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Technical Bulletin

Industrial Ventilation – Design Velocities **TB.100.1.04**

This Bulletin discusses the Types of Velocities used for Industrial Ventilation Systems Design.

Capture Velocity is the air velocity at any point in front of or at the hood opening necessary to overcome opposing air currents and to capture the contaminated air by causing it to flow into the hood. Capture velocity is the result of the hood airflow rate and hood shape.

Typical Capture Velocities for contaminants released under the following conditions are:

Released with little velocity into quiet air (evaporation, degreasing, etc), 50 to 100 fpm

Released at low velocity into moderately still air (spray booths, low speed conveyors, welding, plating, etc), 100 to 200 fpm

Active release into an area of rapid air motion (spray painting in shallow booth, barrel filling, crushers, etc), 200 to 500 fpm.

High velocity release into an area of very rapid air motion (grinding, abrasive blasting, tumbling, etc), 500 to 2000 fpm.

The lower range is used for area air currents favorable to capture, contaminants of low toxicity or nuisance value, intermittent, low production, and high flow hoods moving contaminants in a large mass of dilution air.

The upper range is used for disturbing area air currents, high toxicity contaminants, high production, high usage, and small hoods for local control.

When the airstream density varies from standard, it may be necessary to vary the capture velocity by the square root of the $density_{standard} \div density_{actual}$

Face Velocity is simply the air velocity across the opening of the hood area.

Slot Velocity is the air velocity through the opening of a slotted hood and is only used to obtain uniform air distribution across the hood face.

By design, slots have an aspect ratio (W/L) of 0.2 or less and use velocities of 1500 to 2000 fpm, with the slot velocity approximately 2 times the plenum velocity.

Plenum Velocity is the air velocity across the plenum cross section and is normally used with a slotted hood. Plenum velocity should be < 50 % of the Slot Velocity.

Duct Velocity is the air velocity across the duct cross section and must be greater than or equal to the minimum contaminant transport velocity. Excessively high velocities waste energy and often accelerate wear.

The range of minimum duct velocities for contaminant types are as follows:

Vapors, gases and smoke, normally 1000 to 2000 fpm

Fumes (welding, soldering, etc), 2000 to 2500 fpm

Very fine, light dust (cotton lint, wood flour, etc), 2500 to 3000 fpm

Dry dusts & powders (fine rubber dust, molding powder, light shavings, etc), 3000 to 4000 fpm

Average industrial dusts (grinding, buffing, silica flour, clay dust, limestone dust, etc), 3500 to 4000 fpm

Heavy dusts (sawdust, metal turnings, sandblasting, iron dust, etc), 4000 to 4500 fpm

Heavy or moist dusts (moist cement, sticky buffing lint, small chips, etc), 4500 fpm and up.

For sticky materials, condensation, and electrostatic effects, velocity alone may not be sufficient to prevent contaminants from settling and plugging the ducting.

Optimum Economic Velocity is generally from 1000 to 3000 fpm. Factors include the contaminant and airstream characteristics, rain and wind exposure, airflow measuring instrument limitations, and installedmaterials and energy costs. In most cases, the optimum velocity is near 2500 fpm.

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