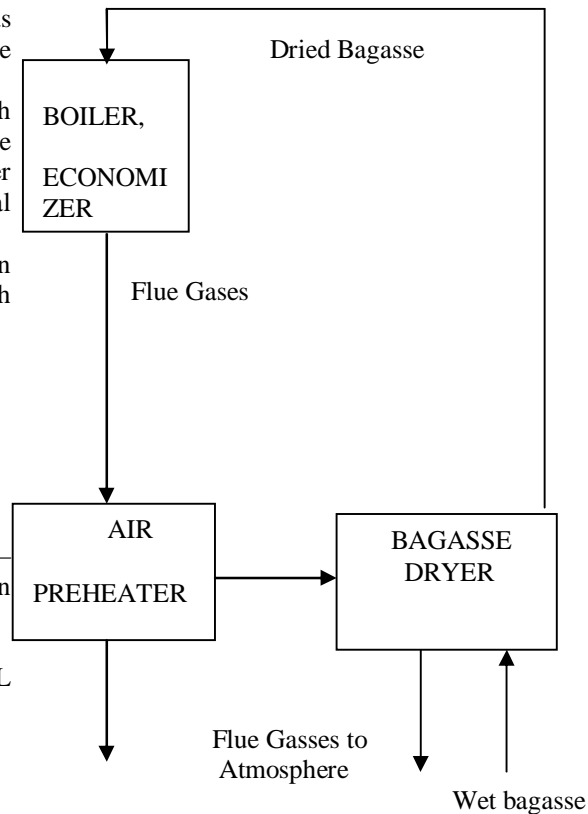


FIG 3B – BAGASSE DRYER – SEQUENCE ARRANGEMENT -



The Bagasse dryer is installed between the boiler ID fan and the chimney. The wet bagasse from the mill is drawn from the bagasse elevator and is transported to the dryer by belt conveyor. The dried bagasse is transported back to the main bagasse carrier for boiler by another belt conveyor. The flue gas to the dryer are taken from the existing ducting that connects the outlet of the boiler to the chimney through to the dryer fan. The bagasse feed to the dryer is controlled through rotary valve

The dryer fan moves the fuel gases and bagasse mix throughout the dryer tube where the temperature of the fuel gases and the moisture in the bagasse is reduced. Dried bagasse and fuel gases are separated in cyclone separators. The dried bagasse is discharged on the belt conveyor at the bottom of the cyclone and the fuel gases are discharged to atmosphere.

III. FOR SELECTION OF THE DRYER THE FOLLOWING PARAMETERS WERE CONSIDERED –

1. Heat transfer rate
2. Retention time
3. Uniformity of drying
4. Number of insulations
5. Operating results.

#### IV. DRYER OPERATION

It is understood that the main goal of the bagasse drying action, according to the design is to get fuel gas temperature at 75 deg C minimum rather than any bagasse moisture content. Dryer operation are controlled through a control loop which regulates the quantity of bagasse fed to the dryer through rotary valve and gate of bagasse elevator. The quantity of fuel gas is controlled by regulating the RPM of dryer fan in order to keep the fuel gas temperature close to 75 deg C. The bagasse dryer can be put in and out of operation without disturbing the boiler and does not require any extra manpower for operation. Also the dryer does not require any special maintenance.

#### V. OPERATIONAL SAFETY –

Utmost care is required to prevent jamming of dryer tube due to fly ash and bagasse. Though the process time in the dryer is only a few seconds, care should be taken to prevent fire in the dryer. The fire can be due to succession of events – e.g. there is a bagasse jam at the dryer outlet and the process continuousness is interrupted. Some quantity of bagasse remains inside the dryer – mostly in the cyclone and is exposed to larger than normal residence or contact time with the fuel gases and / or hot metal parts. As a result moisture content of the bagasse is further reduced. Under these conditions bagasse is susceptible to catch fire. Therefore the flow of bagasse in and out of the dryer should be monitored continuously during operation.

#### VI. CONCLUSION

The paper gives an use of bagasse dryer and how the bagasse dryer method is working and reduce the moisture content in bagasse. And give the explanation of the operational safety. By using this the boiler efficiency is also increased.

#### VII. ACKNOWLEDGEMENT

We would like to sincerely thank to the people who helped us to carry out study at the K.C.P sugar factory. We should also thank the KLUNIVERSITY.

#### VIII. REFERENCES

- [1] Cane Sugar Engineering, Peter Rein page nos. 621, 625-627
- [2] Proceeding of 14<sup>th</sup> International Drying Symposium, 2004, Brazil page nos. 994
- [3] Handbook of Cane sugar Engineering, E. Hugot