

European Network on New Sensing Technologies for Air Pollution Control and Environmental Sustainability - *EuNetAir*

COST Action TD1105

WGs and MC Meeting at ISTANBUL, 3-5 December 2014

Action Start date: 01/07/2012 - Action End date: 30/06/2016

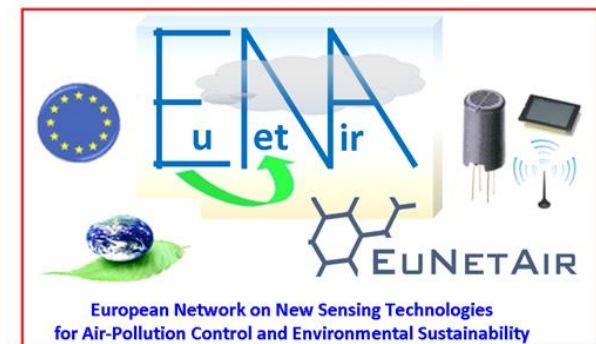
Year 3: 1 July 2014 - 30 June 2015 (*Ongoing Action*)

Summary activities in WG-4



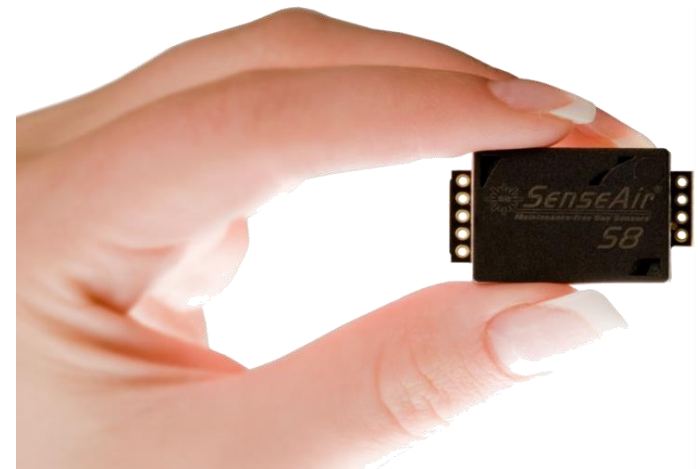
Ingrid Bryntse
WG4 Leader,
SenseAir AB / Sweden

 **cost**
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



Ingrid Bryntse at SenseAir, WG4 leader

- we have many reference sites, but the sensors are mostly hidden



Hong Kong international airport, 1997



WG-4 Testing in Aveiro, Portugal

14 days in Oct 2014, outside a bus

- **SenseAir: CH₄, humidity, temp and CO₂**
- **SGX Sensortech: CO, O₃, NO₂**
- **Alphasense: CO, NO, NO₂, O₃, VOC (PID), SO₂ (Heathrow box)**

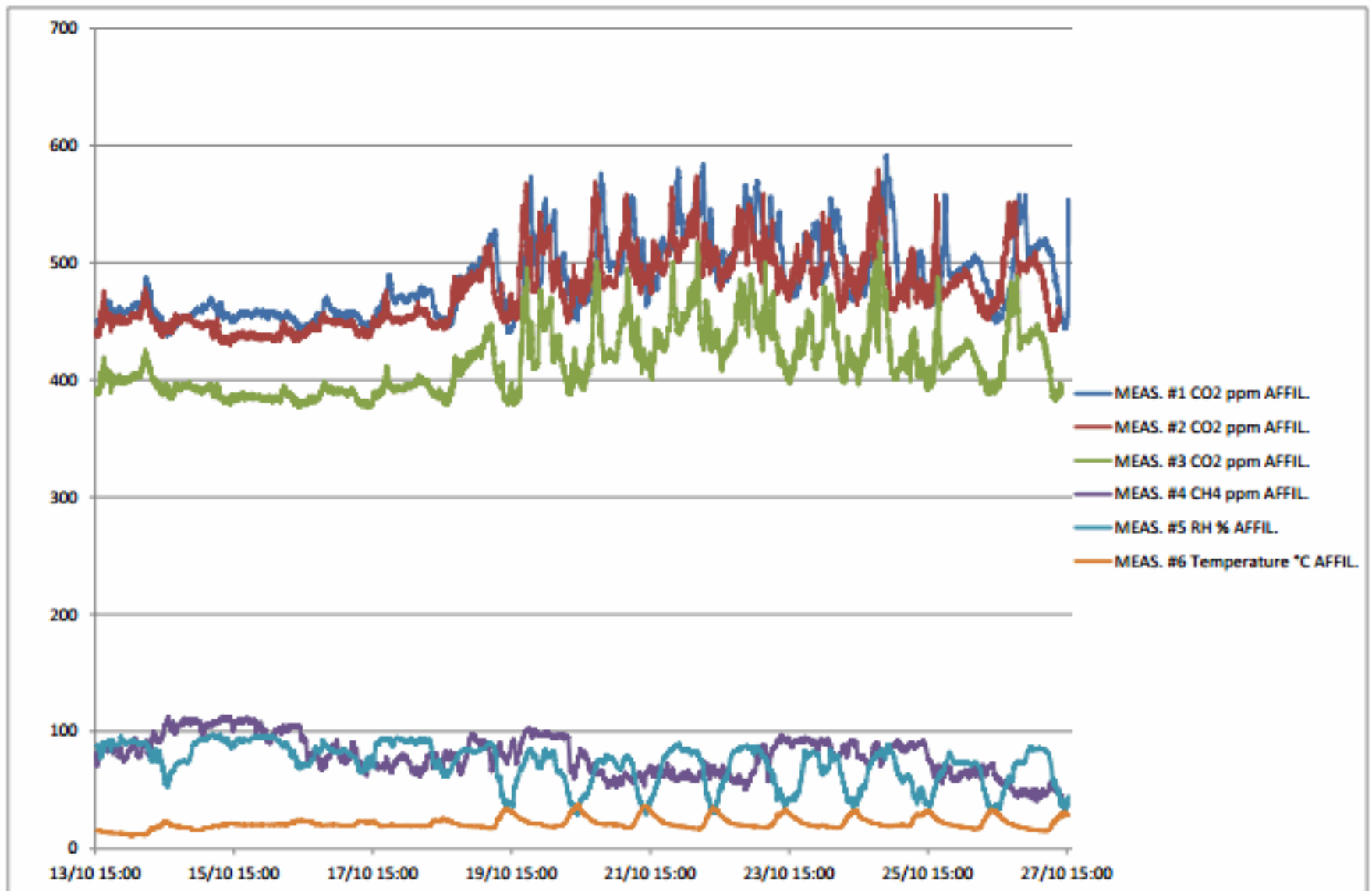
3 SenseAir S8



SenseAir tSENSE

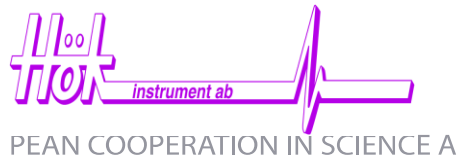
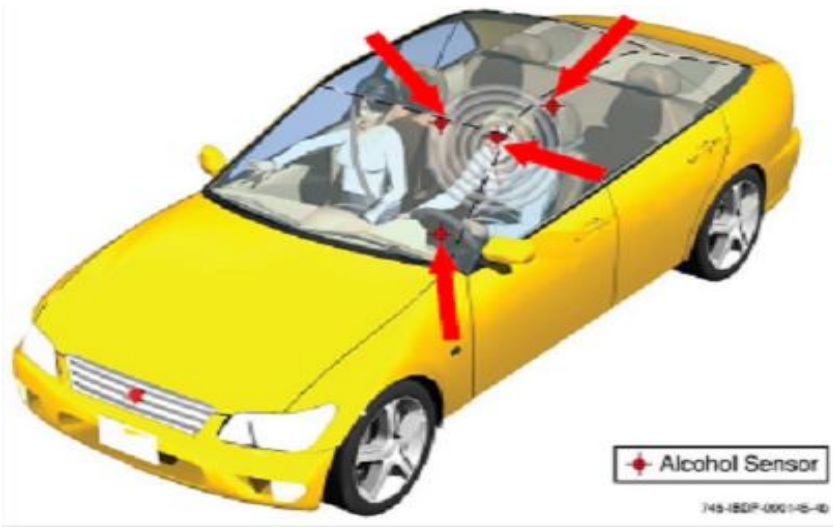


WG-4 Testing in Aveiro, Portugal



Alcolock projects for handheld device and future EtOH sniffer:

Long Path Length



EDF Methane challenge for Fracking Industry in USA

Severe testing in open competition for a methane alarm device

One of five left:

SenseAir in co-operation with Honeywell Analytics RAE Systems





Nicolas Moser, SGX, WG-4 Vice leader

Field testing at Oporto and Lisbon airports

- STSM with IDAD with monitoring of CO, NO₂ and O₃ in Oporto and Lisbon
- Data treatment by Joao Ginja from Idad at SGX
- Same sensors have been reused during the joined monitoring session in Aveiro testing



Anne-Claude Romain, Liege University,

Subgroup leader

- EN/TC 264/WG 27: Air quality - Determination of odour exposure in ambient air by using field inspection (finished)
- EN/TC 264/WG 2: Improvement of the EN13725: Determination of odour concentration by dynamic olfactometry (on going)
 - Sampling : area sources
 - Uncertainties determination
 - Methodologies
- **Belgian National Health Council**
 - Working group on
 - Indoor air pollution (chemical agents)
 - Multidisciplinary group (toxicologist, medicin doctors, chemists, monitoring sciences, biologists)
 - Belgian Royal decree



Scientific objectives

Public Wallonia laboratory (ISSEP=VITO-Flemish one):

- Monitoring of odour pollution and annoyance from Wallonia landfills in order to harmonise the methodology and to determine realistic standards
- At this time, no regulation (only recommendations in « pemit »)
- the trend is: percentile 98, 1uo/m³

Scientific context and objectives in the Action

| Variables | Threshold level (28 days) |
|--|------------------------------------|
| R Somme de tous Ri $R_i = C_i/LCI$ Ci : concentration mesurée du COV dans le local test LCI : concentration limite d'intérêt (→CEN 16516 ou AgBB) | ≤ 1 |
| COVT | $\leq 1000 \mu\text{g}/\text{m}^3$ |
| COSVT | $\leq 100 \mu\text{g}/\text{m}^3$ |
| Subst Cancér 1A et 1B | $\leq 1 \mu\text{g}/\text{m}^3$ |
| Formaldéhyde | $\leq 100 \mu\text{g}/\text{m}^3$ |
| Acétaldéhyde | $\leq 200 \mu\text{g}/\text{m}^3$ |
| Toluène | $\leq 300 \mu\text{g}/\text{m}^3$ |

John Saffell, Alphasense, subgroup leader

Air Quality sensor validation

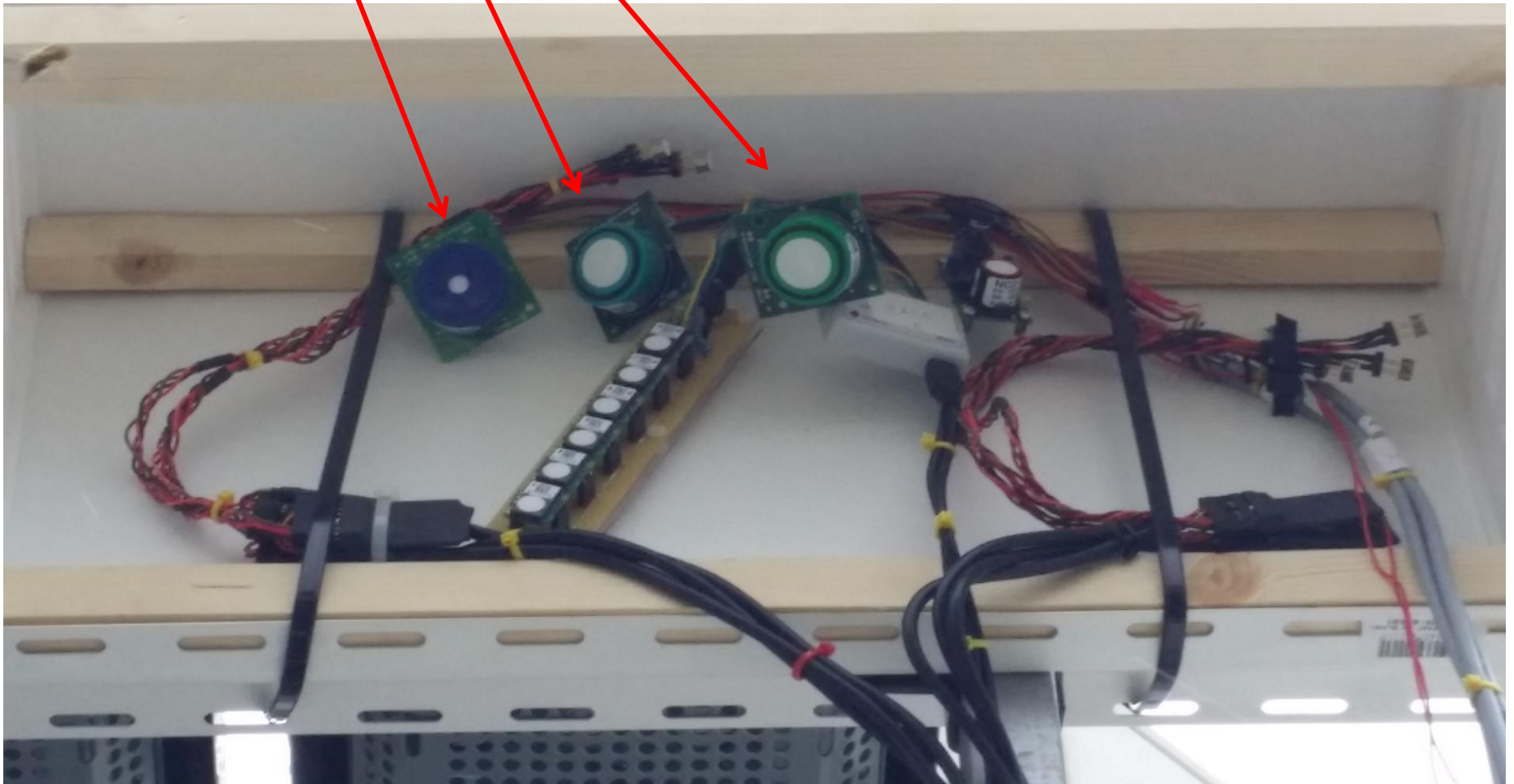
- MACPoll test results and test protocols now available
- EMPA validation testing of Heathrow boxes (2014)
- University of Manchester validation of PM_{2.5}, PM₁₀ OPCs (2014)
- US EPA is now engaged and trying to integrate low cost sensor networks with their AQMs. Much work to do, but they are accepting that the European equivalence philosophy should eventually be adopted by the US EPA.

Regulations, Protocols and Standards

- ASTM member: 22.2 (Ambient air)
 - Very engaged with rewrite of ASHRAE 62 ventilation rates, correcting for type of citizen and usage (Hal Levin and Andy Persily): D6245
 - D7297-06 Standard practice for evaluating residential IAQ concerns: revised
- British Standards Institute (member EH2/3 and EH2/5)
 - EN14662 benzene testing standard in draft stage, to be approved
 - ISO/TC146/SC5/WG6: currently modifying LIDAR standard
 - CEN/PC 421 emission safety of combustible air fresheners in draft stage
 - ISO 16000-30 Sensory testing of indoor air published (?)
 - ISO 16000-32 Investigation of buildings for the presence of pollutants- published
 - prEN15251 Guideline for using indoor environmental parameters for the design...of buildings- draft for discussion

Alphasense was also in Aveiro

NO₂, NO, CO



Challenges in Air Quality Control

WG4 has focussed on the following target analytes:

Bad Odours

- H₂S and organic thiols (mercaptans)

PM, Particulate Matter

- PM₁₀, PM_{2.5}, ultrafine PM and BC
- A state-of-the-art summary of PM sensors / analyzers was written by Anita Lloyd Spetz and John Saffell. Will be slightly upgraded concerning BC.

Challenges in Air Quality Control

Small combined sensors for PM

High-Accuracy Multi-Environment Sensors Module

Tongdy has introduced following 4 models:

- PM2.5/PM10 + Temperature/humidity
- PM2.5/PM10 + Temperature/humidity + CO2 (SenseAir S8)
- PM2.5/PM10 + Temperature/humidity + VOC
- PM2.5/PM10 + Temperature/humidity + CO2 (SenseAir S8) + VOC

It's Typical Applications are:

- Air quality detector
- Automobile carriage air quality detection and control
- Air purification equipment
- Conditioning fresh air system
- Ventilation equipment
- Other IAQ on-line



VOC in In-door air

- CH_2O methanal (formaldehyde)

Inorganic gases

- NO_2 nitrogen dioxide & O_3 trioxygen (ozone)
- CO_2 carbon dioxide
- A summary of main applications

Priority Innovation Requirements in Air Quality Control

- **Background / Problem statement:**
- New sensors developed in Europe should be further developed into real products / systems.
- In order to manufacture well-performing sensors or analysers one needs automatic calibration facilities that can handle high-volumes.
- If we want to compete with low-cost manufacturers outside Europe we need as smart and efficient calibration processes as possible.