Assesment of air-conditioning systems in tertiary use nZEB by means of BIM and Energy Plus

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1. Introduction – The future of engineering lies on following the Green Engineering principles as stated by the European Community [1-2] and the United States Environmental Protection Agency [3]. Between them energy consumption reduction plays a fundamental role. By the end of 2018 buildings constructed inside the European Union must start to follow the nearly Zero Energy Building (nZEB) standard. To do that researches have been carried out in which both active and passive energy efficiency measures are needed when air-conditioning systems are to be installed in buildings [4]. When these measures are applied a reduction of non renewable primary energy consumption is obtained. In this work the results obtained by simulating a 3749.58 square meters building, already improved with passive energy efficiency measures, with different air-conditioning systems designed to reduce the energy consumption are presented.

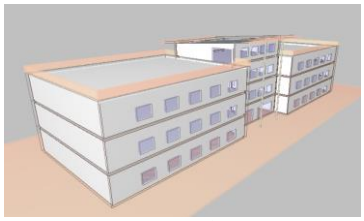

Image 1. BIM model of a building

2. Experimental – The model of a building was developed by means of the tool "Building Information Modeling" (BIM) (Revit by Autodesk). Then it was incorporated as a IFC file to Cypetherm EPlus (from CYPE Ingenieros) to carry out, by means of the calculus engine Energy 8.8, yearly dynamical simulations of several air-conditioning systems in order to find out the building energy needs.

3. Results and Discussion – The results provided by those simulations may be seen in Table 1, where the primary non-renewable energy consumption and its energy vector are shown.

Table I. Simulation results

System type	Non-renewable primary energy consumption / m^2 ($kWh/m^2.year$)	Non-renewable primary energy consumption (kWh.year)	Percentage of savings
Standard	14.6	54831.2	---
Hyperinverter	6.5	24428.5	55.5 %
Variable Refrigerant Flow (VRV)	4.6	17321.5	68.5 %
Biomass + VRV	4.3	16264	70.6 %

4. Conclusions – These simulations have pointed out the need of a detailed study of the energy efficiency of the systems to be used in a nZEB in order to minimize the primary non-renewable energy consumption.

5. References

[1] European Parliament and Council. "DIRECTIVE 2010/31/UE". O.J.E.U, pp. 13–35, 2010.
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[3] US EPA. "About Green Engineering." Available at: https://www.epa.gov/green-engineering/about-green-engineering#principles. April, 2018.
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