

Theory:

11-7. The Swenson-Walker crystallizer. One of the commonest types of continuous crystallizers (with cooling only) used in the United States is the Swenson-Walker crystallizer, shown in Fig. 11-2. It consists of an open trough *A*, 24 in. wide, with a semicylindrical bottom, a water jacket *B* welded to the outside of the trough, and a slow-speed, long-pitch, spiral agitator *C* running at about 7 rpm and set as close to the bottom of the trough as possible. This apparatus is ordinarily built in units 10 ft long, and a number of units may be joined together to give increased capacity. Forty feet is the maximum length usually driven from one shaft, and, if lengths greater than this are desired, it is usual to arrange several such crystallizers, one above the other, and allow the solution to cascade from one bank to the other.

The hot concentrated solution to be crystallized is fed at one end of the trough, and cooling water usually flows through the jackets in counter-current to the solution. In order to control crystal size, it is sometimes desirable to introduce an extra amount of water into certain sections. The function of the spiral stirrer is not especially that of either agitation or conveying the crystals. Its purpose is, first, to prevent an accumulation of crystals on the cooling surface and, second, to lift the crystals that have already been formed and shower them down through the solution. In this manner the crystals grow while they are freely suspended in the liquid and therefore are usually fairly perfect individuals, reasonably uniform in size and free from inclusions or aggregations.

At the end of the crystallizer there may be an overflow gate where crystals and mother liquor together overflow to a draining table or drain box, from which the mother liquor is returned to the process and the wet crystals are fed to a centrifuge. In other cases, a short section of inclined screw conveyor lifts the crystals out of the solution and delivers them to the centrifuge, while the mother liquor overflows at a convenient point. The advantages of this type over those previously mentioned are large saving in floor space and in material in process, but especially a saving in labor.

Another but less common type of continuous crystallizer is built in the form of successive lengths of pipe, each surrounded with a jacket of a larger-diameter pipe. Cooling water is in the annular space between the two pipes, and inside the inner pipe is a spiral agitator. The method of operation is the same as in the Swenson-Walker. If more than one length of pipe is needed, the units are usually assembled in vertical stacks. The stirrer rotates at 5 to 30 rpm.

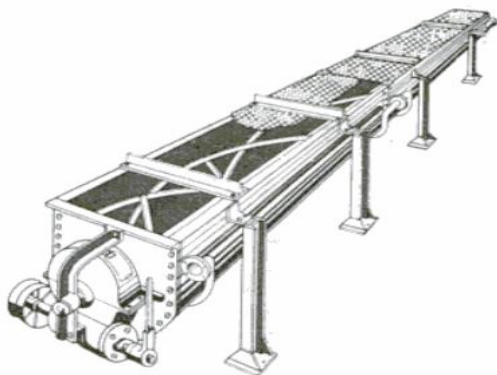


Figure 19.23. Swenson-Walker crystallizer. (Courtesy Swenson Division of Whiting Corporation.)