HSLU Hochschule Luzern

Technik & Architektur

Bachelor's Thesis in Energy Systems Engineering

Minimizing Operational Energy Demand of Buildings in Different Climates

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In response to rising energy consumption, the optimization of passive building design has been a crucial topic for improving energy efficiency and indoor comfort in recent years.

This project aims to see the effect of three climatic conditions such as warm Mediterranean, oceanic, and continental climates on the energy demand of buildings and their internal operative temperature (IOT).

Furthermore, the effect of parameters such as night-time ventilation air change rate, glazing U-value, window to wall ratio, and solar exposure for shading device on the IOT in a passive design of building approach were tested.

For the calculations, the standards of the European standard DIN 15251:2012 was mainly used. Wufi Plus simulation and Design of Experiment method implemented in Minitab software were the applied methodologies to carry on with the study.

It is concluded that in a well-designed building and by means of decent insulation it is possible to control the IOT in oceanic and continental climates without the use of active heating/cooling.

In case of warm Mediterranean climate, the use of mechanical cooling was inevitable. Also, Minitab results illustrate that night-time ventilation air change rate has the highest impact on the IOT when implementing passive design of buildings approach.

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