Titre/Title

"Les problématiques de prédiction et maîtrise de systèmes
complexes : cas des bâtiments"

The problems of prediction and control of complex systems:
the case of buildings

Résumé / Abstract

The primary objective of buildings must be to provide a comfortable environment for people.

In order to improve energy efficiency and thermal comfort in the building, the use of phase change materials (PCMs) is one of the suggested solutions. The glass façades have gained also popularity due to their aesthetic appearance. However, glass façades often cause occupants thermal discomfort, in addition to consuming considerable amounts of energy.

The building performance (regulation) evolve toward a building integrating a producing integrated system. Hybrid solar PVT has the potential to become a major player in the integrated renewable energy sector, but one of the main barriers is the lack of reliable data due to limited number of monitored PVT hybrid systems with proven thermal performance results.

We have to clarify the relative order of these solutions and how possible to combine such number of objectives under various constraints. Moreover, due to the new building performances, the error in models in comparison with the needs became almost same order (Noise/signal) and questions on the method still open.

The main purpose of this presentation is to optimize the building design, the thermal comfort based on the combined use of numerical simulations, design of experiments technique and an optimization method. The integration of generic thermal model of electrical appliances is ongoing in order to evaluate the influence of their thermal gain on low energy buildings.

To determine the critical parameters affecting thermal comfort, the use of numerical simulations and design of experiments aims to develop meta-modeling relationships between design factors and response variables. Such optimized design improves thermal comfort conditions as well as energy savings but must overcome the antisymmetric character of PCM storing/recovering energy management in the walls.