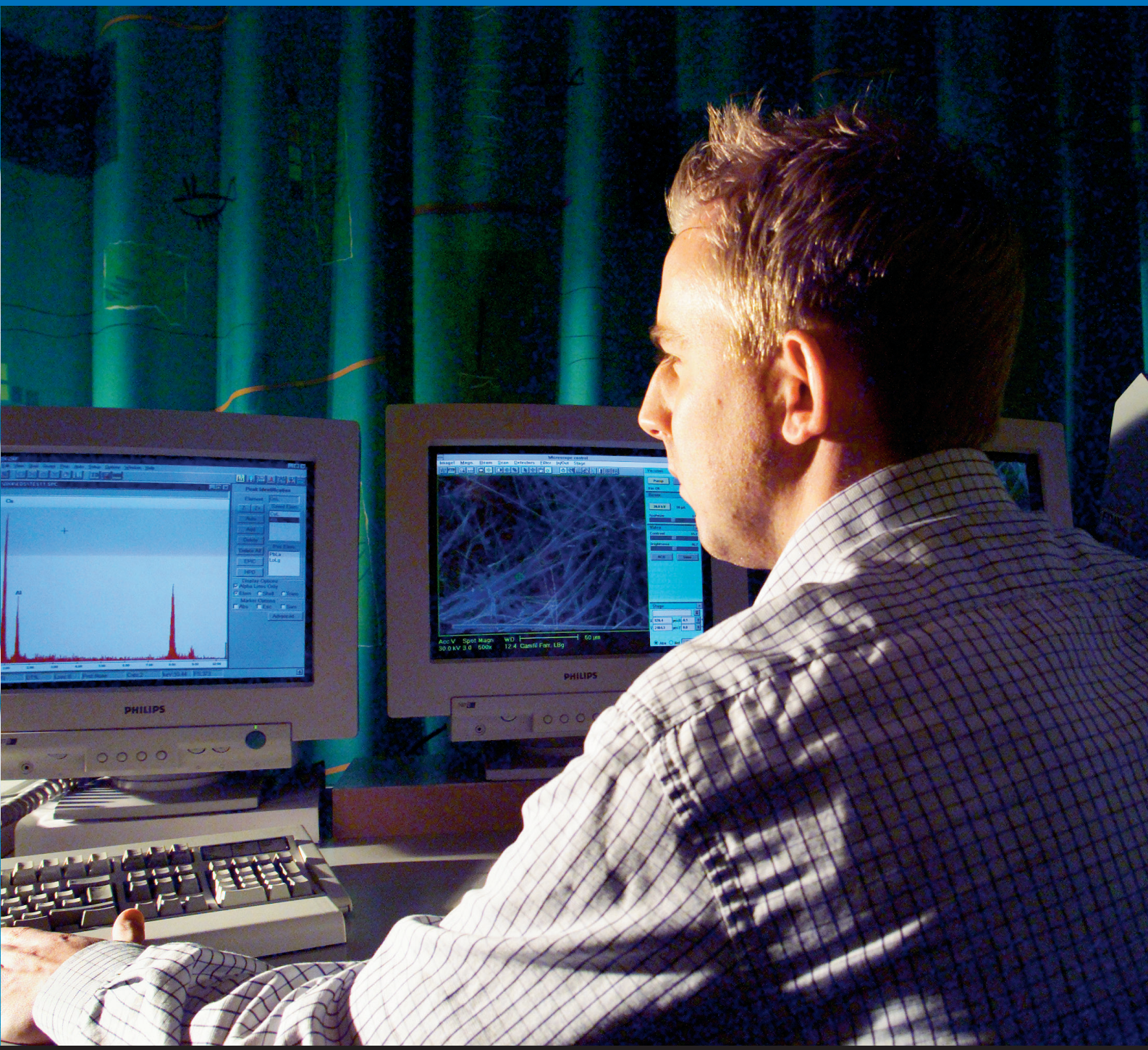
camfil FARR



camfil farr air analysis system

Camfil Farr	Technical information
Camfil Farr air analysis system	
Camfil Farr - clean air solutions	

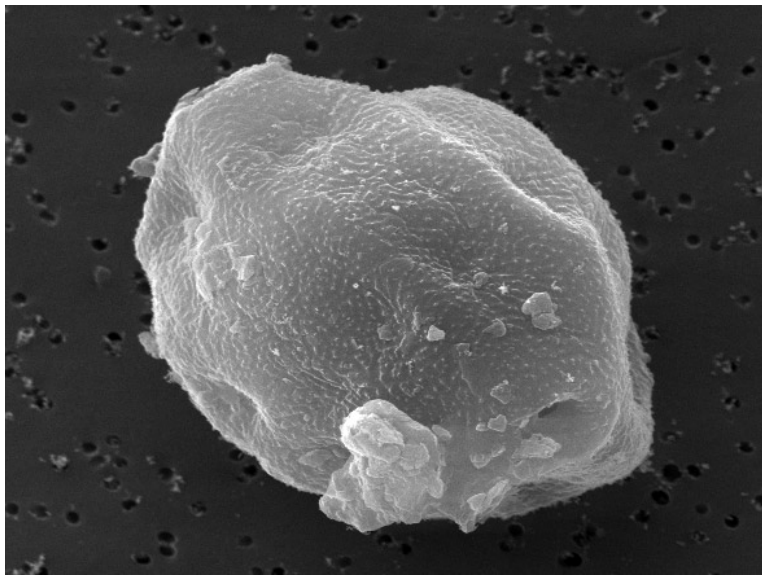
are you breathing fresh air?

The 80's and 90's have seen a increased interest in questions relating to air quality and air contamination. This is to a certain extent due to increased awareness of problems associated with indoor air quality and also due to heightened focus on health risks associated with poor air quality. Consequently, the need for improved analysis methods has also increased.

The Camfil Farr Air Analysis System

In conjunction with the Wallenberg Laboratory at the University of Stockholm, Camfil Farr has completed a research project aimed at achieving a deeper understanding of air particles and how they effect our health. As a result of this work, a sampling system evolved for air analysis based on the size and quantity of particles found with the help of a Scanning Electronic Microscope (SEM) with an x-ray Spectrometer (EDAX). This method is suitable for the analysis of different types of particle contaminants in outdoor air, ventilation systems and indoor air.

An example of a situation where this method is considered useful is in the evaluation of different filter classes and how filters of different characteristics perform in ventilation systems. A further application is the analysis of dust problems often in connection with Sick Building Syndrome (SBS).



Birch pollen

why choose the camfil farr air analysis system?

Using the Camfil Farr Air Analysis System, Camfil Farr places a wealth of knowledge about air filtration at your disposal and offers analysis of the air in ventilation systems in order to control the quality of the air you breathe.

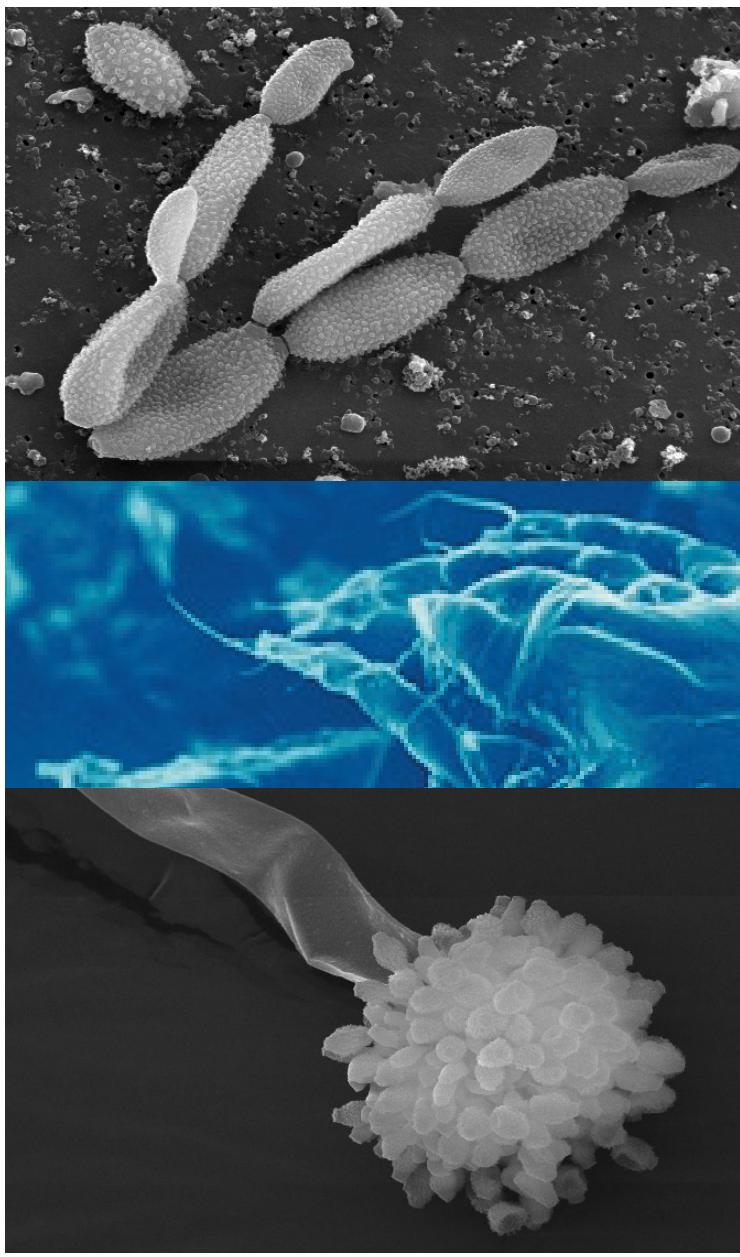
Some advantages of having improved air quality include;

Health Protection

Contaminants both from indoors and outside, e.g., dust, dirt, traffic exhausts, pollen and microorganisms etc, often give rise to allergies and asthma. By minimising the quantity of particle contaminants in the air of air conditioned or ventilated buildings the risk for sickness is also reduced.

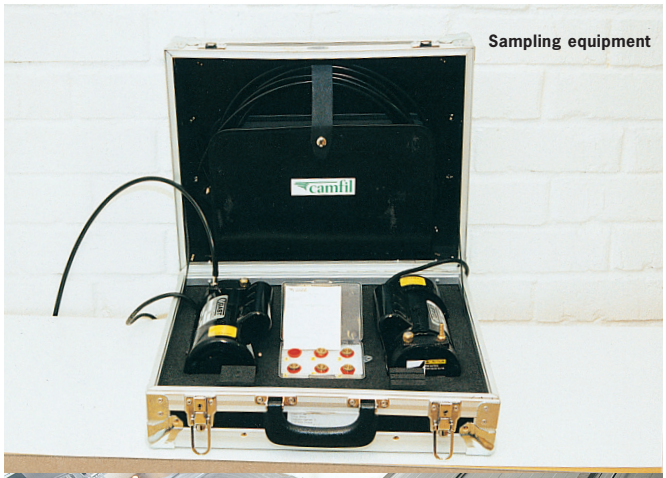
Lower Running Costs

If the efficiency and reliability of air handling equipment are improved, the running costs for the plant will be lower. Air quality and air handling equipment efficiency are effected not only by the system design, workmanship and application but also by the maintenance and in particular the inspection of the installation that should be carried out during every filter change.



Spores

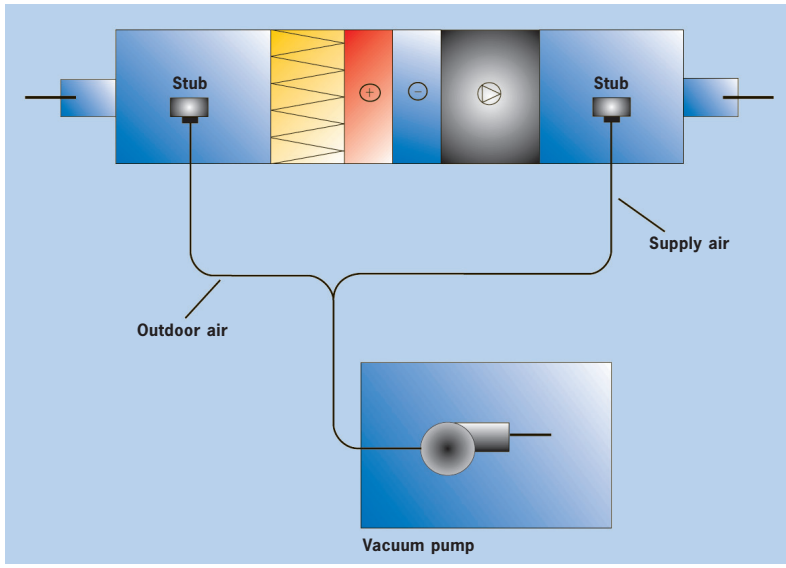
how the air sample is taken



Sampling equipment

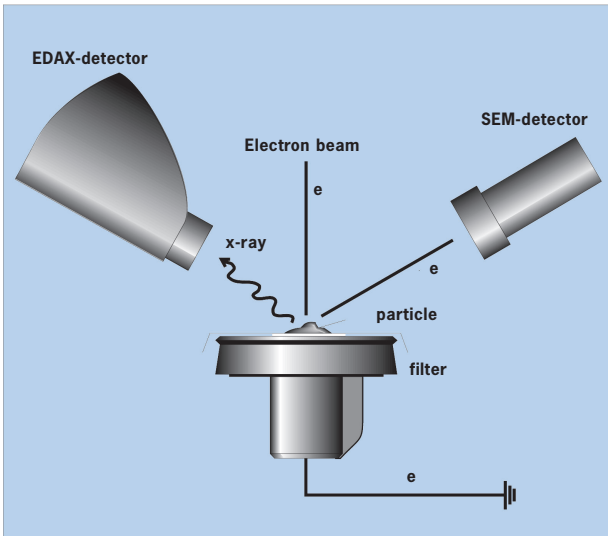
Brass stub for sampling

The air is drawn with the help of a vacuum pump over a “millipore” membrane for around 1 hour. The membrane has a series of holes 0.6 µm in diameter. Airborne particles larger than 0.2 µm fasten on the surface of this membrane located in a brass stub. The membrane can be observed in the SEM at the Camfil Farr laboratory where the quantity and type of particles found give a visual indication of the quality of the air in question.



Sampling setup

how the analysis is carried out



Detail of SEM/EDAX process

When using the SEM, the sample to be studied is exposed to high-energy electrons and this leads to a number of physical phenomenon. Certain electrons are reflected (secondary electrons) and can then be detected and give rise to a picture. Simultaneously, the atoms in the sample are effected in that the electrons at the lowest energy level are excited and these electrons jump to a higher energy level. Later, when these electrons jump back an x-ray is emitted from the sample. This radiation is specific for each basic element contained in the sample, and it is therefore possible to obtain chemical information about the samples different particles.

It is important that those electrons that are not reflected or pass through the sample are quickly conducted away. The stub is conductive and can be used directly in the SEM. To prevent the sample/membrane from becoming charged, it is covered with a thin layer of conductive material, in our case gold, before the sample is mounted in the SEM.

What can be observed in the SEM?

With the help of the SEM, the quantity of particles, and their outer structure, size and shape can be studied. By making use of the x-ray signal the sample emits, it is also possible to make an analysis of an individual particle's basic elemental structure. This allows the distinction to be made between non-organic and organic particles and carbon.

The types of organic particles that can be distinguished include pollen, bacteria, organic fibres, spores and other organic material. For the non-organic particles it is possible to make a further classification based on their basic elemental constituents and then draw conclusions about the origin of the particles. The particle structure of the sample indicates if and where problems with the ventilation system might exist.

The sample is judged as follows:

Sample 1, Outside Air

The sample is clean, normal or contaminated. The quantity of particles varies with traffic intensity, season, weather conditions, wind direction etc. As a reference for other samples it is necessary to obtain a sample of the outside air.

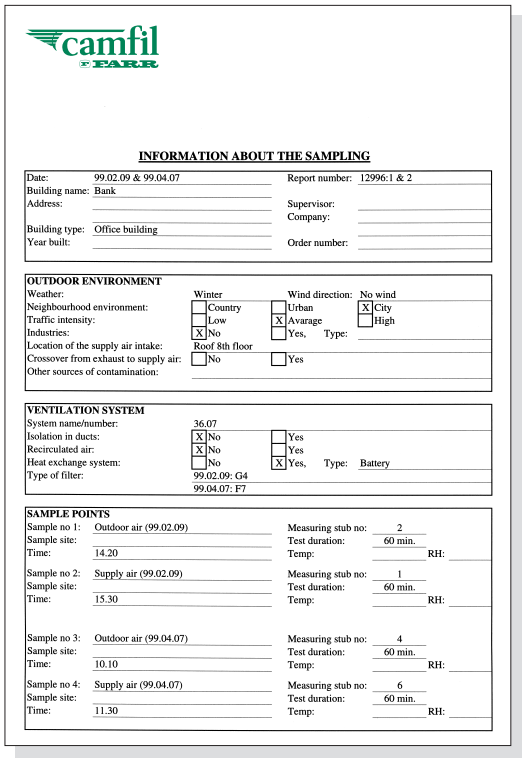
Sample 2, Supply Air

The sample is of good quality, accepable quality or poor quality. If the supply air is judged to be of poor quality, a detailed comment is provided.

The quantity of particles in the supply air is chiefly dependant on the level of filtration. Sometimes, particles can be generated after the filter in air handling equipment and also it is possible that particles from the exhaust air can be transferred to the supply air.

Sample 3, Room Air

This sample is judged as being clean, normal or contaminated. The size and quantity of particles found indoors depend on the activity being carried out along with the level of filtration and type of ventilation system.



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INFORMATION ABOUT THE SAMPLING

Date:	99.02.09 & 99.04.07	Report number:	12996:1 & 2
Building name:	Bank		
Address:		Supervisor:	
		Company:	
Building type:	Office building		
Year built:		Order number:	

OUTDOOR ENVIRONMENT

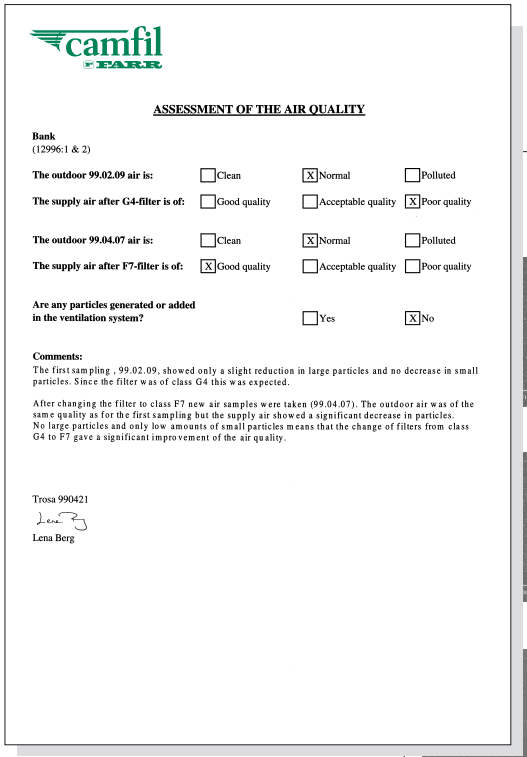
Weather:	Winter	Wind direction:	No wind
Neighbourhood environment:	[ ] Country	[ ] Urban	[X] City
Traffic intensity:	[ ] Low	[X] Avarage	[ ] High
Industries:	[X] No	[ ] Yes, Type:	
Location of the supply air intake:	Roof 8th floor		
Crossover from exhaust to supply air:	[ ] No	[ ] Yes	
Other sources of contamination:			

VENTILATION SYSTEM

System name/number:	36.07		
Isolation in ducts:	[X] No	[ ] Yes	
Recirculated air:	[X] No	[ ] Yes	
Heat exchange system:	[ ] No	[X] Yes, Type:	Battery
Type of filter:	99.02.09: G4		
	99.04.07: F7		

SAMPLE POINTS

Sample no 1:	Outdoor air (99.02.09)	Measuring stub no:	2
Sample site:		Test duration:	60 min.
Time:	14.20	Temp:	RH:
Sample no 2:	Supply air (99.02.09)	Measuring stub no:	1
Sample site:		Test duration:	60 min.
Time:	15.30	Temp:	RH:
Sample no 3:	Outdoor air (99.04.07)	Measuring stub no:	4
Sample site:		Test duration:	60 min.
Time:	10.10	Temp:	RH:
Sample no 4:	Supply air (99.04.07)	Measuring stub no:	6
Sample site:		Test duration:	60 min.
Time:	11.30	Temp:	RH:



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ASSESSMENT OF THE AIR QUALITY

Bank
(12996:1 & 2)

The outdoor 99.02.09 air is:	[ ] Clean	[X] Normal	[ ] Polluted
The supply air after G4-filter is of:	[ ] Good quality	[ ] Acceptable quality	[X] Poor quality
The outdoor 99.04.07 air is:	[ ] Clean	[X] Normal	[ ] Polluted
The supply air after F7-filter is of:	[X] Good quality	[ ] Acceptable quality	[ ] Poor quality

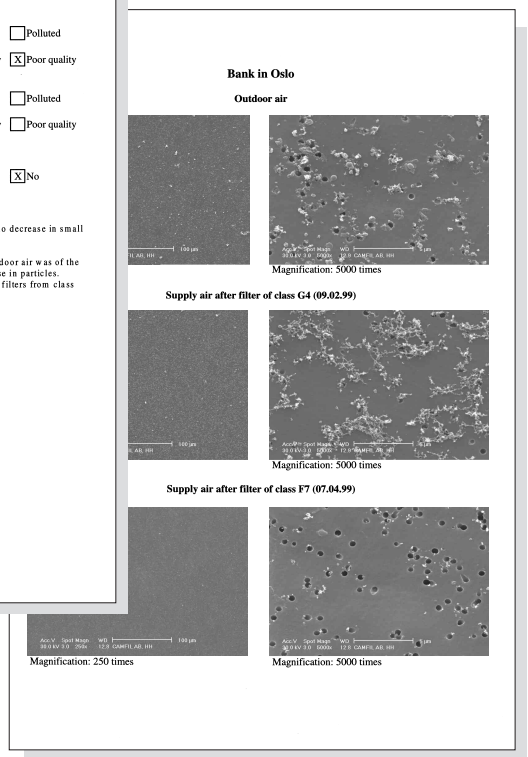
Are any particles generated or added in the ventilation system? [ ] Yes [X] No

Comments:
The first sampling , 99.02.09, showed only a slight reduction in large particles and no decrease in small particles. Since the filter was of class G4 this was expected.

After changing the filter to class F7 new air samples were taken (99.04.07). The outdoor air was of the same quality as for the first sampling but the supply air showed a significant decrease in particles. No large particles and only low amounts of small particles means that the change of filters from class G4 to F7 gave a significant improvement of the air quality.

Trosa 990421

Lena Berg



Bank in Oslo

Outdoor air

Magnification: 5000 times

Supply air after filter of class G4 (09.02.99)

Magnification: 5000 times

Supply air after filter of class F7 (07.04.99)

Magnification: 250 times

Magnification: 5000 times

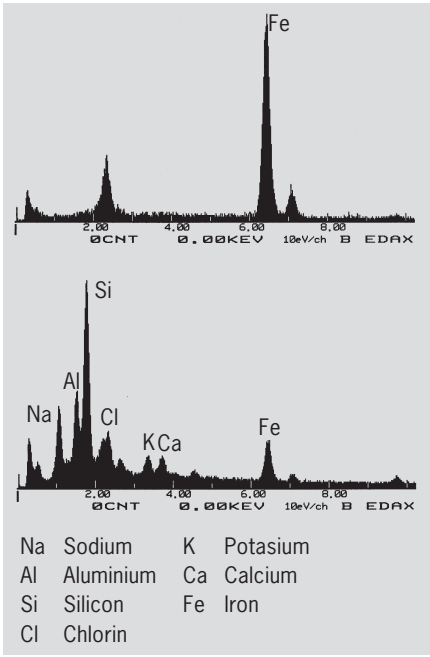
The Report

After the analysis is complete, the results are summarised in a report that consists of three parts:

- Details recorded during the sampling.
- Photographs of captured particles along with, under certain circumstances, an EDAX nalysis.
- Evaluation of samples and comments.

EDAX-analysis.

Edax-analysis is carried out for example if non-organic particles are discovered on a supply air sample in an attempt to determine the origin of the particles. Where unfiltered air has flowed into a ventilation system the non-organic particles might consist of for example silicon, aluminium, and potasium, since these

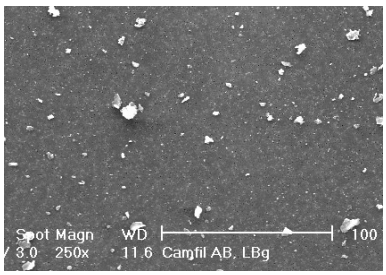


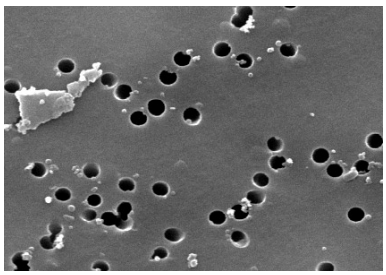
Na	Sodium	K	Potasium
Al	Aluminium	Ca	Calcium
Si	Silicon	Fe	Iron
Cl	Chlorin		

are normal basic elements found in gravel. If quality filters are installed and, however, large particles are found in the supply air sample it can in many cases be shown that the particles consist mainly of iron and have been generated by rusting components of the ventilation system. The results of the analysis are displayed as a curve where every basic element is displayed as a peak. The height of each peak depends on the percentage of the analysed particle that is formed by a certain element.

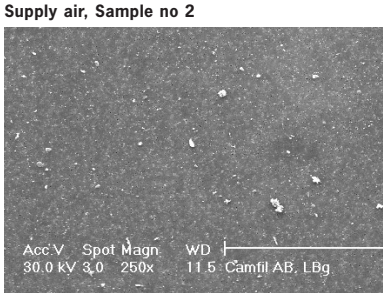
leakage in a ventilation system

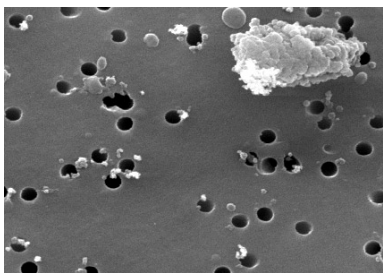
Outside air, Sample no 1





Supply air, Sample no 2





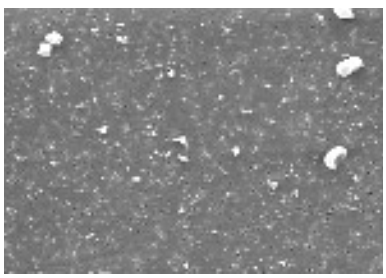
Camfil Farr Hi-Flo F85, filter class F7

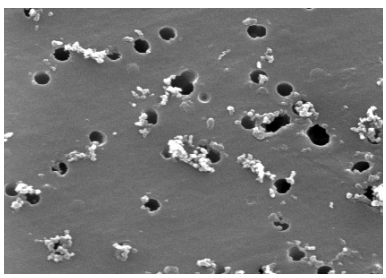
A routine test on a ventilation system in an office building was carried out during the annual filter change. The system was cleaned and the filters new.

During the first test the same quantity of particles was observed both with the outside air and the supply air. This led to suspicions about leakage in the ventilation system.

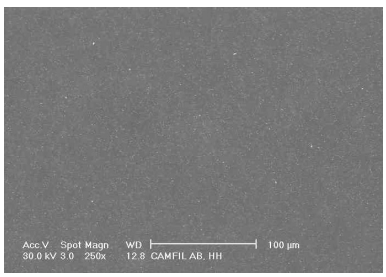
leakage repaired

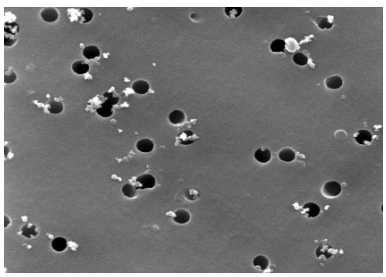
Outside air, Sample no 1





Supply air, Sample no 2





The samples taken indicated a good filtration of the air, with a considerably reduced quantity of particles in the supply air compared to the outside air.

Conclusion

It is clear that the measures taken against the leakage were successful, resulting in well filtered supply air.

camfil FARR

On world standards...

...Camfil Farr is the leader in clean air technology and air filter production.

Camfil Farr has its own product development, R&D and world wide local representation.

Our overall quality goal is to develop, produce and market products and services of such a quality that we aim to exceed our customers expectations.

We see our activities and products as an expression of our quality.

To reach a level of total quality it is necessary to establish an internal work environment where all Camfil Farr employees can succeed together. This means an environment characterised by openness, confidence and good business understanding.

www.camfilfarr.com

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YOU WILL FIND THEM ON OUR WEB-PAGES.

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