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Measurement of dryer condensing rates (batch method)

Scope

This Technical Information Paper outlines a method to measure condensing rates and blowthrough steam flows from a single dryer cylinder. Separate methods are provided for dryers operating above atmospheric pressure and those operating under low pressure or vacuum. These methods require that discharge from the dryer be temporarily diverted and collected in a drum of water.

Other methods for measuring condensing rates are outlined in TIP 0404-18 (Measurement of dryer condensing rates (vertical separator method)) and in TIP 0404-03 (Measurement of dryer condensing rates (continuous method)). The 0404-18 method is used most commonly for measurement in the field, but it measures the average condensing rate of all dryers discharging condensate into the separator tank and it does not provide a measurement of the blowthrough flow rate. The 0404-03 method provides measurement of both condensing rate and blowthrough flow rates for a single dryer, but requires more equipment and instrumentation than this method requires, at least for dryers operating above atmospheric pressure.

Safety precautions

This method for measuring the rate of steam condensation and blowthrough flow 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 contact with hot pipes, valves, and other equipment. Use hand and eye protection when setting up and operating the equipment.

Content

Test instructions

For dryers operating above atmospheric pressure (Fig. 1)

1. Measure tare (empty) weight of drum.
2. Fill drum approximately 2/3 full with water at 7-15 °C (45-60 °F).
3. Measure weight of drum and cold water.
4. Measure temperature of cold water in drum.
5. Measure steam supply temperature.

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6. Measure steam supply pressure.
7. Open valve V_1 and measure dryer discharge pressure.
8. Shut valve V_3 ; open and regulate valve V_2 so that dryer discharge pressure V_1 does not change.
9. Let steam and condensate flow stabilize in hose, then plunge hose into drum of cold water. Start stop watch.
10. When water temperature in the drum approaches 60°C (140°F), remove hose and simultaneously stop the stop watch.
11. Measure weight of drum and hot water.
12. Measure temperature of hot water in drum.

NOTE 1: Avoid spilling water when hose is plunged into drum.

NOTE 2: Do not heat water above 60°C (140°F), for some blowthrough steam may fail to condense.

NOTE 3: Repeat test at least three times, or until consistent results are obtained.

NOTE 4: The method is not practical for dryers operating under vacuum.

NOTE 5: Calibrate scales, thermometer, and pressure gauges.

NOTE 6: The machine condition must be held constant during the test.

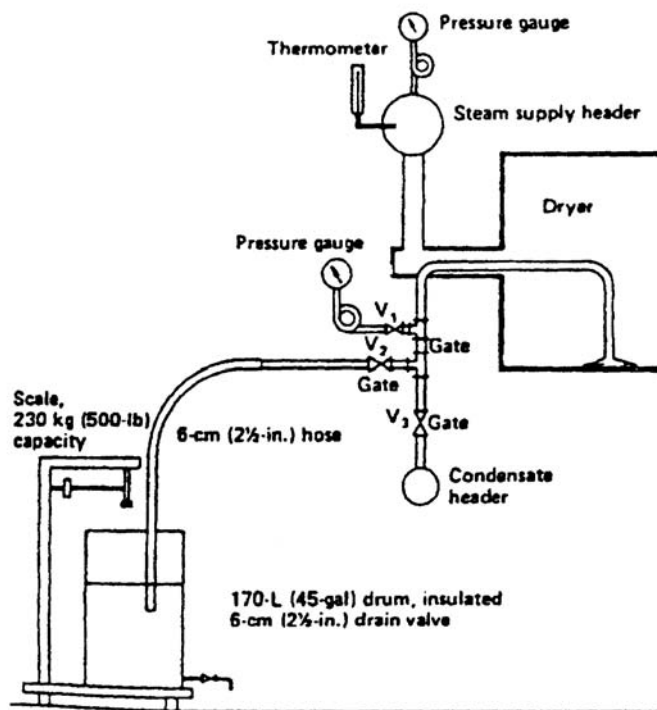


Fig. 1. Dryers operating under pressure.

For dryers operating near or below atmospheric pressure (Fig. 2)

1. Measure tare weight of drum.
2. Fill approximately $2/3$ full with water at $7-15^\circ\text{C}$ ($45-60^\circ\text{F}$).
3. Measure weight of drum and cold water.
4. Measure temperature of cold water in drum.