



CHAPTER 3

INSTRUMENTS & EQUIPMENT

3.1 Instruments

The dryer used in this study is consisted of four significant parts as follows:

3.1.1) Dryer's Body / Drying Chamber

Dryer's body or drying chamber is fabricated from profiled steel bars and steel plates in sizes of :

width x length x height
700 x 1600 x 500 mm.

All sides of dryer are insulated by glass wool 50 mm. thickness and density of 80 kg/m^3 with aluminum foil cladding. All structural steel of the dryer is coated with heat resistant paint to protect any corrosion by moisture in air.

At front and rare sides of dryer, the dryer shell plates are cut out to make one stripped hole for veneer feeding in and out respectively.

The roughly general arrangement of the dryer's body is shown in Figure 3.1 and Figure 3.2 is provided to show the detail of dryer's body and insulation

3.1.2) Hot Air Unit

Hot air unit is consisted of chamber and LPG burner which can be adjustable. By LPG regulator, fresh air will be draught through the unit by centrifugal blower into the

dryer.

Frequency Inverter is used to control and vary air flow rate through the dryer.

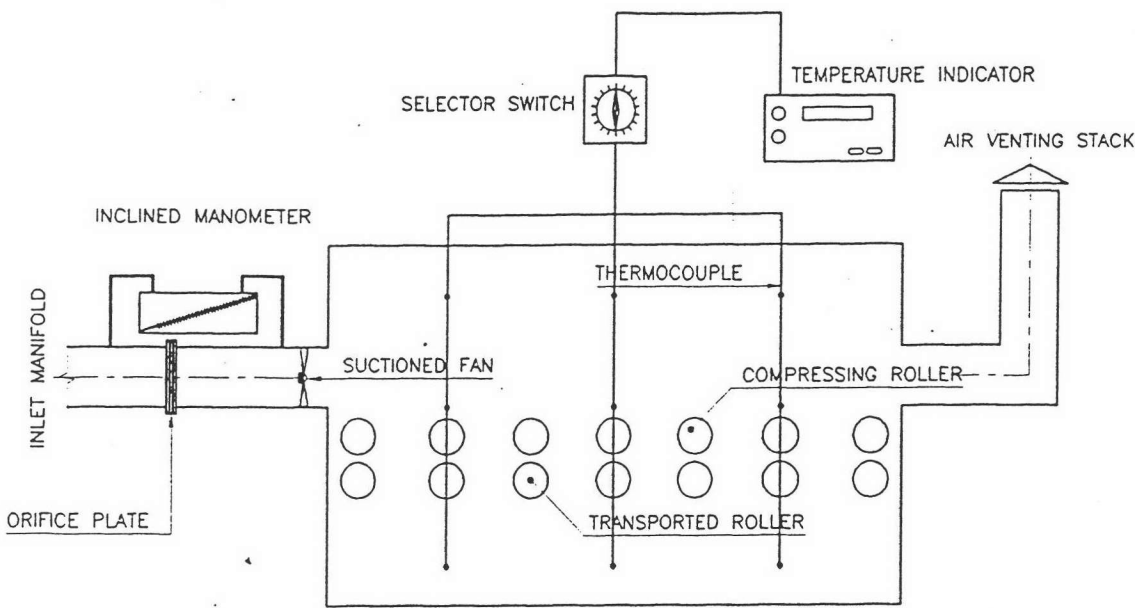


Fig. 3.1 Roughly general arrangement of the dryer, inlet and outlet manifolds, rolling conveyor and set of temperature indicator.

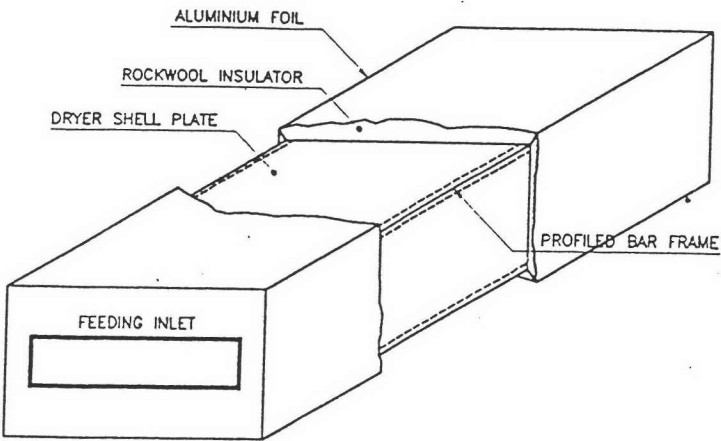


Fig. 3.2 Isometric drawing of dryer's shell and insulation.

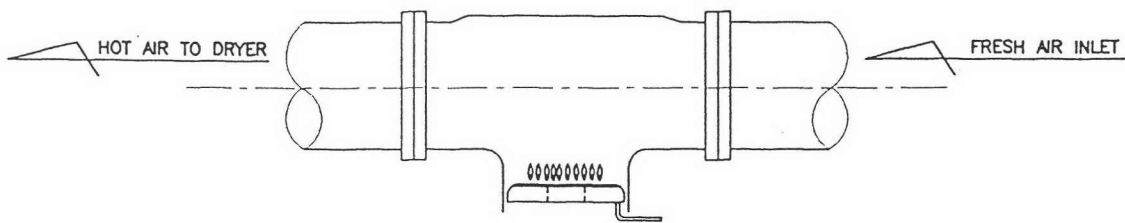


Fig. 3.3 Show Chamber and LPG Burner of hot air unit.

3.1.3) Inlet and Outlet Manifolds

Inlet manifold is consisted of

- air inlet pipe, use carbon steel pipe diameter 250 mm. and 2,000 mm. length
- Orifice plate and inclined manometer is provided at front of suction pipe to measure flow rate of fresh air.
- Blower is centrifugal type dia 250 mm., maximum air flow rate : 1500 cfm., provided inside the inlet manifold to give the turbulent flow that cause better convection mass transfer.

Outlet manifold is consisted of

- air vent stack, use built-up box steel plate 180 x 180 mm.

3.1.4) Conveyors

Veneer sheet is passed through the drying chamber by 6 sets of rolling conveyors, fabricated from mild steel pipe and shaft and also coated with heat resistant paint to protect corrosion from moist air. The speed of motor can be adjusted by using frequency inverter to suit and relate to the drying rate of veneer during passing drying chamber.

3.2 Measurement Methods and Equipment

3.2.1) Moisture Content of Wood

Wood moisture tester is provided for roughly check the moisture content of veneer when it is moved out from dryer.

- Measuring range 6 % - 30 %
- Accuracy ± 0.5 %

The actual values of veneer moisture content are measured by weighing veneer with electric weighing equipment. The accuracy of this equipment is ± 0.001 g.

3.2.2) Temperature / Relative Humidity

The average temperature of air inside the dryer is the important value to state the condition of dryer. For a meaningful value, Cromel - Alumelm (K type) thermocouple range 0-400 °C and temperature switch model ID-8 is used to monitor dry bulb temperature at various levels of three sections inside the drying chamber. This measuring system is calibrated by dipping each thermocouple in temperature controlled water bath.

For dry/wet bulb temperature of atmosphere, thermometer mercury bulb type, temperature range 0 - 105 °C and accuracy ± 0.2 °C is used.

3.2.3) Air flow rate

Orifice plate and inclined manometer is used to measure fresh air flow rate to the

dryer.

3.2.4) Relative Humidity of Atmosphere

Hygrometer, range 0 . 100 % and accuracy + 1 % is used.

3.2.5) Resident Time

Stop watch with the accuracy 0.001 second is used.

Measuring equipment used in this study are as follows:



Fig. 3.4 Electric weighing equipment

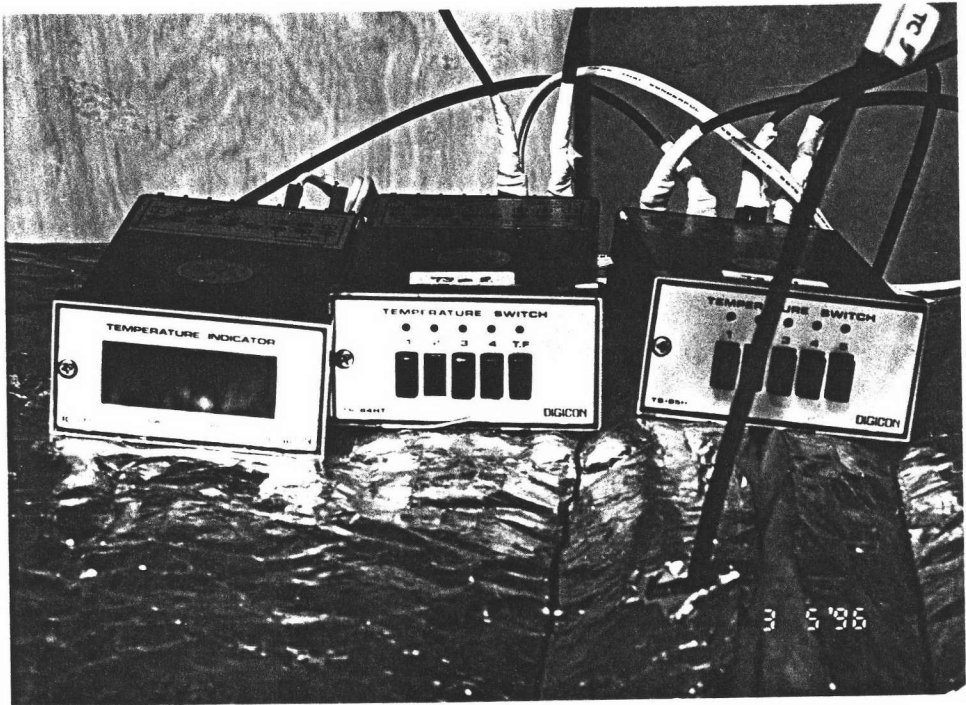


Fig. 3.5 Temperature indicator and Temperature sensor

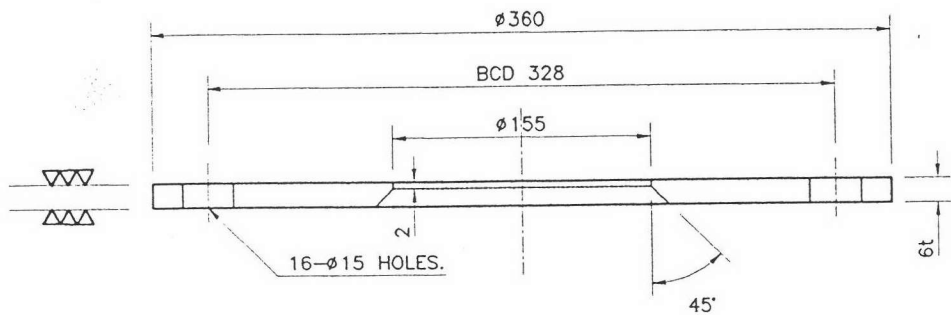


Fig. 3.6 Orifice Plate

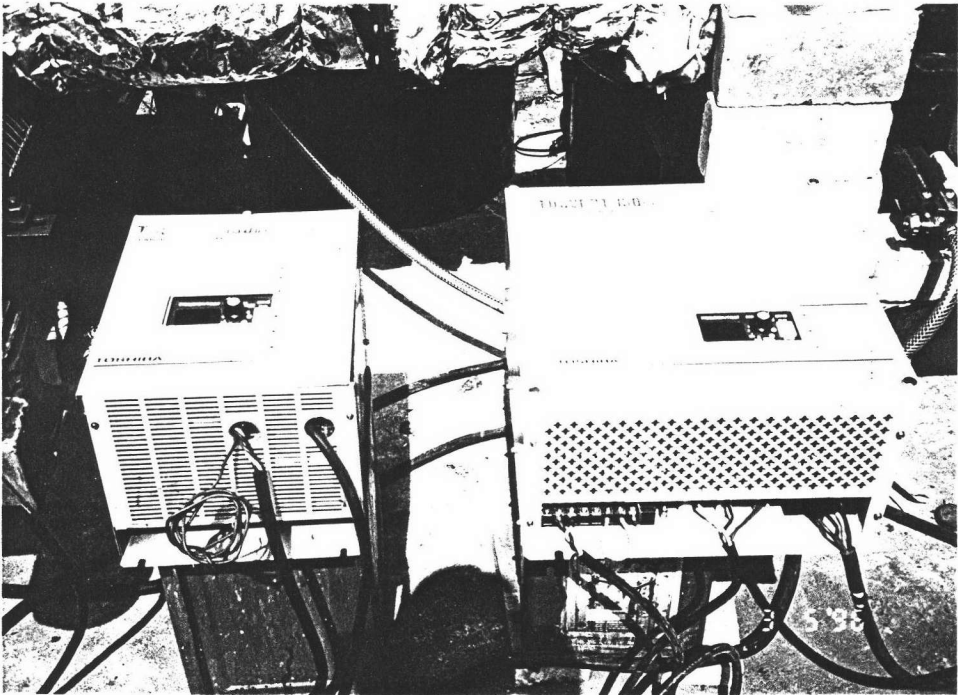


Fig. 3.7 Frequency Inverter