

## Bagasse Drying Methods

Drying generally refers to the removal of moisture from a solid by evaporation. Based on the mode of heat transfer, bagasse dryers can be classified into two types.

1. Indirect or non contact Dryers.
2. Direct or contact Dryers.

Both indirect drying and direct drying can be attempted for drying of bagasse.

### **1. Indirect Dryers:**

They are also called as non-adiabatic units, where the heat transfer medium is separated from the product to be dried by a metal wall. In the case of drying of bagasse, the heat transfer is only through conduction and forced convection. No radiative heat transfer takes place because of lower temperature levels of operation. The indirect drying method can be tried for bagasse with low pressure steam (3ata or less) by adopting large tube bundles, inside a large bin. Typically the bagasse moisture can be reduced from 50% to 45%. A dryer handling 90 t.p.h through put of wet bagasse at 50% initial moisture can be dried to around 86 t.p.h of bagasse at 45% outlet moisture with around 4.0 t.p.h of evaporated moisture. The dryer would consume around 6.3 tons of low pressure steam. Even after discounting for the energy of steam used and the electrical power required for the drive of dryer motor, there can be significant energy economy because of increased boiler efficiency and increased boiler steam output. The increase in boiler efficiency and the increase in steam to bagasse ratio because of lower moisture content in bagasse used is shown in figure 1.

A typical indirect dryer for bagasse application can be a bin dryer. The large bin is kept vertical with large diameter (100 or 150 mm) pipes passing along the vertical axis at a pitch of 450 to 600 mm and the bin circumference is also lined with vertical steam pipes. The pipes are fed at the top with low pressure steam with radial outlets from a common feed header, reaching to individual pipes. The pipes are again connected together at the bottom end and the condensate removed out of the system. The bagasse is charged to the dryer at the top from belt conveyors. The bagasse descends vertically down to the bottom where it is extracted by a bagasse extractor. During its travel down the container bin, the bagasse gets dried by physical contact with the steam pipes and the liberated water vapour travels up and out of the container bin.

As on date there are no non-contact type bagasse drier functioning anywhere successfully. The above description is of a drier with promising features that can be given a trial.

## **2. Direct dryers:**

Direct dryers or adiabatic or contact type dryers, transfer heat by direct contact of the product with the hot gases. The gas transfers sensible heat to provide the heat of vaporisation of the moisture present in the solid. It is possible to obtain some non-luminous radiation heat transfer benefit also in this case, since the moisture content in bagasse is quite high. Direct heating is preferred wherever feasible, for the following reasons.

1. Rate of heat transfer is high due to direct contact between the flue gas and the raw material.
2. Short residence time
3. Uniform drying

Drum type rotary dryers can be selected for direct drying bagasse. The waste flue gases at boiler outlet or other suitable temperature level waste gas can be used for this purpose. Generally rotary dryers operate in concurrent mode to avoid possibility of ignition. However, since bagasse contains very high moisture and the waste gases contain significantly low quantities (less than 8% by weight) of oxygen, a counter current dryer can be advantageously adopted to save on cost and space for dryer installation. Nevertheless, contact type dryers will have suitable provisions for fire fighting because of possibilities of leakage air ingress.

The main component of this dryer is a steel shell set up on rollers by means of bandages (hoops) located in the shell. The cylindrical chamber is usually inclined with a slope to the horizontal so that the solids slowly progress through the dryer under gravity, but the characteristic action of the dryer is provided by the longitudinal lifting baffles known as flights, which collect the material and subsequently shower it through the flue gas stream as the barrel rotates. These lifters are fastened to the inner surface of the drum.

The additional requirement for direct (Contact type) dryers, is, that it becomes necessary to separate the waste gases (with dried out moisture) from the fine dust of bagasse that would be carried along. This concept therefore requires additional investments.

There were some contact type direct dryers tried for bagasse drying in a certain location in India. The dryer was later dismantled since there were operational problems that had to be addressed to, before making it suitable for continuous operation.

Bagasse drying is a concept which deserves additional attention and developmental efforts. Since the ultimate aim is to achieve energy economy in the combustion of bagasse, it is necessary that the energy balance is always kept in mind while various concepts are developed.