WP1

- WP.1.1 – Pilot study
  - Measurements from all seasons are completed
- WP.1.2 – Cross sectional exposure study
  - Started home inspections – field measurements
- WP.1.3 – Development of exposure model

WP 1.1 Objectives

- Inter-zonal flows within a home
- Seasonal changes in the ventilation rate
- Temporal and spatial behavior of gaseous pollutants
- Comparison between different air change rate measurement techniques
- Temporal and spatial behavior of selected chemical, biological and particulate pollutants
- Comparison between different dust sampling and airborne particle collection methods

Measurements

Air change rate & Thermal conditions

- CO_2 concentration
- Temperature, relative humidity
- Surface temperature
- Monthly average air change rate measurements (PFT)
- Continuously measured air change rates (Tracer gas measurements using INNOVA)

Settled dust & Airborne particles

- Pizza-box
- Electrostatic dust fall collectors
- Vacuum-cleaning of surface dust onto filters
- Airborne particle size distribution (0.75µm–15µm)
- Airborne particle samples onto filters (Inhalable PM1 and PM2,5)
- Ultra fine particle count with P-track (PM1)

Microbiology

- Fungal spores
- Bacteria
- Actinomycetes
- Endotoxin
- Glucan
- Enzymes

Chemistry

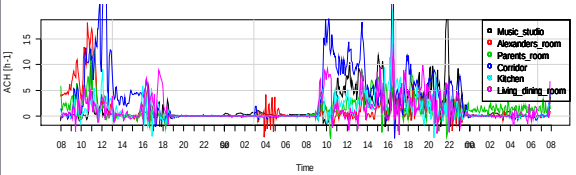
- Adsorbent tube (tenax)
- Passive air samples (O_3, NO_2 and aldehydes) indoor and outdoor
- Window wipe with 2-propanol
- Chemicals: Pthtlates, Fatty Acids, Flame retardants, Pesticides, Glucolethers, Aromatic

WP 1.1 Objectives

- **Seasonal changes in the ventilation rate**
- **Temporal and spatial behavior of gaseous pollutants (Inter-zonal flows within a home)**
- **Comparison between different air change rate measurement techniques**
- Temporal and spatial behavior of selected chemical, biological and particulate pollutants
- Comparison between different dust sampling and airborne particle collection methods

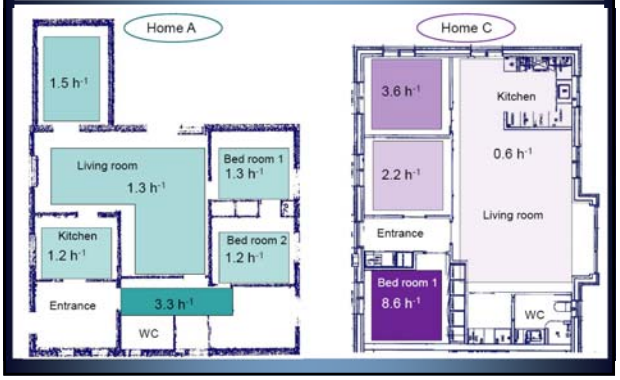
Air change rates

Home	Type	Build	Area (m²)	Occupants
A	Detached house	1964	139	3
B	2 storied detached house	1921	143	4
C	Row house	2007	98	2
D	Detached house + basement	1947	101	2
E	Apartment	2004	85	1



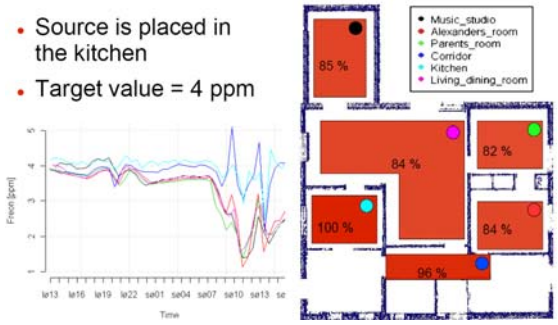
•Diurnal changes in air exchange rate: lowest ACR during the night. This trend was less pronounced in autumn and winter season.

Air change rate in Summer - Spatial differences



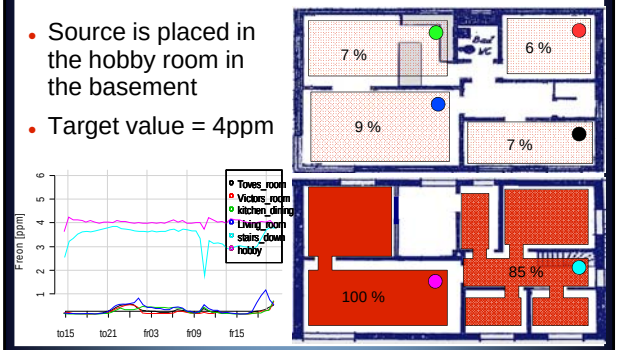
Freon spreading Home A (autumn)

- Source is placed in the kitchen
- Target value = 4 ppm

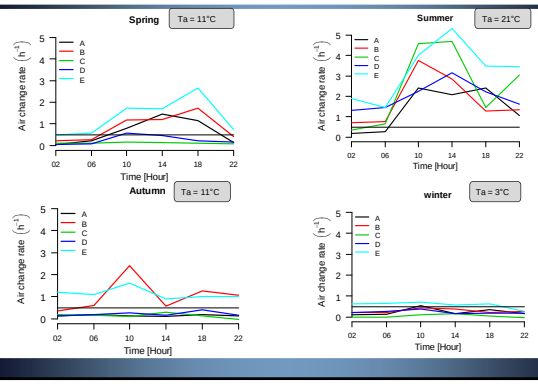


Freon spreading Home D (summer)

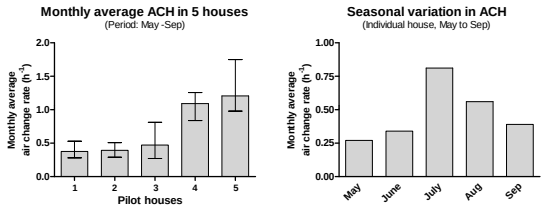
- Source is placed in the hobby room in the basement
- Target value = 4ppm



Seasonal changes in ACH



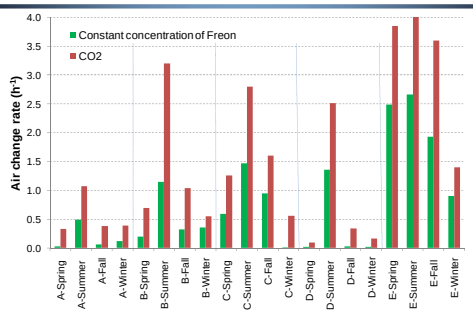
Average air change rate PFT



- Large variation between dwellings
- Similar pattern in all 5 dwellings

Comparison of air change rate measurement techniques

Comparison of air change rate measurement techniques



Three out of the total 101 compared nights demonstrated lower ACR with the CO_2 method compared to the TG method. Only 11 nights (11%) showed a ACR(CO_2) / ACR(TG) ratio between 1.0-1.5.

The average ACR(CO_2) / ACR(TG) ratio was 11.5.

Comparison of air change rate measurement techniques

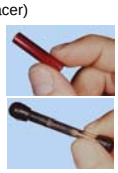
PFT-method (**Per**Fluorocarbon **T**racer)

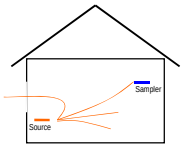
Emission from sources

4-6 sources in each dwelling

Collection on samplers

4-8 samplers in each dwelling





Home	PFT	Freon®
A	0.20	0.23
B	1.41	0.28
C	0.25	0.04
D	0.30	0.22
E	0.99	0.56

Average air change rates for the entire dwellings. On average, three times higher than those measured by the constant concentration method.

Blower door test in the 5 homes

WP 1.2

- Inspections of 60 homes started 24 October

  Up to 6 homes per week (visited twice)
  - Inspection
  - Questionnaires

General Diet Behavior

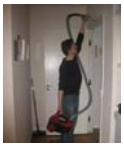
WP 1.2

- 48-hour measurements
  - Particle measurements (NanoTracer + gravimetric sampling of PM2.5)

  - CO_2, T, RH in bedroom and living room

WP 1.2

- Dust sampling: EDC (1month), vacuumed settled dust



- Biomarkers (blood, urine x 2, saliva)

WP 1.2 - 1.3

- Model predicting ultrafine particle concentration in dwellings based on building characteristics and occupant behavior
- Indoor environment vs. biomarkers / health endpoints
- Samples frozen until further funding:
  - Settled dust and urine ⟶ phthalates and their metabolites

WP 1.2 - 1.3 and beyond

Phthalates and their metabolites in 3-6 year-olds:

- Good correlations between dust and urine levels
- "Globalization" of phthalate exposure

	DEP DI/TDI	BBzP DI/TDI	DnBP DI/TDI	DiBP DI/TDI	DEHP DI/TDI	*DEHP DI/RfD*	TDIcum (DEHP, DnBP, DiBP)
No. above TDI/100%	0	0	7	18	4	*23*	98
Median	0.002	0.001	0.20	0.27	0.11	*0.27*	0.63
95%	0.01	0.003	0.61	0.94	0.40	*1.01*	1.82

TDIcum - Cumulative tolerable daily intake (n=431)

WP 1.2 - 1.3 and beyond

- Estimated exposure from different pathways: Ingestion, inhalation, dermal exposure (air+dust)
- Comparison with daily intake from urine levels

	Other sources / total intake (%)
DEP	10
BBzP	95
DnBP	70
DEHP	92
DiBP	40