

relative humidity of 65 per cent, or even more, before the desired results can be obtained.

CALCULATIONS

The methods for determining the proper heating and cooling loads for the various industrial processes are similar to those outlined in Chapters 6 and 7. Because of the large number of motors and heat processing units usually prevalent in an industrial application, it is particularly important that operating allowances for the latent and sensible heat loads be definitely ascertained and used in the calculations to determine the total design load.

REFERENCES

- Effect of Air Conditioning upon Munitions, by J. I. Lyle (A.S.H.V.E. TRANSACTIONS, Vol. 23, 1917, p. 383).
- Air Conditioning for Sausage Manufacturing Plants, by M. G. Harbula (A.S.H.V.E. TRANSACTIONS, Vol. 28, 1922, p. 343).
- Air Conditioning and Refrigerating Large Bakeries, by W. L. Fleisher (*Heating, Piping and Air Conditioning*, December, 1929, p. 621; January, 1930, p. 24).
- Air Conditioning for Textile Plants Making and Using Synthetic Yarns, by L. L. Lewis (*Rayon Textile Monthly*, July, August, September, 1930).
- Air Conditioning in the Bakery, by W. L. Fleisher (A.S.H.V.E. JOURNAL SECTION, *Heating, Piping and Air Conditioning*, February, 1931, p. 158).
- Air Conditioning in Industrial Processes (Match Factory), by W. L. Fleisher (*Heating, Piping and Air Conditioning*, March, 1931, p. 196).
- Air Conditioning of Press Rooms, by I. C. Baker (*Heating, Piping and Air Conditioning*, July, 1931, p. 553).
- Pre-Cooling Fruits and Vegetables with Circulating Air, by C. E. Baker (*Heating, Piping and Air Conditioning*, January, 1932, p. 42).
- Air Conditioning Maintains Quality of Fruits and Vegetables, by C. E. Baker (*Heating, Piping and Air Conditioning*, August, 1935, p. 369).
- Air Condition the Bakery Throughout, by W. W. Reece (*Heating, Piping and Air Conditioning*, August, 1936, p. 149).
- Air Conditioning as Applied in Theatres and Film Laboratories, by D. C. Lindsay (*Transactions Society of Motion Picture Engineers*, April, 1927; Vol. XI, No. 30, p. 335-365).
- Air Conditioning Requirements of Multicolor Offset Printing, by C. G. Weber (*Refrigerating Engineering*, December, 1936, p. 6).
- Banana Ripening Manual, Circular No. 14, Equipment Department, Fruit Dispatch Co., New York, N. Y.
- The Commercial Storage of Fruits, Vegetables and Florists' Stocks, by D. H. Rose, R. C. Wright and T. M. Whiteman (*U. S. Department of Agriculture*, Circular No. 278).
- Reactions of Lithographic Papers to Variations in Humidity and Temperature, by C. G. Weber and L. W. Snyder (*U. S. Bureau Standards Journal Research*, January, 1934).
- Relation of Air Conditions to Tobacco Curing, by J. Johnson and W. B. Ogden (*Wisconsin Agricultural Research Bureau* 110: 1-48, 1931).
- Temperature Studies of Some Tomato Pathogens, by Alice A. Nightingale and G. W. Ramsey (*U. S. Department of Agriculture Technical Bulletin* No. 520, August, 1936).
- The Treatment of Offset Papers for Optimum Register, by C. G. Weber and M. N. V. Geib (*U. S. Bureau Standards Journal Research*, February, 1936).
- Summary Report of National Bureau of Standards Research on Preservation of Records, by A. E. Kimberly and B. W. Scribner (*U. S. Bureau of Standards Miscellaneous Publication*, 154, March 16, 1937).

Chapter 40

INDUSTRIAL EXHAUST SYSTEMS

Classification of Systems, Design Procedure, Requirements for Suction and Velocity, Hoods, Design of Duct Systems, Collectors, Resistance of Systems, Efficiency of Exhaust Systems, Selection of Fans and Motors, Corrosion

IN almost every industry some type of exhaust or collecting system is essential to achieve efficient and economical control of dusts and fumes. General design information is included in this chapter which is intended to relate primarily to factory exhaust systems.

CLASSIFICATION OF SYSTEMS

There are two general arrangements, the central and the group systems. In the central system a single or double fan is located near the center of the shop with a piping system radiating to the various machines to be served. In the group system, which is sometimes employed where the machines to be served are widely scattered, small individual exhaust fans are located at the center of the machine groups. The group arrangement has the advantage of flexibility.

Exhaust systems are also classified by the means employed to collect dust or other material handled. The dust or refuse may be collected and controlled by enclosing hoods, open hoods, inward air leakage, or by exhausting the general air of the room.

With some classes of machinery it is not feasible to closely hood the machines and in these cases open hoods over or adjacent to the machines are provided to collect as much as possible of the dust and fumes. This class includes such machines as rubber mills, package filling machinery, sand blast, crushers, forges, pickling tanks, melting furnaces, and the unloading points of various types of conveyors.

The open hoods should be placed as close to the source of dust or fumes as possible, with due regard to the movements of the operator. When the hood must be placed at some distance above the machine it should be large enough to encompass an area of considerable extent as diffusion is usually quite rapid.

Consideration must also be given to the natural movement of the fumes. For those that are lighter than air the hood should be over or above the machine and where a heavy vapor or dust-laden air at ordinary temperature is to be removed, horizontal or floor connections are required. If it is attempted to remove heavy dust such as lead oxides by an overhead hood the conditions may be worse than if no exhaust were used at all, owing to the rising air current carrying the dust up through the