MILJØPRØVEBANKEN
- Nasjonal prøvebank for miljøgifter

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Procedure 006: Collection and sampling of air

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1. Aim of procedure

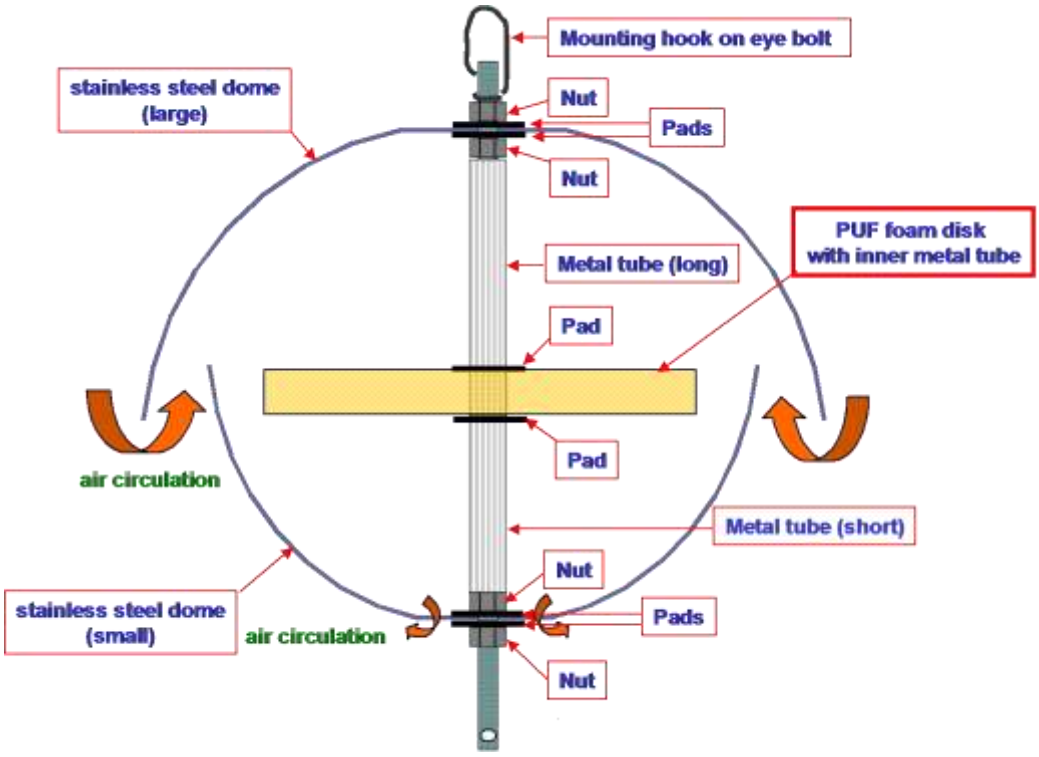
This procedure describes all the various steps of collection and sampling of air for the Environmental Specimen Bank for environmental pollutants. This procedure describes every step of the sampling and handling of samples to ensure that the procedure can be used in a clear way. The procedure should cover all aspects of reproducibility, quality and registration of data for the sampling material.

The procedure is partially based on the manual for EMEP (EMEP, 1996) and internal procedures at NILU.

2. Field sampling

2.1. Passive air sampling with PAS-PUF sampler

2.1.1. Principles



PAS-PUF sampler (see
Figure 1) is a type of passive air sampler that collects air through natural diffusion. The sampler accumulates gaseous contaminants in air on a polyurethane foam disk (PUF; adsorbent) and is well suited for sampling of slightly less volatile compounds. Cleaned foam discs are delivered from NILU and assembled in the sampler when the sampling period begins. The foam disc is exposed for 3 months. At the end of the sampling period, the foam disc is removed from the sampler and packed in the package from a new unexposed foam disk that will be used for the next sampling period.

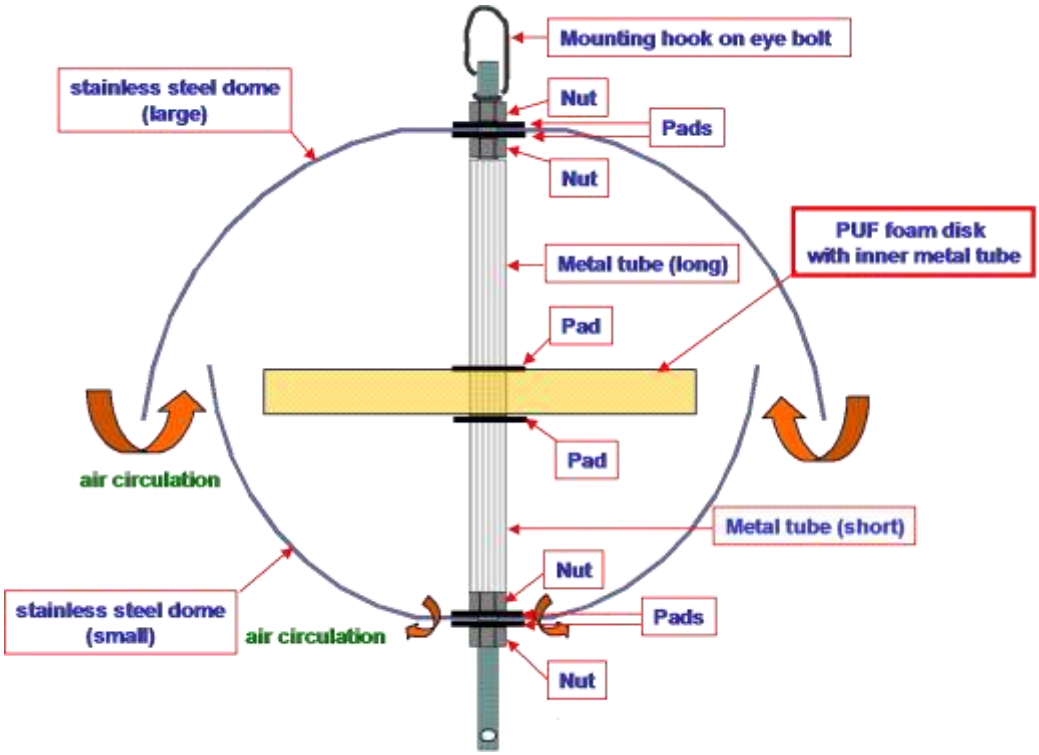


Figure 1: The design of a PAS-PUF sampler (Illustration: Anne Katrine Halse, NILU).

2.1.2. Beginning of sampling

The following equipment is needed for PAS-PUF sampling

1. Sampler:
    a. 2 bowls in stainless steel (big and small)
    b. Metal rod with threads for attaching nuts etc.
    c. 4 nuts
    d. 6 washes
    e. 2 metal tubes (long +short) + very short (to be placed in the centre of the PUF (see fig. 1))
2. Adsorbent
3. Accessories
    a. Markeringspenn
    b. Clean gloves (one par for deployment, one pair for collection)

OBS! The foam disc is made of a material that collects environmental pollutants in very low concentrations. Hence, it is necessary to use the provided gloves during deployment/collection. During mounting and dis-mounting of the PUF disc, limit the contact and handling of the PUF as much as possible. The sampler should be mounted outdoor to avoid exposure to compounds that can be present in high concentrations indoor. The samples will be analysed for this type of compounds.

Mounting/dis-mounting of the sampler

Once you are in the field, mount the sampler on the metal rod (figure 1). **Begin from the top,** and the following parts should be mounted, in the following order: Begin with the metal rod with threads and mount the following parts: nut, washer, bowl (stainless steel, big), washer, nut (tighten this one properly), metal tube (long), washer,

PUF (foam disc with an inner metal tube), washer, metal tube (short), nut (tighten this one properly), washer, bowl (stainless steel, small), washer, nut (tighten this one properly).

The sampler should be at least 1.5m above the ground.

2.1.3. End of sampling

Unscrew the lower bowl (hold the sampler up-side down), wear clean gloves and carefully remove the foam disc from the sampler, wrap the sampler in 2 layers of aluminium foil and put it in a zip lock bag (bag with aluminium foil will be provided) for storage (make sure that the sealing is air tight). Un-pack and mount the new PUF. Keep the aluminium foil and the zip-lock bag for packing the exposed PUF.

2.1.4. Labelling of sample

Mark the zip-lock bag with station name and location, date and sampling period (beginning- and end-date). Note any kind of problems that might have occurred/been observed. The foam disc should be stored in freezer after sampling until they are sent to the Environmental Specimen Bank.

2.2. Passive air sampling with PAS-XAD2 sampler

2.2.1. Principles

PAS-XAD2 sampler (see Figure 2) is a type of passive air sampler that collects air through natural diffusion. The sampler accumulates gaseous contaminants in air on an XAD2-powder (adsorbent) and is well suited for sampling of volatile compounds. A mesh cylinder (figure 2) with clean XAD will be sent from NILU and should be mounted in the sampler when the sampling period begins. The mesh cylinder filled with XAD2 should be exposed for 3 months. Afterwards, the mesh cylinder is removed from the sampling device and put into the cover package used to transport a new, unexposed cylinder that will be mounted for the next sampling period.

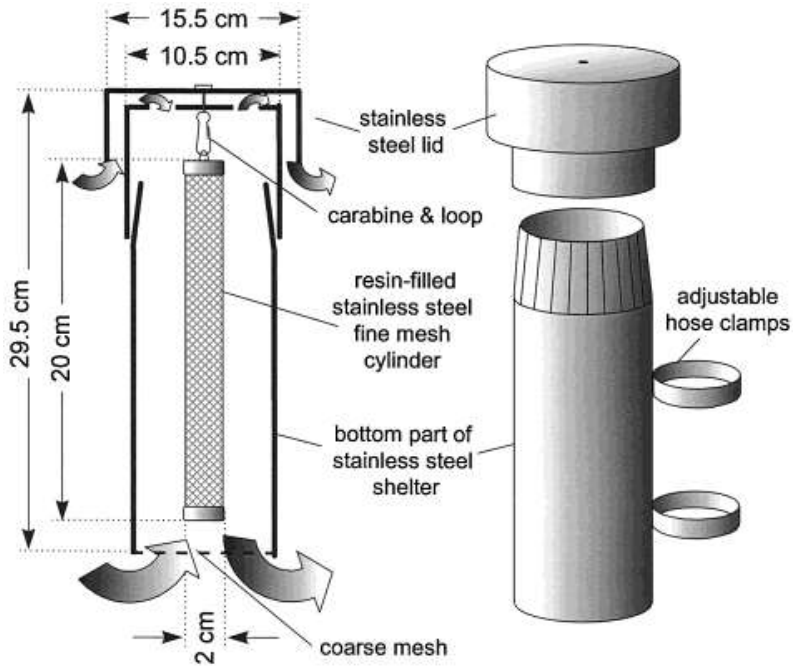


Figure 2: Scheme for PAS-XAD2 sampler

2.2.2. Equipment needed for PAS-XAD2 sampling

1. Sampler:
    a. Covering tube in stainless steel
    b. Lid in stainless steel
    c. Carabiner
2. XAD2-adsorbent in a steinless steel net cylinder (adsorbent tube)
3. Accessories
    a. Labeling pen
    b. Clean gloves

Mounting/dis-mounting of the adsorbent tube
OBS! The XAD-2 adsorbent is made of a material that collects environmental pollutants in very low concentrations. Hence, it is necessary to use the provided gloves during deployment/collection. During mounting and dis-mounting of the adsorbent tube, limit the contact and handling of the PUF as much as possible. The sampler should be mounted outdoor to avoid exposure to compounds that can be present in high concentrations indoor. The samples will be analysed for this type of compounds. Any kind of personal care products, except for approved products in the "Nøytral" brand should be avoided 24h prior sampling.

2.2.3. End of sampling

After 3 months of exposure, the whole sampler is demounted. A new adsorbent tube is taken out from its aluminium foil packing. The adsorbent tube that was in the sampler is taken out from the samping device and put on aluminium foil. The new adsorbent tube is attached in the sampler and the sampler is mounted on the stative (or other support where it has been hanging). Remember to use clean gloves during the whole procedure. Make sure that the sampler hang freely inside the steel mesh of the cylinder.

Wrap the exposed adsorbent tube in 2 layers of aluminium foil and put it in a zip lock bag (bag with aluminium foil will be provided) for storage (make sure that the sealing is air tight). Use the packaging material from the new, unexposed sampler to pack the exposed sampler.

2.2.4. Labelling of sample

Mark the zip-lock bag with station name and location, date and sampling period (beginning- and end-date). Note any kind of problems that might have occurred/been observed. The adsorbent tubes should be stored in freezer after sampling until they are sent back to NILU.

2.3. Active air sampling with AAS-filter high volume air sampler

Particle-bound air contaminants will be collected with an active high-volume sampler (AAS filter: active air sampler with filter only). With AAS filter sampling, also non-/little volatile pollutants (e.g. PBDE-209, the larger PCBs, dioxins and PAHs, as well as all heavy metals, except mercury) can be sampled. To avoid problems with filter clogging and loss of collected compounds through vaporization, the sampling period must be much shorter than for PAS-PUF and PAS-XAD2, and the filters should be changed every second week. In order to get particle samples representing the same time period (i.e. 3 months) as the gaseous samples, mixed samples of all filters are made from a given period of time. Hence, for the AAS filters, a mixed sample is made from all filters from a defined sampling period (n=6). Each filter is cut into 12 pieces (fig. 3) and are pooled in 12 glasses.

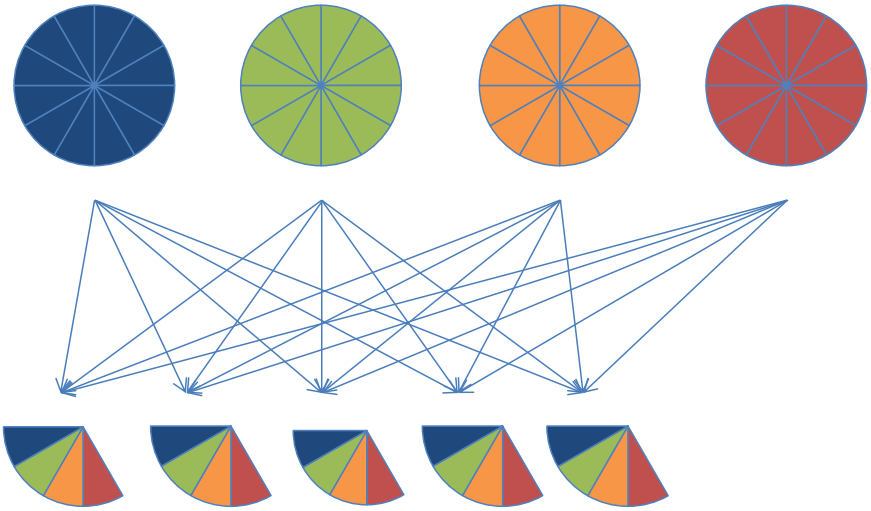


Figure 3: Example on how to divide and pool quarts filters from active air sampling.

3. Transport of sample

3.1. Packing

The sampling material (filters, foam discs or adsorbent tubes) should be packed in aluminium foil and MAGIC VAC® or PE-bags in transport boxes approved by NILU for shipment of air samples. The way of packing should ensure that the samplers are transported safe for any kind of damages of the material, and that the samples are not getting in contact with any areas or compounds that may contaminate the samples. The parcels should be marked clearly with sender's name and address, sent to NILU and addressed to a contact person there. The shipping should be made in a fast and safe manner, and extra storage time during shipping should be avoided (e.g. do not send samples on a Friday!)

3.2. Transport routines

The shipping should be made in a fast and safe manner, and extra storage time during shipping should be avoided (e.g. do not send samples on a Friday!) A contact person at NILU should be informed on forehand regarding time of delivery to ensure that the parcel is received in a proper way. If post or shipping companies are used, the parcel must be sent in a traceable manner.

4. Preparations and work at NILU laboratory

4.1. Cleaning and preparation of the sampling material

For cleaning and preparation procedures of the sampling material before sending material to the field locations, please use the procedure in use at NILU. IN general, this means that PUF and XAD2 will be cleaned with appropriate solvents and the AAS filters will be burned at 450°C during 8h. For shipment og samples and samplers to the field locations, follow the procedures described above in this procedure.

4.2. Repacking and dividing samples after sampling

The PAS-PUF samples should be taken out from the transport bags, put in MAGIC VAC® storage bags and sealed by the vaccuum packing machine.

The PAS-XAD2 samples should be transferred from the adsorbent tubes into glasses with a screw cap. All samples from the same sampling period should be packed in the same zip-lock bag.

The AAS-filters are removed from the Digitel filter holder. The filters should be cut with clean scissors as shown in Figure 3.. All subsamples from one sample are put on a piece of aluminium foil for each pooled sample. All filters are then divided in the same way and the pooled samples are thereafter packed air tight in aluminium foil and a MAGIC VAC® bag that will be sealed by the vaccuum packing machine.

4.3. Quality assurance (laboratory blank and field blank)

Both the origin of sampler and the cleaning procedures for the samplers might affect future analyses for compounds. Hence, enough unexposed material should **every year** be stored as blank samples. Laboratory blanks will be collected from 2018 and onwards.

5. Registration of data, marking and freezing samples

Data from the field and sample schemes are transferred to the database. Every sample package get a unique identification number (Luft_ID) and are also give a unique sample number (P_ID). In the data base, information about where the samples are stored will be included. This information should include which rack and section of it, which shelf and box where the sample is stored.

All glasses and MAGIC VAC bags should be labelled with (freezing safe labels) unique sampling numbers.

After transfer of sample material to the glasses, they should be closed and sealed and frozen at -25 ^{o}C in the freezer of the Environmental Specimen Bank.

6. References

EMEP, 1996, URL: http://www.nilu.no/projects/ccc/manual/download/cccr1-95rev.pdf (22.01.2013)

7. Appendix

Appendix 1: Sampling sheet for air sampling for the Environmental Specimen Bank, should follow the sample during transportation

Name of location	Birkenes/Zeppelin mountain			
	Start:		Stop:	
Period of sampling	Date dd.mm.yyyy	Time hh.mm	Date dd.mm.yyyy	Time hh.mm
Pump velocity m^3/h				
Pump number				
Station responsible/ technician				
Date of shipment				

Data from the sampling periode

Any important information regarding disturbances during the time of sampling	

Appendix 1. Sampling sheet