which reduces to pointing off two places in the CFM and multiplying by the ppm.

Given: VU and CFM; Find: ppm

$$\frac{0.1 \times VU}{CFM} \times 1{,}000 = ppm \quad (5)$$

which reduces to pointing off three places in the CFM, one place in the VU, and dividing the former into the latter.

Given: VU and ppm; Find: CFM

$$\frac{1{,}000}{ppm \times 10} \times VU = CFM \quad (6)$$

As the VU represents a definite weight of ozone, in a definite period of time, ozonizers so rated leave no question as to their actual capacity. The decimal character of the unit admits of much facility in calculations.

WATER PURIFICATION

Ozone finds a very important application in the purification of water. Operating costs rarely exceed an energy expenditure of 500 watt-hours per thousand gallons.

Ozone successfully eliminates odors and tastes of organic origin, particularly the tastes and odors due to excessive chlorination, and the presence of chlorinated phenols and tarry substances. Organic colors are bleached, and the effluent of a properly designed ozonizer is practically sterile.

The essentials of a good water ozonizer are an adequate and constant supply of ozone, in sufficiently high concentrations to effect high solubility at normal temperatures, adequate mixing of the ozonized air and water, under conditions which produce maximum diffusion and absorption, and over a sufficient period of time to effect sterilization. The control should provide under and over voltage release, together with a release for water pressures too low to efficiently operate the mixing device.

INDUSTRIAL USES

Ozone finds a number of applications as an oxidizing agent, in industrial operations, many of which are of little interest in ventilation. However, ozone may be used to accelerate the drying of paints and varnishes, the "oxidation" of drying oils, and many other drying operations involving oxidation. Such problems are generally specific, and it is advisable to consult the manufacturers of ozone equipment concerning them.

COLD STORAGE

Ozone is of value in cold storage for the prevention of mould development, deodorizing of storage spaces, after removal of odoriferous products, to prepare for other commodities. The preservation of flavor, particularly in eggs, and the general freshening and vitalizing of the air, the advantage of which is reflected by the superior condition of products stored in "fresh" air over those stored in "dead" air.

CHAPTER XXXI

METHODS OF DRYING

Natural Drying Types of Dryers, Moisture Content, Air Circulation, Moisture Removal, Heat and Air Volume, Required Time of Drying, Dryer Construction.

DEFINITION OF TERMS

DRYING is usually understood to mean the removal of moisture (usually water) by evaporation. In its broader sense, it includes such processes as dessication, concentration, distillation, ordation, baking and calcining. In this discussion the term drying will be limited to the removal of moisture by evaporation.

The material to be dried may be in a liquid, plastic or solid form. In the case of substances containing an excessive amount of free water, the evaporating process is often preceded by the removal of a part of the water by such methods as gravitational settling, filtration, condensation, absorption by contact with dry materials, or mechanical extraction with presses or centrifuges.

NATURAL DRYING

In *natural drying*, evaporation is obtained by utilizing the sensible heat of air at ordinary temperatures (air drying), or by exposure to the radiant heat of the sun (sun drying), or by a combination of the two. For many industrial processes, natural drying is either unsatisfactory or uneconomical.

Artificial drying produces evaporation artificially by supplying heat to the material either (1) by contact with surfaces heated by combustion, steam, hot water, heated oil, electricity, or latent heat of condensation, (2) by radiation directly to the material from a heated surface, or (3) through a current of heated air, superheated steam, or other gas, such as products of combustion, passing over or through the material. Evaporation may occur either at the boiling point, in a saturated atmosphere, or at a temperature below the boiling point. In the latter case, the vapor pressure of the surrounding atmosphere must be maintained below the vapor pressure of the liquid in the material through some means of producing a circulation of air and vapor and of removing the evaporated moisture from the air. Where products of combustion can be used, a particularly high overall efficiency of the dryer is possible.

Radiant heat, transferred to the material by direct radiation from heated surfaces, is sometimes used to supplement the heat supplied by

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