Measuring particulate matter: accurate and quick

Exposure to particulate matter in the air is a persistent environmental problem. Inhalation of fine particles has negative effects on health and life expectancy.

Fugitive material is one of the sources of particulate matter. One example is dust that is released into the air by activities at industrial sites such as storage and transhipment terminals. Sometimes, boundary values are exceeded locally, causing hindrance for the surroundings.

Up to now, measuring particulate matter in this kind of situation was only possible with costly equipment. Moreover, experts were needed to interpret measurement data, for example to determine the source of the emissions. ECN's Dust Monitoring System has changed this situation.

What is the Dust Monitoring System?

- A complete measuring network for continuous, real-time measuring of particulate matter at a specific location.
- Easy: no need to worry about installation, operation and management.
- Determining the source location and source emission using a distribution model.
- Alarm function in case of high concentrations of particulate matter, enabling intervention.
- Reports suitable for internal use and for justification towards the competent authority.

Example of application: Coal transhipment

The Dust Monitoring System is in use at a coal transhipment terminal in the port of Amsterdam. Eight sensors have been installed that visualise the amount of fugitive dust, online and real-time. ECN processes the measuring data and offers them in a clear report to the manager of the site.

A dispersion model is used to determine which part of the emissions originates from the coal transhipment terminal. This enables monitoring, signalling and intervention in processes in case of undesired, high concentrations of dust. Based on continuous annual measurement, the annual emission load can be calculated.
Simple, but accurate sensors
Particulate matter sensors measure the dust in the air based on scattering of light caused by dust particles. ECN has improved these sensors such that trends and spatial variation can now be mapped. With the sensors, a larger spatial coverage can be achieved compared to traditional measuring equipment.

Dispersion model for source determination
In the dispersion model, measurement data are combined with meteorological data. This way, the model calculates the location and emission of the particulate matter source. Hence, it is possible to establish if the particulate matter indeed originates from a monitored location and, if needed, to further specify the location on the site. Moreover, model results can be linked to the activities at the site, such that it can be established if the emission peaks coincide with certain activities.

Signalling when boundary values are exceeded
The Dust Monitoring System continuously measures the concentration of particulate matter in the air. It is therefore easy to quickly determine on site if boundary values are being exceeded. If needed, the system will send a signal to the site operator, who can then take measures to minimise hindrance. The registration of activities at the site can be linked to the Dust Monitoring System, for example through a log. This way, it can be monitored to what extent specific activities contribute to the emission of particulate matter.

Clear reporting
The system processes the measuring data into a clear report, containing information on the development of concentrations over time and the location and emission of sources at the site. The information contained in the report is suitable for internal use, for example to arrange company processes such that hindrance is minimised. The information is also suitable for reporting to the competent authority.

Flexible system enables other applications
By installing additional sensors (nitrogen, ozone) and adjusting the information that is generated, other applications are also possible. Examples include the measuring of air quality in cities, in production halls and in offices.