Grant agreement no: 285037

Integrated Air Quality Sensor for Energy Efficient Environment control

DELIVERABLE REPORT

Deliverable No	**D9.5**
Deliverable Name	**Programme of Training Activities**
Work Package No	**9**
Lead Beneficiary	**CTECH**
Author(s)	**H. Newton, C-Tech**
Checked By:-	**E. Jones, C-Tech**
Checked By:-	**J. De LeHeras**
Due Date	**30/9/14**
Achieved Date	**13/11/14**

Contents

1 Introduction

1.1 The INTASENSE Project

The key objective of the INTASENSE project is to develop new and innovative system for the control of indoor environments. Space heating typically accounts for more than 50% of the energy consumption of public and residential buildings in the European Union[1], and reduction of this energy demand is a key strategy in the move to low energy/low carbon buildings. The careful management of air flow within a building forms part of this strategy through the control of inlet fresh air and exhaust air, maximising air re-circulation, and minimising the amount of fresh, cold air which is often drawn in through a heat exchanger. However, in doing this, there is a high risk that the air quality is reduced.

Continued exposure to environments with poor air quality is a major public health concern in developed and developing countries. It is estimated that, taken together, the pollutants responsible for poor air quality cause nearly 2.5 million premature deaths per year world-wide[2]. Significantly, around 1.5 million of these deaths are due to polluted indoor air, and it is suggested that poor indoor air quality may pose a significant health risk to more than half of the world's population[3]. Due to its link with industrialisation, societal health problems associated with poor air quality disproportionately affects the developed and rapidly developing nations - it is estimated that air pollution is responsible for the premature deaths of 370,000 Europeans citizens annually, with average life expectancy reduced by nearly nine months[4]. The chronic illnesses associated with exposure to poor air quality represent a major drain on international economies. In addition to the public healthcare costs, it is estimated that the total recorded sick leave in the EU that can be linked to poor air quality represents a productivity loss equivalent to more than €80 billion annually[5].

Remedial action to improve air quality (particularly indoor air quality) is often easy to implement. Often, relatively simple measures such as increased air flow through ventilation systems, or a greater proportion of fresh air to re-circulating air are sufficient to improve air quality. In other cases, low-energy air purification and detoxification technologies are available which will reduce the concentration of specific pollutants. Similarly, filtration systems (e.g. electrostatic filters) can be switched in to reduce the level of the particulate matter in the air (the principle pollutant responsible for poor health). However, these technologies need to be used intelligently in a cost efficient manner – this is difficult to achieve without a detailed knowledge of the nature of the pollutants.

The key problem is the ability to monitor continuously and quantify air quality and identify the nature of the pollutants themselves. A number of technologies exist that can be used to measure the various concentrations of all the individual major pollutants. Similarly, there already are a number of geographic national outdoor air quality measurement networks that allow the generation of an air quality index (AQI) to inform citizens of potential hazards. These network measurement nodes use a combination of on-line monitoring and periodic sampling followed by off-line analysis to determine

[1] Janssen, R., *Towards Energy Efficient Buildings in Europe,* EUROACE, 2004.

[2] *Estimated deaths and DALYs attributable to selected environmental risk factors, by WHO member state*, WHO 2002 (http://www.who.int/entity/quantifying_ehimpacts/countryprofilesebd.xls)

[3] *ibid*, WHO 2002.

[4] *The Clean Air For Europe (CAFÉ) Programme*, EU Thematic Strategy, September 2005.

[5] Hansen, C. and Selte, H., *Air pollution and Sick-leaves*, Env. and Resource Economics, Vol. 16, pp31-50 (2000)

the AQI. The monitoring systems and analytical equipment used in these networks is bulky, expensive and cannot provide real-time comprehensive air quality monitoring required to sufficiently protect public and worker indoor and enclosed air spaces. Member States dedicate very considerable resources to measuring and monitoring outdoor ambient air quality and informing the public of the state of ambient air quality - but people actually spend 90% of their time indoors. Although indoor air quality is partially determined by ingress of polluted outdoor air, in modern sealed or semi-sealed buildings most indoor air contaminants arise from sources within the building itself. Hence reliable, integrated, cost-effective monitoring of indoor air quality is a very high priority for human health protection.

Key project Objectives:

(i) Combine breakthroughs in micro- and nano-scale detection to deliver an air quality sensing system with advanced capabilities that can provide, at low cost, comprehensive monitoring of all key airborne pollutants linked to poor health of citizens.

(ii) Provide an easily configurable system for an extensive range of bespoke applications with different well-defined pollutant profiles, hence facilitating widespread implementation and maximum impact.

(iii) Develop a smart air quality sensing system that can intelligently interface with existing ventilation and air treatment systems to maximise their energy-efficiency and effectiveness, while also offering the capability for specific purification actions in response to identified pollutants.

(iv) Substantially improve the prospects for health, quality of life, and productivity of EU citizens by providing a comprehensive air quality monitoring system capability that will transform the implementation of air purification.

(v) Generate data from a demonstration unit in real operating conditions that validates the effectiveness and durability of the developed technologies and to lay the foundations for exploitation as a smart low-cost high-performance air quality monitoring system.

1.2 Scope and Objectives of this deliverable

Dissemination is an extremely important activity within INTASENSE. The consortium partnership is eager to disseminate the results from this project as widely as possible and to maximise the commercial impact of the results and technologies developed during the project.

However, the consortium is also aware that it must maintain confidentiality of its know-how and protect its IPR position in order to establish a strong position in such a competitive market. Therefore, although dissemination will be pursued as quickly as possible, it will at all times be subordinate to the IPR protection. The relationship between protection of IPR and dissemination will be closely governed by the Management Board and covered by the Consortium Agreement (See description of “Management of Knowledge and Intellectual Property” in Section 2.1.1).

2 Dissemination Plan

2.1 Dissemination Strategy

Dissemination means disclosure of foreground by any appropriate means other than that resulting from the formalities for protecting it, including publication of foreground in any medium.

Dissemination activities will be linked closely to "Use" of the technology. For example, exploitation of the results will be promoted by dissemination to potential end-users and to their customers, i.e. organisations such as large manufacturing companies, industry associations and public bodies or government departments.

To facilitate dissemination, in the first instance a visual identity will be developed for the INTASENSE project, comprising a logo and style in different formats, in line with the FP7 visual guidelines. Templates will be produced for MS Office PowerPoint.

A standard presentation introducing the project and providing a generic overview for public use by project partners will be developed and distributed; this will be periodically updated as the project progresses to incorporate the latest developments and results achieved.

A project website will be established www.INTASENSE.eu. This website will act as a central information source and provide a point-of-contact with the project for the research, SME and industrial communities, as well as for the general public.

The public-facing website will introduce the INTASENSE objectives and highlight the results, outputs and activities (past and forthcoming) of the project. It will also host publications and similar documents, and provide instructions on how to acquire further details on the project for interested parties. In addition, a private (password protected) secure website area for project partners will be used for internal dissemination and project management.

For the scientific research community, dissemination will occur principally through articles published in scientific and technical journals, as well as presentations at scientific conferences and seminars. Presentation of the project's results at scientific and industrial conferences at national, EU and wider international events by all partners will be encouraged wherever possible, provided the project's IPR policy is respected.

However, the consortium recognises that the scientific press and conferences are unlikely to reach all of the target audiences. For example, scientific publications and conferences are often poorly subscribed to / attended by SMEs due to cost and time pressures. Therefore a second route to dissemination will be via specific and targeted publications, announcements and meetings; in the form of leaflets, flyers, press releases, newsletters and workshops. Such dissemination mechanisms can often be more effective in attracting interest in the relevant industrial and SME sectors. Industry sector organisations, at the national or international levels, will provide a useful contact route for such dissemination activities.

2.2 Training

To further enhance the benefits of the project amongst the partners, a programme of education and training will be developed to transfer the knowledge generated by the project within the consortium.

This internal training will take the form of seminars or lectures held at project meetings. External experts will also be invited to transfer knowledge into the partnership.

To develop the programme of training, each partner has been requested to deliver topics in which they have particular expertise. Those judged to be of most relevance and widest interest to the partners have been selected for presentation during the course of the project.

The following general subjects of training were identified:

1. The INTASENSE project itself (general scope, coverage, goals and milestones and plans to reach them – given to external parties)
2. Indoor air quality (chemistry and health implications)
3. Solid state gas sensing
4. Particle detection
5. Microfluidics optimisation

2.3 Key Training Audience

The overall aim is to maximize the utilisation of the training potential of the INTASENSE consortium. Training activities were tailored in such a way to reach the audiences most efficiently through appropriately selected channels and tools – internal and external to the consortium.

2.3.1 INTASENSE Internal Training

Ensuring effective internal communication and training among the Consortium partners represents an important key success element for the INTASENSE Project.

Partner organizations are important for this for two reasons. Firstly, they are potential users of INTASENSE project technology themselves; and secondly they represent “influencers” because of their significant connections and relationships with the associated industrial sectors.

Methods of internal training will be various; from providing workshops to other partner organisations, to seminars showcasing results, to specific organised consortium training at project review meetings.

Documents and files for internal training will be uploaded on the project website (in the partner’s area). A secure project partner’s area has been set-up on the INTASENSE website www.project-INTASENSE.eu, whereby individuals directly involved in project delivery each have specific usernames and passwords to enable access to this area.

2.4 Training Activities Timing

Training activities were planned in accordance with stage of the development in the project as planned in the Description of Work (DoW). Although a number of dissemination activities took place during the first 12 months of the project the most significant activities took place throughout the remaining 24 months.

2.5 Training Management

2.5.1 Training Contacts

As described in the DoW (Task 9.3), internal and external partners of the consortium are expected to contribute to the training according to their foreseen role and effort using all available tools, thus for instance by participating and providing workshops or webinars and will strive to maximise the existing training channels for the purpose of developing the consortium members' skills for INTASENSE.

The training manager is the central contact point for internal/external training. Full name and contacts will be mentioned on any document where it appears to be relevant.

The contact details to be currently mentioned are:

CTECH, as Coordinator, is the central contact point for training. The contact details to be currently mentioned are:

Rob Bell, Project Coordinator
rob.bell@ctechinnovation.com
Tel: +44 151 347 2989
Fax: +44 151 347 2901

2.5.2 Training Monitoring

All consortium partners are encouraged by the partner responsible for training to report the results of each training activity immediately after they are presented. An excel spreadsheet has been created for this purpose, with drop-down menus providing a pre-determined selection of entrees for type of activity, type of audience etc. to ensure consistency of reporting by each partner. The populated sheets will be collated from all partners every six months and a master record transferred to the private area of the website to enable an overview to be kept.

This deliverable summarises the training carried out on the project during its 3 year duration and the tables below give details:

2.6 Training (internal and external)

To further enhance the benefits of the project amongst the partners, a programme of education and training will be developed to transfer the knowledge generated by the project within the consortium. This internal training will take the form of seminars or lectures held at project meetings. External experts will also be invited to transfer knowledge into the partnership.

Date	Type	Type of audience	Countries addressed	Partner responsible/ involved
23/10/2011	Lecture/Seminar - Indoor Air Quality	Scientific community (higher education, Research) - Industry, 15 people	EU and Associated States	LANCASTER UNIVERSITY
14/03/2012	Organisation of Workshops	Scientific community (higher education, Research) - Industry - Policy makers, 30 people	EU and Associated States	C-TECH INNOVATION LIMITED
27/03/2012	Lecture/Seminar - Wireless Sensor Networks	Scientific community (higher education, Research) - Industry, 15 people	EU and Associated States	ADVANTIC SISTEMAS Y SERVICIOS
13/09/2012	Lecture/Seminar - Detection & monitoring of particulates	Scientific community (higher education, Research) - Industry, 15 people	EU and Associated States	TECHNISCHE UNIVERSITAET ILMENAU
19/02/2013	Organisation of Workshops - Sensor prototype for formaldehyde detection in indoor environments	Scientific community (higher education, Research) - Industry, 60 people	Spain	CENTRO DE ESTUDIOS E INVESTIGACIONES TECNICAS
19/02/2013	Organisation of Workshops - Conductometric Micro sensor based on in-situ grown ZnO Nanostructures for Air Quality Monitoring	Scientific community (higher education, Research) - Industry, 60 people	Spain	CENTRO DE ESTUDIOS E INVESTIGACIONES TECNICAS
12/03/2013	Organisation of Workshops - The INTASENSE project within the Energy Efficient Buildings PPP	Scientific community (higher education, Research) - Industry - Policy makers, 30 people	EU and Associated States	C-TECH INNOVATION LIMITED

14/05/2013	Workshop - Clean room session	Scientific community (higher education, Research) - Industry, 15 people	EU and Associated States	CENTRO DE ESTUDIOS E INVESTIGACIONES TECNICAS
30/10/2013	Seminar - Sensors for toxic gas detection	Scientific community (higher education, Research) - Industry, 15 people	EU and Associated States	CENTRO DE ESTUDIOS E INVESTIGACIONES TECNICAS
26/03/2014	Visit - Madrid Tunnels visit- IAQ remediation	Scientific community (higher education, Research) - Industry, 15 people	EU and Associated States	Madrid Municipal authority, Madrid, Spain (EXTERNAL)
15/09/2014	Workshop - *INTASENSE* demo set-up and skills transfer between the consortium	Scientific community (higher education, Research) - Industry, 15 people	EU and Associated States	FULL CONSORTIUM