HIGHER TECHNICAL INSTITUTE
MECHANICAL ENGINEERING COURSE

DIPLOMA PROJECT

DESIGN OF A SOLAR ROOF AS AN INTEGRATED ENERGY SOLUTION

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BY
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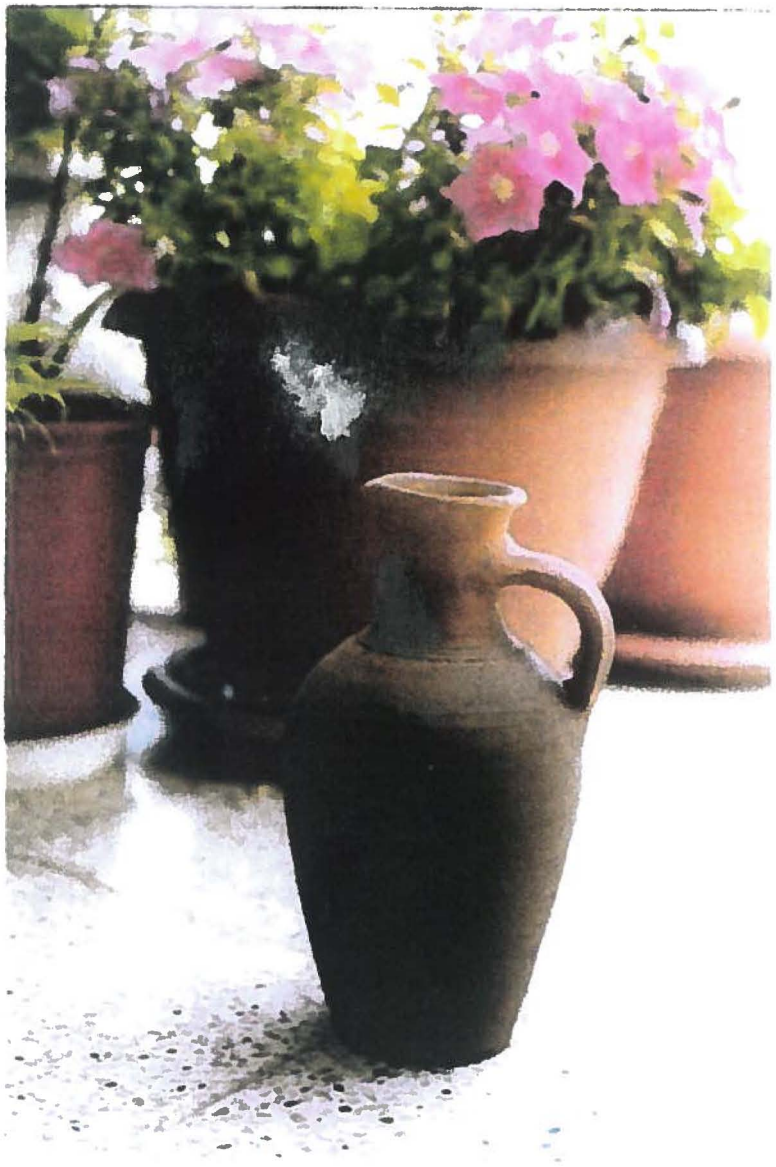
THE SOLAR ROOF



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PROJECT REPORT

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ABSTRACT

Scientific/Technological quality and innovation

Need and Issues

1. Industrial: Obtain a new system for conditioning of buildings, that replaces the current air conditioning systems, moreover with better working conditions, with a lot of energy saved, more than 75%, and with null health risk.
2. Economic: Obtain a new system at lower installed cost with lower use of energy and at lower electrical power than the current air conditioning systems.
3. Social problem to overcome: Decrease the CO_2 and other greenhouse gases, reduce the heat rejected to the atmosphere, eliminate the aerial noise and reduce the legionella disease risk. Improving the acceptability of renewables.

The project addresses the saving of imported energy, the reduction of the electric energy pick, mainly in summer time, the reduction of the greenhouse gases by the use of the solar energy and the increase of renewable energy use.

The competing technology is the current air conditioning systems which have several limitations, the main are:

- Intensive use of electrical electricity yielding high cost and high CO_2 emissions.
- High power of electric network and a large number of new electric lines having an environmental impact.
- Bad working conditions that create the sick building syndrome: draught, odour, high inner contamination, thermal imbalance.

A significant step forward beyond the state-of-the-art

- New solar roof design, that catches the sun energy for heating, cooling, recovery of energy and in certain applications, it can replace the structural roof.
- Total integration of room conditioning with sanitary hot water production.

These claims represent a big step forward beyond the state of the art and save 75% of energy.

A critical appraisal of the level of technical risk and any relevant factors which may influence the chance of success

The only risk involved in the system could be the use of more auxiliary energy than the one postulated for the relevant equipment of the system, meaning higher electrical consumption or higher estimated cost with the risk to save less energy than the one predicted, but we believe that this risk is low.

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Introduction

Nowadays, the necessity to save energy is more imperative than ever before. The reason is the constant decrease of petroleum reserves, its price instability and the increase in the demand of energy by the consumers, which force them to pay more for this kind of energy. Therefore, mankind has turned to sources of energy other than petroleum, like the solar and the wind energy.

An example on energy system, which utilizes the solar energy, is the solar roof. Its main purpose is to replace the water cooling tower, which is used in the air condition units in large installations, in order to cool the condenser during summer months by using water.

The solar roof is used to cool the water in the summer months and heat it in the winter months.

In the summer, the water cools due to the phenomenon of the evaporation of the water droplets, while in the winter is heated due to its contact with a warmer surface.

The cooling towers consume a lot of energy, make noise and vibrate while the exposure of droppings to the air may cause the Legionella disease.

The solar roof consumes a low amount of electricity, makes no noise, has no vibrations and decreases dramatically the dissemination of Legionella.

The principle for the operation of the system will be explained in this project.