Equipment for measuring ultrafine particles in the air ($PM_{0.1}$)

Senior researcher Teis Nørgaard Mikkelsen, Technical University of Denmark's (DTU) Department of Environmental Engineering, has received a donation of DKK 93,650 from COWIfonden for purchase of equipment for atmospheric measurements of ultrafine particles ($PM_{0.1}$) and a flue gas analyser.

Air pollution in Denmark
The chairmanship of the Council of Economic Advisers in Denmark expresses in a discussion paper (March 2016) that air pollution impacts our health and leads to among others cardiovascular diseases, asthma and lung cancer. Health costs constitute presumably most of the total costs related to air pollution in Denmark.

Ultrafine particle pollution ($PM_{0.1}$)
Particle pollution is thought to be the air pollution factor, which is most detrimental to our health in Denmark and the most important sources are domestic heating (wood-burning stoves), agriculture (ammonia) and road transport. $PM_{0.1}$ is the term for 0.1 µm-sized particles or less. $PM_{0.1}$ has a particularly big surface per unit of weight as opposed to bigger particles, and this feature allows it to enter the lung tissue from where it is taken up by the bloodstream. $PM_{0.1}$ is a relatively new research area compared to the research done into big particles, and there is a huge lack of systematic measurements and data within this field.

DTU's Department of Environmental Engineering launch tests of ultrafine particles, $PM_{0.1}$
The equipment will be used for teaching and research in connection with the new long-term strategy of the recently established section "Atmospheric Environment" at DTU's Department of Environmental Engineering. Together with bachelors, candidates and PhD students, it will be possible for students attending the DTU course "Air pollution and environmental effects" to use the equipment for a wide range of measurement campaigns.

These measurements may be either direct or indirect. Direct measurements are taken at the source (emission), which may be for example chimneys of wood-burning stoves and exhaust pipes from diesel cars. The measurements render it possible to show whether new initiatives like chimney filters have the desired effect or whether the particulate filters of diesel cars continue to work as intended after a number of years. Indirect measurements (immission) are taken in areas where the air contains a high degree of particles, such as for example areas with dense road traffic, badly ventilated tunnels, residential areas with many wood-burning stoves and localities affected by ammonia. It is not yet clear how big the local variety of $PM_{0.1}$ is and whether special considerations need to be taken under certain weather conditions.

Another way to reduce the particle pollution in the cities is during urban planning where the vegetation can be integrated as a filter mechanism, which "leaches" the harmful particles and gases into the atmosphere. This is often part of the "green city" concept, but it is more easily said than done, as different types of vegetation have different absorption properties and because plants also respond differently to environmental factors such as temperature and humidity. This makes it necessary to carry out actual tests and measurements with the

equipment that DTU's Department of Environmental Engineering has now been able to purchase by means of the donation from COWIfonden.

It is the idea that the tests are to be carried out for a number of years and that DTU's Department of Environmental Engineering will apply for research projects, which will relate to the above tests.