

TABLE 1. DRIERS FOR EVAPORATION OF WATER

| Type                  | Kind            | Materials Handled                                     | Means of Handling                             | Temp. Range, Deg. F. | Heat Supply                                           | Uses and Remarks                                                                            |
|-----------------------|-----------------|-------------------------------------------------------|-----------------------------------------------|----------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Batch or Intermittent | Compartment     | Paper, Leather, Yarns, Lumber, Foodstuffs             | Suspended, Truck, Tray                        | 80 to 180            | Steam Coils, Air, Electricity                         | When production does not warrant continuous drier                                           |
|                       | Agitated        | Chemicals too sticky for Rotary Drier                 | Shoveled into Drum or Pan                     | 100 to 330           | Water, Steam Jacketed, may have Vacuum on top         | Where dust must be saved                                                                    |
|                       | Vacuum          | Chemicals, Explosives, Pharmaceuticals, Food Products | Tray, Basket, Tumbling Drum                   | 80 to 300            | Water, Steam                                          | Cost of operation high, for expensive materials                                             |
| Continuous            | Tunnel          | Ceramics, Chemicals, Lumber, Food Products            | Truck, Tray, Belt                             | 100 to 350           | Steam Coils, Air, Electricity, Products of Combustion | For high production                                                                         |
|                       | Rotary          | Bulk                                                  | Cascades through                              | 80 to 500            | Air, Steam, Products of Combustion                    | Where material will stand rough handling and is not subject to balling up                   |
|                       | Drum            | Liquids, Slurries                                     | Flowed on Drum, Dry Material Scraped off      | to 310               | Steam, may have Vacuum on Top                         | Hygroscopic materials dried with vacuum, and packed immediately                             |
|                       | Cylinder        | Paper, Textiles, Chemicals                            | Continuous Sheets, Endless Chain Belt         | to 350               | Steam inside of Drum                                  | Where material comes in sheets or rolls, and will stand direct contact with heating surface |
|                       | Festoon         | Paper, Chemicals                                      | Continuous Sheets, Suspended on Metal Screens | to 200               | Air, Steam Coils                                      | Where one side cannot come in contact with supports until dry                               |
|                       | Tower or Column | Grains, Sand                                          | Falls through by Gravity                      | 125 to 250           | Air, Steam Coils                                      | Where headroom is available                                                                 |
|                       | Spray           | Solutions over 30% Solids                             | Sprayed into Chamber                          | 120 to 350           | Air, Products of Combustion                           | Drying is almost instantaneous                                                              |
|                       | Induction       | Metals, for removal of traces of Water                | Placed in High Frequency Field                | to 400               | Electricity                                           | Where heating of metal from inside out is important                                         |

## Conduction or Direct Contact Drying

This method of drying is advantageous where the material can be flowed on to the drying surface and the dried material scraped off, or where the material to be dried can be handled in a sheet, and where there is no danger of subjecting the product to the full temperature of the heating medium. The source of heat for this method may be steam, electricity, hot oil or hot water.

## Convection

The circulation of heated air or other gases about the material to be dried is generally termed convection drying. The convection may be either natural or forced. With forced circulation, the temperature of the

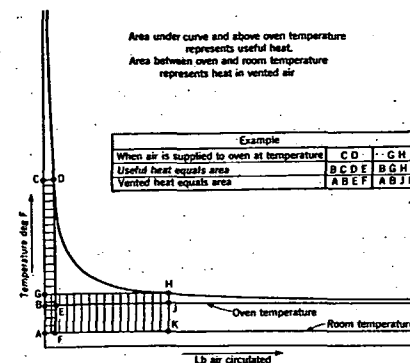


FIG. 1. RELATION BETWEEN USEFUL AND TOTAL HEAT SUPPLIED

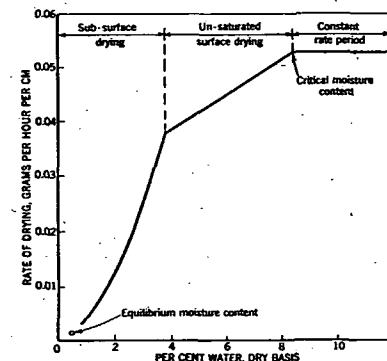


FIG. 2. RATE OF DRYING OF WHITING SLAB

drier is more uniform and the rate of drying is much higher than with natural circulation. Where humidity is used, the control is much easier, and more accurate.

The source of heat for a convection drier may be steam, electricity, hot water, oil-fired heater, gas-fired heater, or coal furnace. Where either oil, gas or coal is used, the type of heater may be direct or indirect; i.e., the products of combustion may be used (direct), or the circulated air may be heated through an interchanger (indirect).

Where the direct type is used, there is naturally a higher thermal efficiency, but it can only be used where the odor, soot, or the chemical elements of the products of combustion do not affect the material being dried. When heat economy is an important consideration this method (Fig. 1) may be used, permitting a small amount of air to be circulated, if a sacrifice of accurate control of temperature and humidity can be justified.

## DRIERS

The term *adiabatic drier* is applied to a drier in which all the heat is supplied by air externally heated. The temperature of the air in the