Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : LABAT Given names : Matthieu

Status (prof., assistant prof., …) : Assistant Professor

Laboratory : LMDC Website address : https://www.lab-lmdc.fr/

Institution : INSA Toulouse Website address : https://www.insa-toulouse.fr/

Scientific competence of the supervisor:

Heat and mass transfer; Fluid mechanics; HVAC system; Modelling; Numerical methods; Building
Metrics (web of science, 26/03/2024)
H-index: 12 ; Publications: 21 ; cited: 434 ; citing articles: 379.

Two major publications in the field proposed for the PhD :

1. Labat, M., Hazyuk, I., 2023. Numerical comparison of an office cooled with and without a ventilated slab using a model predictive controller. Applied Thermal Engineering 228, 120500.
2. Rouleau, J., Ramallo-González, A.P., Gosselin, L., Blanchet, P., Natarajan, S., 2019. A unified probabilistic model for predicting occupancy, domestic hot water use and electricity use in residential buildings. Energy and

Website address of the personal page : https://cv.hal.science/matthieu-labat

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Description of the research work proposed for a PhD ***Topic # (see list) :*** V-4. ; VI-3.

Title : Toward a smart control of Solar Domestic Hot Water (SDHW) systems

Subject :

Among the numerous research subjects related to energy consumption, the one used for Domestic Hot Water (DHW) has some specificities. We propose to explore the improvement in controlling the SDHW. This study will rely on a numerical work mostly, as the use of dynamic model is now common and allow more flexibility and accuracy. We propose to rely on TRNSYS software in order to take advantage of the experience in our lab. TRNSYS software is a widespread tool used to solve heat and mass transfer in dynamic thermal systems. It is suitable with parametric studies, sensitivity analysis and multi-objective optimization. The main objective is to develop a robust design of a SDHW system, which is a system that is able to address the hot water demand for minimum capital and operational costs. To do so, we propose to follow the following steps: 1. To achieve an extensive literature review to determine the hydronic system used for SDHW, in order to select the most relevant ; 2. To include a stochastic hot water demand based on already published work on this topic and on our own experience in another domain ; 3. Achieve a sensitivity analysis to identify the most influencing input parameters and gain confidence in the model. 4. Propose and test smart control techniques, moving progressively from simple to advanced techniques.

Keywords :

Energy consumption, control, modelling, stochastic approach, optimization

Expected collaborations :

Academic: I.Hazyuk (Institut Clément Ader, Université de Toulouse, INSA/ISAE-SUPAERO/MINES-ALBI/UPS/CNRS, 31400 Toulouse, France)
Company: TECSOL (Tecnosud - 105 Av. Alfred Kastler - BP 51008 66101 PERPIGNAN Tél: +33 4 68 68 16 40)

Background required from the applicant :

The applicant should be master graduated in the field of Mechanical Engineering, Energy or Architecture. The applicant should be skilled in advanced heat transfer and fluid dynamics. Basic knowledge of control, modelling and programming are required. Additional skills in energy systems will be appreciated. Finally, written and spoken English are mandatory.

Existence of a PDF file detailing the proposal ("yes" or "no") : yes

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