Abstract


In Brazil a lot of electrical energy is used by building air-conditioning because of the tropical climate. In many cases there is a general congruence of solar irradiation and demand for building air-conditioning and solar thermal cooling has the potential to satisfy a part of the rapidly growing cooling demand. Due to excellent solar irradiance and a high cooling demand there exists in Brazil good conditions for the use of solar-assisted air-conditioning. In this work the most important solar cooling techniques and their suitability in Brazil are discussed. The objective of the present study is to analyze the technical and economic feasibility of medium sized solar-assisted air-conditioning in Brazil. The energy saving potential of solar-thermal air-conditioning in comparison to best practical solutions in Brazil using conventional split air-conditioning systems, is shown based on a case study (auditorium in Guaratinguetá - São Paulo). The economy of solar-assisted air-conditioning is thereby discussed. The basic principles for the dimensioning of a system for solar cooling are described. The auditorium in the case study is modelled by using the dynamic thermal building simulation program Helios-PC. In this context it is, as well, demonstrated how the cooling load could be decreased by adapting the indoor temperature according to the Brazilian standards of thermal comfort and by using building insulation.

Keywords

Solar cooling air-conditioning; Solar thermal collectors; Dynamic thermal building simulation; Energy efficiency; Economic assessment.