

## Fine Dust

### What is Fine Dust?

Fine dust consists of tiny particles with diameters of less than 10 micron, e.g. soot from diesel vehicles or incinerators. Fine dust is a potential cause for respiratory diseases and increases the risk of cancer.

### Health Effects

Nowadays, dust is held responsible for the effects of air contamination on human health. These effects range from respiratory diseases such as cough to asthmatic attacks. The extent of the effect of particles on the respiratory tract depends on the toxicity and the particle size: the smaller the particle, the deeper it can penetrate the lungs.

Since the nasopharynx cannot filter particles smaller than 10 micron, fine dust PM10 reaches the lungs to a certain extent. The smaller a particle, the deeper it can penetrate the lungs. Therefore ultra-fine particulates (diameter smaller than 0,1 µm) can penetrate the pulmonary alveoli where they are only broken down very slowly or even settle (silicosis).

Epidemiologic studies have shown that the increase of 10 µg/m<sup>3</sup> in PM10 concentration in ambient air lead to a strongly significant increase in morbidity rate - relative to hospitalisation due to respiratory disease - by 0,5 to 5,7%, and the mortality rate has increased by 0,2 to 1,6%. A fine dust cohort study conducted 2001-2004 in Germany observed an increase of approximately 9% in mortality rate per 10 µg/m<sup>3</sup> fine dust.

Due to the linear correlation there is no such thing as a harmless fine dust concentration. For the population of the European Union, the over-all fine dust exposure will lead to a reduced average life expectancy of at least 1 year.

Recent research has shown that the PM2.5 proportion of fine dust is especially hazardous to human health. It is therefore predictable that future measurements and measures will concentrate on these sizes.

Since we spend most of our time indoors, indoor air pollution is an important issue.

### Measured values, effects on human health and recommendations

Fine Dust (by weight)	Number of fine dust particles per liter (and per cu.ft.) of air :*	Health Effects	Recommendations
0 µg/m <sup>3</sup> to 9.9 µg/m <sup>3</sup>	<b>0 - 30'000</b> (0 - 850'000)	No negative health effects to be expected.	No special recommendations
10 µg/m <sup>3</sup> to 19.9 µg/m <sup>3</sup>	<b>30'000 - 60'000</b> (850'000 - 1'700'00)	No negative health effects to be expected.	No special recommendations
20 µg/m <sup>3</sup> to 34.9 µg/m <sup>3</sup>	<b>60'000 - 105'000</b> (1'700'000 - 2'971'000)	Hardly any negative health effects to be expected.	No special recommendations
35 µg/m <sup>3</sup> to 49.9 µg/m <sup>3</sup>	<b>105'000 - 150'000</b> (2'971'000 - 4'245'000)	Asthmatics and children with asthma may show cough and asthma symptoms when exposed to dust over a long period of time. People suffering from cardiac and vascular diseases may also show a worsening of symptoms.	Adults and children suffering from respiratory diseases and people suffering from cardiac and vascular diseases should reduce exposure to contaminated areas.
50 µg/m <sup>3</sup> to 99.9 µg/m <sup>3</sup>	<b>150'000 - 300'000</b> (4'245'000 - 8'490'000)	Long exposure can lead to irritations of the respiratory tract, coughs and headache	Time spent in contaminated areas should be reduced.
100 µg/m <sup>3</sup> and higher	<b>300'000 +</b> (8'490'000 +)	Can lead to irritations of the respiratory tract, coughs and headache. The frequency of asthma attacks may increase.	Time spent in contaminated areas should be reduced to a minimum.

\* Experience values of the Saint Blasius Institute S.A., Lugano; measured particle sizes: 0,3 µm; measuring instrument: ParticleScan Pro.

## Fine Dust Guidelines

### European Union

More and more cities in EU member states can no longer comply with the new EU standard values for fine dust. These define that a maximum of 50 microgram per cubic meter may be exceeded on up to 35 days per year.

The standard 99/30/EG passed in 1999 defined the following threshold values as of January 1, 2005:

- 50 µg/m<sup>3</sup> for the 24-hour median of PM10, may be exceeded on 35 days per year;
- 40 µg/m<sup>3</sup> for the annual median of PM10.

Standard 99/30/EG also defines that on January 1, 2010 the following accentuation of threshold values will become effective if not revised before this date:

- 50 µg/m<sup>3</sup> for the 24-hour median of PM10, may be exceeded only on 7 days per year;
- 20 µg/m<sup>3</sup> for den annual median of PM10.

When threshold values are exceeded, the responsible officials are obliged to initiate counter measures and to prepare for air cleaning measures if designated future threshold values are clearly exceeded.

### Switzerland

The threshold value for PM10 in Switzerland is 20 µg/m<sup>3</sup> for the annual median. In densely populated regions and along strongly frequented road axes, this threshold value was exceeded in the year 2000. This value may only be exceeded once every year.