

A. SPRAY CHAMBERS OR TOWERS

Air-washing equipment that depends on liquid sprays or cascades is characterized by empty or nearly empty enclosures through which air moves against fairly low resistance. The air-liquid contact surface is that of the liquid droplets as they fall through the air, supplemented by the surfaces of any deflecting elements placed across the air stream (Figure 25). As the air-liquid contact surface is increased by reduction of droplet size, a critical point is reached where the air stream begins to entrain or carry over the spray or fog. Spray pressure and nozzle type are therefore related to the velocity of air movement, and practical operation requires a compromise between high contact surface for most effective cleaning, and high air-treating capacity.

The spray chamber may be constructed as a vertical cylinder with tangential air inlet (Figure 25). Centrifugal force can be developed by the rotating air stream as a means of separating the liquid droplets and any large solid particles entering the chamber.

B. DEFLECTION ORIFICE SCRUBBERS

Figure 26 illustrates a type of air scrubber that makes use of energy in the air stream to generate a liquid spray or cascade. The "orifice" is the space between the surface of the liquid and a deflection element or "gate" below which the air must pass to reach the scrubbing zone. In some designs the air is impinged vertically against the liquid surface and escapes in all directions with the entrained liquid. Fully submerged impingement nozzles are used in gas-sampling instruments, but the impact velocities are far greater than used in air or gas cleaners of practical industrial design.

The orifice scrubber requires close control of liquid level to ensure the correct amount of liquid entrainment and, at the same time, prevent an excessive pressure drop, represented by depression of the liquid surface in the vicinity of the orifice. Pressure drop generally ranges between 2 and 6 inches of water.

C. PACKED TOWERS

Gas or vapor absorbers used extensively in the chemical industries are vertical cylinders or towers packed with materials like broken stone, hard coke, clay spheres, Berl "saddles," or hollow cylinders or rings made of ceramic, metal, carbon, or glass, according to the chemical and structural properties required. Packed towers are remarkably effective as air cleaners when correctly designed and operated.¹¹

The height of an absorption tower influences its effectiveness, while the cross-sectional area determines its air-handling capacity. For convenience in estimating capacity, the movement of air or gas through a packed tower is expressed in

¹¹ Max Leva, *Tower Packings and Packed Tower Design*. The United States Stoneware Co., Akron, Ohio, 1953.

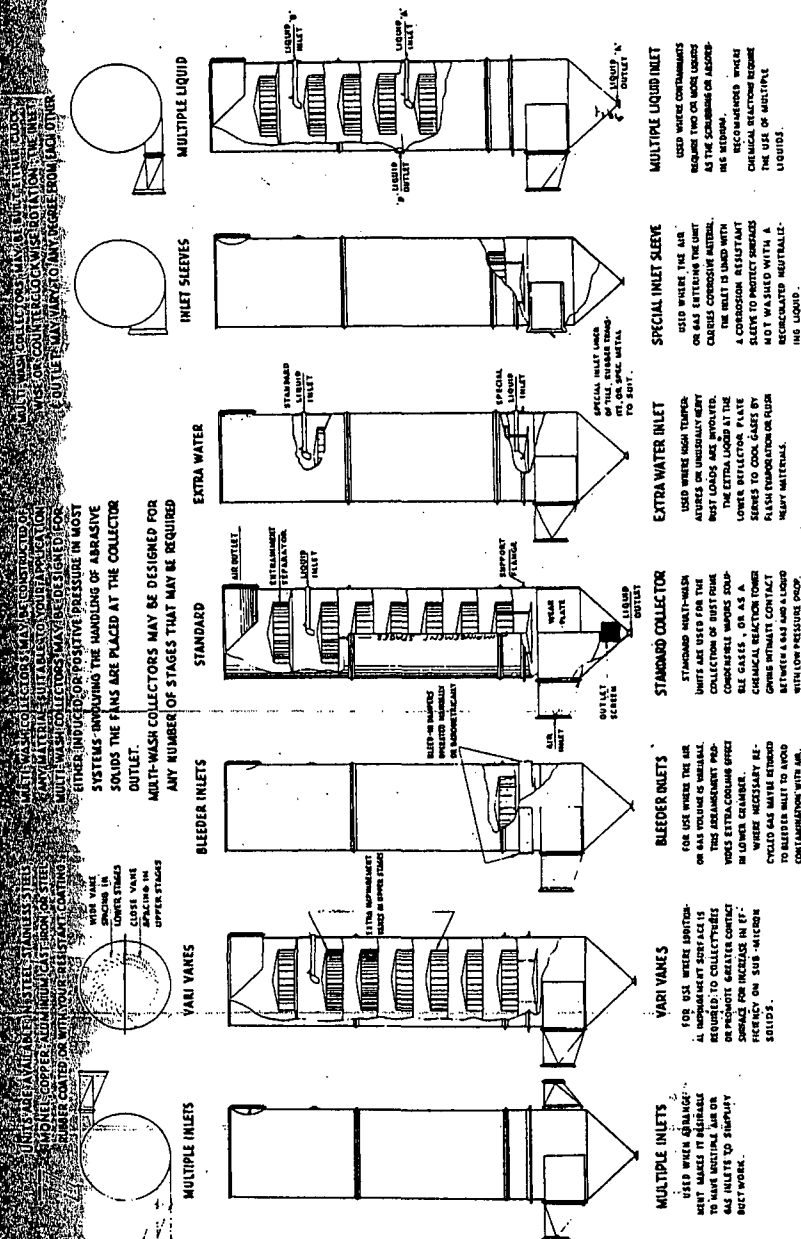


Figure 25. Multiple-stage centrifugal scrubber. (Courtesy Claude B. Schneible Co., Detroit.)