

Self Powered Wireless Sensor Network for HVAC System Energy Improvement

The project focuses on the concept that a better knowledge of current building conditions can lead to decision making and control strategies. However, gathering this data could be expensive due to the cost of installation and maintenance of sensors. TIBUCON proposes a cheaper solution based on Self Powered Multi Magnitude Wireless Sensor Networks.

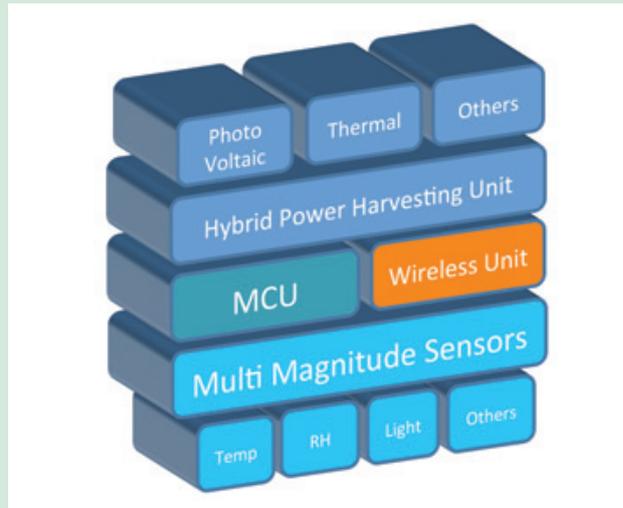
Introduction

The project focuses on the space heating and cooling aspects, proposing a solution beyond the existing wireless based HVAC control systems, derived from the use of Self Powered Multi Magnitude Wireless Sensor Network (SP-MM-WSN) for building thermal condition monitoring.

The network completely avoids the use of cables and removable batteries, thanks to the combination of extremely energy efficient wireless communication technology, ultra low power electronics, and power harvesting. The use of SP-MM-WSN results in an easy to deploy and maintenance free building monitoring system that makes it the ideal candidate for either new or existing HVAC installations.

Partners

Coordinator: Mostostal Warszawa, Poland
Belgium: Katholieke Hogeschool Kempen |
Poland: E&L Architects | **Spain:** Tekniker-IK4,
Giroa, part of Dalkia Group



Modular design for SP-MM-Wireless Sensor

Objectives

The project aims to reduce energy consumption through HVAC system performance enhancement. This is achieved thanks to an ICT based building integral wireless connectivity system that can support the building condition monitoring, and real time control and actuating scheme. The 2 main objectives of the project are to:

- Empower old and new building monitoring through extremely cost effective SP-MM-WS
- Development thermal simulations of the heating system and to continuously compare them with the data from the sensors

This real time comparison between measured and simulated outputs can be used to monitor the thermal comfort of the inhabitants and the dynamic behaviour of the HVAC, so that system faults can be detected and energy spoilage can be avoided. Depending on the situation, the results are to be passed to the building manager or the building users, so they can undertake the necessary actions.

Methodology

The project is divided in 4 main phases. The first phase has been oriented to bring together the experts, stakeholders and end-users in ICT, Construction and Energy present in the consortium to define and establish the main basis and facts for a successful solution development. This first phase paves the way for the second phase, which addresses the main technological developments such as the SP-MM-WSN design, and the building models and simulations.

At the beginning of the third phase, the TIBUCON solution will be deployed in 2 buildings. The selected pilot test beds are a new office building in Poland and an existing group of apartment buildings in Spain. During this third phase the performance of TIBUCON solution will be measured under real working conditions. Based on these results, conclusions will be drawn for an effective business model development.

Expected deliverables

TIBUCON provides different types of deliverables aligned with the different technical areas of the project: ICT, construction, and building automation. There is a key deliverable which deals with the main principles for including TIBUCON-like solutions in the design flow of new buildings, and for retrofitting existing ones. There is also a set of deliverables related to the sensor unit itself, including the hardware design, communication protocols and high level data models descriptions. In addition, gateway units will be provided for connecting TIBUCON nodes to the main BMS systems in buildings. First versions of all these units will be available during this year. In addition, some work in line with the definition of novel HVAC control approaches, that makes

the most of TIBUCON's distributed monitoring will be published. Finally, after deploying the system, and having it running for a year, the performance measurements, along with the initial business model and exploitation plans will be delivered.

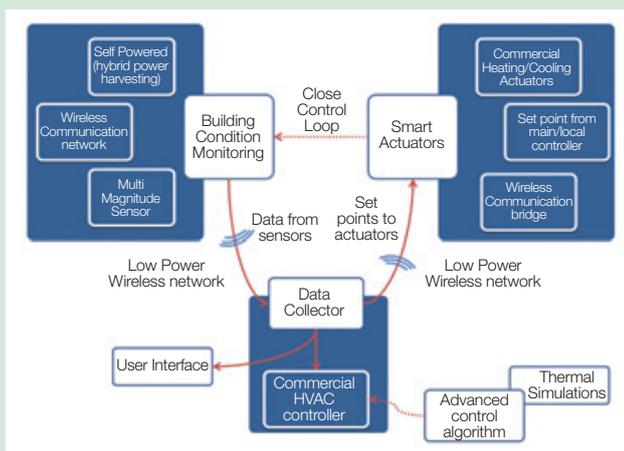
Impact

The main objective of the TIBUCON project proposal is the efficiency improvement of both used and newly installed HVAC system. The possibility of using the solution in HVAC system retrofitting guarantees an enormous potential consumer market, significant energy use and CO₂ emissions abatement.

Since the HVAC systems are one of the main energy consumers within a building, the ESCOs often base their

solution on the HVAC improvements. Therefore a solution like TIBUCON is a big help for ESCOs due to its cost saving and flexibility. Its introduction in the ESCOs toolbox will result in more competitive solutions that will easily enter residential and tertiary energy improvement markets.

Additionally, the wireless and maintenance free technology offered by TIBUCON solution will help construction companies to increase the technological level of their product range. The cost reduction in HVAC system deployment and its improved energy consumption and thermal comfort performance will help companies to increase their competitiveness and thus their market share.



Tibucon system architecture for improving the efficiency of new HVAC installations

Key facts

Start date: September 2010

Duration: 36 months

Total budget: €2.4 million

- Use of SP.MM.WSN to set a maintenance free building monitoring system for HVAC installations
- The solution is suitable for new and existing buildings
- The system will be tested in the office building in Poland and in 4 different residential buildings in Spain