Event: **ENERGY in BUILDINGS 2018**
Date: Saturday November 3, 2018
Place: Athens, Hellas

#	**Christos Pagkalos** Dipl. Mechanical Engineer	
Title:	Research Assistant in Energy and Environmental Research Laboratory, Technological Education Institute of Sterea Ellada (TEISTE), Psachna campus, Evia, Greece	
email:	pagkalos.christos@gmail.com	
Presentation title:	**Energy analysis on Cascade Refrigeration CO2 Systems with Thermal Compression in Super Markets**	

The objective of this study is to present and examine a novel solar assisted mechanical compression refrigeration system. Flat plate collectors are used in order to partially thermally compress the refrigerant, after the mechanical compressor. This design aims to reduce the electricity consumption using a renewable energy source, thus creating a sustainable system.

The thermal compression technology is a consenting technology, due to the ability to use volatile fluids that have the ability to evaporate at ambient temperatures, and of course to work as gas and not as vapor. The suggested design is parametrically analyzed in order to investigate its thermodynamic behavior in various operating conditions. The system is modelled using EES (Engineering Equation Solver) and ANSYS in steady state conditions.

The simulation parameters are the temperature in the evaporator and the maximum temperature in the condenser- as well as the thermal compression fraction expressed with the pressure ratio parameter. The final results proved that the optimum values of the pressure after the mechanical compressor, is 75% of the maximum pressure. For this case, energy savings from 25% to 30% can be achieved. Moreover, the specific collecting area is found to be relatively low, close to 2 m2/kW for the optimum cases. The new design leads to energy savings in all the examined cases and especially in cases with higher evaporating temperature, a fact that makes it ideal for space cooling applications.

CV:	

He studied Mechanical Engineering at the National Technical University of Athens (NTUA) (**Diploma Thesis:** "Three-dimensional computational simulation of pulsed blood flow in the carotid bifurcation." Grade 10/10). Currently he is working as a research assistant in the Laboratory of Energy and Environmental Laboratory (E^2ReLab) of the Technological Education Institute of Sterea Ellada (TEISTE). He has been involved in the following research projects:

1. **Tesse2b:** Thermal Energy Storage Systems for Energy Efficient Buildings, a project that develops an integrated solution for residential building energy storage using solar and geothermal energy, with the purpose of correcting the mismatch that often occurs between the supply and the demand of energy in residential buildings. That is achieved by integrating compact Thermal Energy Storage Tanks with Phase Change Materials (PCM TES) coupled with enhanced Phase Change Materials inside the borehole heat exchangers (BHEs), and using an advanced energy management smart self-learning control system.
2. **RefTheCom:** The analysis of **THE**rmal **COM**pressor operating in **REF**rigeration devices, RefTheCom project, will research, design and manufacture, an innovative cooling and/or freezing system assisted by solar energy. This system will produce refrigeration at two temperatures, one for freezing and one for maintenance, and will have carbon dioxide (CO_2) as working medium. It will be designed as a cascade installation, to eliminate heat from a common compressor, and a thermal compressor, and also act as a high-performance multi-stage machine. In brief, a computational model will be developed to assess the operating behavior of the thermal compressor where the operating areas will be identified and the potential energy savings resulting from the application will be determined.

His responsibilities involve the design, development and optimization of simulation models for equipment and processes, as well as, involving in the organization and set up of experiments of HVAC systems and relevant equipment.

He is a proficient user of the English language (having a C2 certificate) and an independent user in German (having a B2 certificate). He has knowledge of several programming languages (C, C++, and Fortran) and has good command of engineering programs (ANSYS, Matlab/Simulink, Labview, Autocad and EES)