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Measurement of dryer condensing rates (vertical separator method)

Scope

This Technical Information Paper outlines a method for measuring the average rate of steam condensation of the drying cylinders that discharge into a separator tank. The tank must be equipped with shut-off valves and a sight glass or magnetic level indicator for observing the level of condensate in the tank.

Safety precautions

This method for measuring the rate of steam condensation places the technician near steam (hot water vapor) and condensate (hot liquid water) under pressure. Care must be taken to ensure that all equipment is properly and securely connected. Extreme care should be taken to avoid direct contact with hot pipes, valves, and other equipment. Use hand and eye protection when setting up and operating the equipment. Special care should be taken if atmospheric condensate drain valves are opened to help drain the separator. All specific mill safety requirements should be followed. Some mills require that paper machine operating personnel assist by turning hand valves.

Introduction

To accurately measure the dryer section condensing rate with a vertical separator, it is necessary that all connections to the separator and all joints in piping and components be completely tight so that no condensate leakage occurs. To accurately time the condensate rise, hand valve(s) must be easily turned and provide tight shut-off and sight glass indicators must be clean so condensate level can be easily seen.

To accurately calculate condensate flow, a calibrated pressure gauge or thermometer (or both) should be installed in the separator tank to determine condensate specific volume. If local gauges are not available at the tank, separator pressure may be estimated by subtracting dryer differential pressure from steam pressure to the dryer(s). The level control loop must be operational so level can be adjusted; specifically, the condensate level must be able to be lowered to provide a sufficient height of rise. If level is controlled through a distributed control system (DCS), it may be necessary to utilize radios to contact the control room to lower the level.

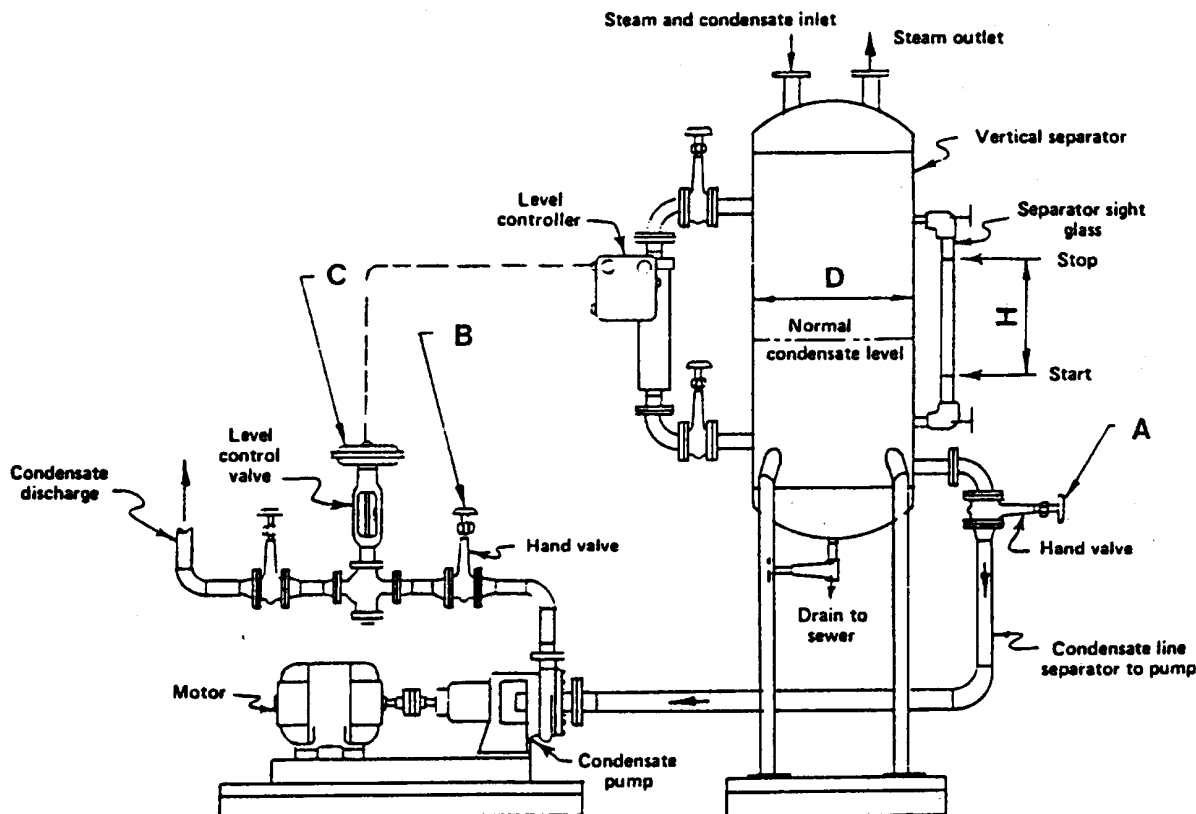


Fig. 1. Diagram showing location of valves.

Test preparation

1. Mark start and stop lines on the separator sight glass (see Fig. 1). Normally these marks should be 100 to 300 mm (4 to 12 in.) apart to provide an accurate measure of the condensate rise. The greater the condensate rise, the greater will be the measurement accuracy. An alternative to marking start and stop lines on the level gauge is to hang a tape measure (lockable type) on the level gauge. This is easier than marking lines and it allows the tester to shorten or lengthen the rise distance, if desired.
2. Lower the condensate level in the separator tank below the start mark on the sight glass or magnetic level indicator by adjusting the level control set point. Start mark may have to be raised if pump NPSH requirement prevents a low level operation.
3. Close all condensate drains from the separator, except the main condensate discharge line to the condensate pump.
4. Record the separator tank diameter and operating pressure or operating temperature. If a separator pressure or temperature gauge is not present or operational, the separator pressure can be determined by subtracting the differential pressure from the dryer steam pressure for the particular steam group being measured.

Test instructions

1. Simultaneously turn off the condensate pump, and close valve A, or close valve B, or increase the condensate level setpoint to maximum to close valve C. It is strongly preferred that hand valves A or B (usually gate valves or ball valves) be shut instead of relying solely on the control valve C, because gate and ball valves are more likely to have tight shut off.
2. Using a stopwatch, measure the time required for the condensate to rise from the start to the stop mark on the sight glass. Record separator pressure to be sure conditions are constant.