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- **Part Number:** 1910
- **Part Title:** Occupational Safety and Health Standards
- **Subpart:** Z
- **Subpart Title:** Toxic and Hazardous Substances
- **Standard Number:** 1910.1043 App A
- **Title:** Air sampling and analytical procedures for determining concentrations of cotton dust

I. SAMPLING LOCATIONS

The sampling procedures must be designed so that samples of the actual dust concentrations are collected accurately and consistently and reflect the concentrations of dust at the place and time of sampling. Sufficient number of 6-hour area samples in each distinct work area of the plant should be collected at locations which provide representative samples of air to which the worker is exposed. In order to avoid filter overloading, sampling time may be shortened when sampling in dusty areas. Samples in each work area should be gathered simultaneously or sequentially during a normal operating period. The daily time-weighted average (TWA) exposure of each worker can then be determined by using the following formula:

Summation of hours spent in each location and the dust concentration in that location.

\_\_\_\_\_ Total hours exposed

A time-weighted average concentration should be computed for each worker and properly logged and maintained on file for review.

II. SAMPLING EQUIPMENT

- (a) **Sampler.** The instrument selected for monitoring is the Lumsden-Lynch vertical elutriator. It should operate at a flow rate of 7.4 + or - 0.2 liters/minute. The samplers should be cleaned prior to sampling. The pumps should be monitored during sampling.
- (b) **Filter Holder.** A three-piece cassette constructed of polystyrene designed to hold a 37-mm diameter filter should be used. Care must be exercised to insure that an adequate seal exists between elements of the cassette.
- (c) **Filters and Support Pads.** The membrane filters used should be polyvinyl chloride with a 5-um pore size and 37-mm diameter. A support pad, commonly called a backup pad, should be used under the filter membrane in the field monitor cassette.
- (d) **Balance.** A balance sensitive to 10 micrograms should be used.
- (e) **Monitoring equipment for use in Class III hazardous locations** must be approved for use in such locations, in accordance with the requirements of the OSHA electrical standards in Subpart S of Part 1910.

III. INSTRUMENT CALIBRATION PROCEDURE

Samplers shall be calibrated when first received from the factory, after repair, and after receiving any abuse. The samplers should be calibrated in the laboratory both before they are used in the field and after they have been used to collect a large number of field samples. The primary standard, such as a spirometer or other standard calibrating instruments such as a wet test meter or a large bubble meter or dry gas meter, should be used. Instructions for calibration with the wet test meter follow. If another calibration device is selected, equivalent procedures should be used:

- (a) **Level wet test meter.** Check the water level which should just touch the calibration point at the left side of the meter. If water level is low, add water 1-2 deg. F. warmer than room temperature of till point. Run the meter for 30 minutes before calibration;
- (b) Place the polyvinyl chloride membrane filter in the filter cassette;
- (c) Assemble the calibration sampling train;
- (d) Connect the wet test meter to the train.

The pointer on the meter should run clockwise and a pressure drop of not more than 1.0 inch of water indicated. If the pressure drop is greater than 1.0, disconnect and check the system;

- (e) Operate the system for ten minutes before starting the calibration;
- (f) Check the vacuum gauge on the pump to insure that the pressure drop across the orifice exceeds 17 inches of mercury;
- (g) Record the following on calibration data sheets:
  - (1) Wet test meter reading, start and finish;
  - (2) Elapsed time, start and finish (at least two minutes);
  - (3) Pressure drop at manometer;
  - (4) Air temperature;
  - (5) Barometric pressure; and
  - (6) Limiting orifice number;
- (h) Calculate the flow rate and compare against the flow of 7.4 + or - 0.2 liters/minute. If flow is between these limits, perform calibration again, average results, and record orifice number and flow rate. If flow is not within these limits, discard or modify orifice and repeat procedure;
- (i) Record the name of the person performing the calibration, the date, serial number of the wet test meter, and the number of the critical orifices being calibrated.

#### IV. SAMPLING PROCEDURE

- (a) Sampling data sheets should include a log of:
  - (1) The date of the sample collection;
  - (2) The time of sampling;
  - (3) The location of the sampler;
  - (4) The sampler serial number;
  - (5) The cassette number;
  - (6) The time of starting and stopping the sampling and the duration of sampling;
  - (7) The weight of the filter before and after sampling;
  - (8) The weight of dust collected (corrected for controls);
  - (9) The dust concentration measured;
  - (10) Other pertinent information; and
  - (11) Name of person taking sample
- (b) Assembly of filter cassette should be as follows:
  - (1) Loosely assemble 3-piece cassette;
  - (2) Number cassette;
  - (3) Place absorbent pad in cassette;
  - (4) Weigh filter to an accuracy of 10 ug;
  - (5) Place filter in cassette;
  - (6) Record weight of filter in log, using cassette number for identification;
  - (7) Fully assemble cassette, using pressure to force parts tightly together;
  - (8) Install plugs top and bottom;
  - (9) Put shrink band on cassette, covering joint between center and bottom parts of cassette; and
  - (10) Set cassette aside until shrink band dries thoroughly.
- (c) Sampling collection should be performed as follows:
  - (1) Clean lint out of the motor and elutriator;
  - (2) Install vertical elutriator in sampling locations specified above with inlet 4 1/2 to 5 1/2 feet from floor (breathing zone height);
  - (3) Remove top section of cassette;
  - (4) Install cassette in ferrule of elutriator;
  - (5) Tape cassette to ferrule with masking tape or similar material for air-tight seal;
  - (6) Remove bottom plug of cassette and attach hose containing critical orifice;

- (7) Start elutriator pump and check to see if gauge reads above 17 in. of Hg vacuum;
- (8) Record starting time, cassette number, and sampler number;
- (9) At end of sampling period stop pump and record time; and
- (10) Controls with each batch of samples collected, two additional filter cassettes should be subjected to exactly the same handling as the samples, except that they are not opened. These control filters should be weighed in the same manner as the sample filters.

Any difference in weight in the control filters would indicate that the procedure for handling sample filters may not be adequate and should be evaluated to ascertain the cause of the difference, whether and what necessary corrections must be made, and whether additional samples must be collected.

(d) Shipping. The cassette with samples should be collected, along with the appropriate number of blanks, and shipped to the analytical laboratory in a suitable container to prevent damage in transit.

(e) Weighing of the sample should be achieved as follows:

- (1) Remove shrink band;
- (2) Remove top and middle sections of cassette and bottom plug;
- (3) Remove filter from cassette and weigh to an accuracy of 10 ug; and
- (4) Record weight in log against original weight

(f) Calculation of volume of air sampled should be determined as follows:

- (1) From starting and stopping times of sampling period, determine length of time in minutes of sampling period; and
- (2) Multiply sampling time in minutes by flow rate of critical orifice in liters per minute and divide by 1000 to find air quantity in cubic meters.

(g) Calculation of Dust Concentrations should be made as follows:

- (1) Subtract weight of clean filter from dirty filter and apply control correction to find actual weight of sample. Record this weight (in ug) in log; and
- (2) Divide mass of sample in ug by air volume in cubic meters to find dust concentration in ug/m. Record in log.

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