ABSTRACT

The study, monitoring and control of environmental phenomena such as the air pollution, climate control or homogenization temperature and humidity indoors, or understanding and extinguishing forest fires pose a constant challenge to the personnel responsible and especially to the researchers. Compete this problematic economic sectors where greenhouse crops, post-harvest cameras, chillers tractor ruminant farms, smart buildings, urban environmental studies, among many others used. In all of them there is a concern for consistency in production, for energy efficiency and environmental impact generated. It is for this homogenization, dispersion and stratification of climate variables and gases, closely related to the ventilation of outdoor spaces and venues of interest. For the understanding of physical phenomena that are generated and subsequent improvement in the structural design and automatic systems, we need a modeling and energy analysis, there are currently several methods: tracer gas techniques, intensive data collection accompanied with box-empirical modeling Black and resolution simulation of physical laws that govern the behavior of study spaces. Previous techniques independently are insufficient to provide practical solutions and are costly or highly particularized to the case study.

That is why the technique Fluid Dynamics Computer (CFD), as a tool that is used to numerically solve the equations of continuity and momentum that govern energy exchange system in order to obtain the fields of speed and direction airflow, the distribution of temperature, humidity and specific gases, becomes viable for later models were used with advanced control systems. However, the CFD technique requires a validation of the results with intensive shooting (space-time) data. Most published studies refer in their conclusions to the need for such validation of the data produced and how it is done.

This document, by means of case studies, seeks to address the complexity of some environmental phenomena using models with the technique of CFD, whose validation also requires a protocol systematically executed a System Data Acquisition (DAS) spatially distributed and temporally controlled, which is achieved with the design and installation of a Wireless Sensor Network (WSN).

Then it finds a first justification case where having the need to study the homogenization of the microclimate of a greenhouse, a DAS is created through the integration of different technologies wired. It shows in addition to extensive technical development, an urgent need to move to a non-wired technology to achieve the spatial coverage required in rooms or spaces with greater volume. It is followed by a case study in the laboratory, which seeks to understand the distribution and stratification of a gas in a chamber with controlled ventilation. Using a CFD model, which in turn feeds and validated with a database generated from a gas sensor WSN becomes. Then, a case study where space analysis moves to a real environment and highly complex, as it is a street in the city of Valencia, Spain.

Keywords: Computational Fluid Dynamics (CFD), Wireless Sensor Networks (WSN), Data Acquisition System (DAS), Embedded Systems, Fieldbus, Gas Sensor, Environmental Monitoring, Environmental Modeling, Environmental Modeling Validation