burners was developed for the Institute of Cooking and Heating Appliance Manufacturers by R. N. St. John. A glass rod is interposed between a light source and a photosensitive cell, both before and after being exposed to the flue gases from a heating device. The diminution of the light transmitted by the rod, due to the deposit of soot on its surface, causes a reduction in the cell emf which is taken as an index of the concentration of smoke in the flue gases. A description of the method is contained in *National Bureau of Standards Commercial Standard* CS104-46.[69]

DETERMINATION OF AIR CONTAMINANTS

Two measures of air dustiness are in use: particles per unit volume of air, and weight per unit volume of air. A comparative method consists in drawing known samples of air through a known area of filter cloth or paper, and comparing the density of the resulting spots with blackness charts or with spots from other sources.

For counting, particles are captured in a device such as the Smith-Greenburg impinger, the Owens jet dust counter, or in an electrostatic or a thermal precipitation device designed for the purpose.[69] Counting is done with a microscope, and the method yields important results when the nature or constituents of the dust are of interest.

For a weight determination, a known volume of air is drawn through a porous crucible or thimble, and the weight gained by the thimble during the operation is the weight of the dust captured from the air sample.[69] For precise work, the thimble must be dried in a desiccating chamber before weighing each time.

At the National Bureau of Standards a test method was developed for interested Government agencies, under which measured samples of the uncleaned air and of the air cleaned by a device under test are passed through filter papers.[69] The ratio of the flow rates through the two filter papers is adjusted during successive tests, until the resulting dust spots approach equality in density as shown by a photometer. The ratio of the flow rates is then indicative of the effectiveness of the cleaner in arresting dust. A statement of an air cleaner's efficiency by any test method, is meaningless unless the test dust is specified. Other instruments for determining gaseous and particulate air contaminants are described in industrial hygiene literature.[69, 69, 69, 70]

SOUND AND VIBRATION MEASUREMENTS[71, 72, 73, 74, 75]

The measurement, analysis, and ultimate control of noise in air-conditioning systems is becoming increasingly important. The sound-level meter is the basic instrument used in acoustic measurements. While a crystal-type microphone is usually supplied with the meter, dynamic and condenser-type microphones can also be used. The dynamic type is employed when the microphone and sound-level meter are separated by a long cable. The condenser microphone is stable and has a flat response. Crystal microphones are stable and sensitive, but require a temperature correction when connected to the sound-level meter through a long cable.

In the refined art of acoustics, the overall or total sound level is of little value. Loudness and annoyance as interpreted by the ear are a function of frequency as well as sound level. The effective rating and control of noise must, therefore, involve the measurement of frequency distribution. The octave-band analyzer, which divides the noise spectrum into eight frequency bands, is most commonly used in conjunction with the sound-level meter. A number of the criteria that have been developed for environmental noise levels are based on octave bands. Narrow-band filters are also available, and impact noise analyzers can be used to measure transient noise levels such as those produced by drop-forge hammers.

Electronic instruments are available for measuring the frequency, amplitude, and acceleration of a vibrating mass. Vibration meters are usually portable, self-contained, and direct reading.

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