

tion of the two, obtained by center exhaust. Further, the air flow may be across the surface of the trays or up or down through the bed, or in any combination of directions. By reheating the air in this type of dryer or recirculating it, a high degree of saturation is achieved before exhausting the air. This reduces the waste of sensible heat.

A variation of this type dryer is the strictly continuous type having one or more mesh belts which travel through the dryer carrying the product, such as Fig. 9. Innumerable combinations of temperature, humidity and air direction and velocity are possible. The labor requirement is low on such a dryer, as it can be loaded and unloaded mechanically. There is the disadvantage of hot air leaks at the entrance and exit, although these can be minimized by means of baffles or inclined ends where the material enters and leaves from the bottom.

Spray Dryers. In recent years the spray dryer has become important for the drying of liquids in many fields, especially in the food industry.

The liquid is atomized by means of pressure nozzles, air jets or centrifugal bowls into the air stream of a tower or chamber. Inlet air tempera-

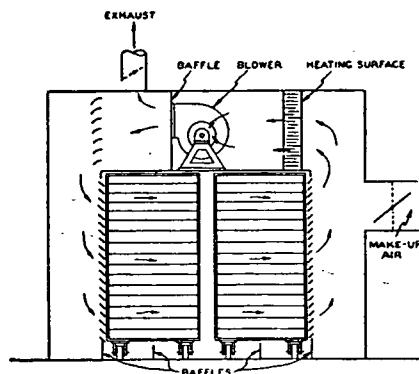


FIG. 8. COMPARTMENT DRYER, SHOWING TRUCKS, WITH AIR CIRCULATION⁵

tures may run from 250-300 F up as high as 1200 F. Drying times are very short because of the minute particle size. Particles as small as 5 to 10 microns are formed in spray dryers. The dry powder is separated from the air by cyclone separators which are sometimes followed by cloth bags or scrubbing towers.

Because of the high inlet temperatures and the relatively large volume of air required, the efficiency of the spray dryer is not too good and, consequently, is seldom used for dilute solutions (less than 30 percent solid). Fig. 10 shows a typical arrangement for a spray drying system.⁵

A common and important feature of all spray processing is the direct conversion of the spray liquid to a granular product suitable for packaging without grinding or other intermediate handling. Another aspect is the unusually high rate of drying attained. In a well designed system 15 to 30 seconds is a fair time for the passage of the sprayed particle through the drying zone; the particle temperature need not rise materially above the

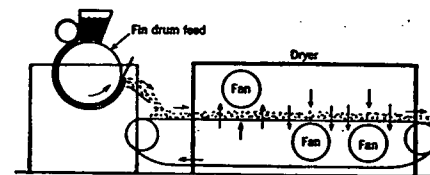


FIG. 9. SECTION OF CONTINUOUS DRYER, BLOW-THROUGH TYPE

wet-bulb temperature of the drying air. This makes the process particularly adaptable to the drying of heat-sensitive material, some of its most important applications being the drying of milk, eggs, potato flour, soap and blood.⁸

Tobacco Curing⁹

Considerable progress has been made recently in developing improved tobacco curing systems, through the application of heating equipment for maintaining uniform temperatures. Controlled heat and air circulation shortens the curing period and improves the quality of tobacco.

Suitable barn ventilation effected by bottom and ridge venting reduces the time and cost of curing. Orientation of barn with respect to the prevailing wind is helpful.

Tobacco Re-drying

In modern plants, tobacco is re-dried in continuous, conveyor type machines under controlled temperature and humidity conditions. One type of machine re-dries leaf tobacco in hands. This machine consists of a drying section, cooling section, and ordering section. As the hands are carried through the drying section on sticks, a high velocity of air is directed down through the heads, and a low velocity of air passes over the body of the tobacco resulting in fast and uniform re-drying.

In the cooling section, the tobacco is quickly cooled and conveyed through the ordering section, where a controlled amount of moisture is added in this section which is maintained at almost saturated humidity ratio, so that the leaves can be packed for storage without the danger of breakage.

Agricultural Drying

Information on drying of agricultural products, such as milk, apples, flowers, tung nut, lumber, fruit juices, broom corn, grain, hay, peanuts,

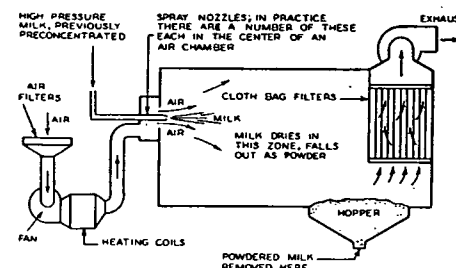


FIG. 10. SPRAY DRYER OF THE PRESSURE-SPRAY ROTARY TYPE⁵