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Presentation title:	**Design of Thermoplastic Tanks for Thermal Energy Storage Applications using Finite Element Analysis**	

In this work, results from the design and development of thermal energy storage (TES) tanks targeted for thermal energy storage applications, using Finite Element Analysis (FEA), are presented and discussed. The tanks are a part of the innovative Tesse2b solution, a modular and low-cost thermal storage technology, based on solar collectors, and highly efficient heat pumps, for heating, cooling and domestic hot water production. The TES tanks contain a heat exchanger (HE) and the paraffin phase change material (PCM), required for the thermal storage, which is selected depending on the targeted application. They also comprise insulation to prevent thermal losses. The tanks' shape is cuboid and they are made of a thermoplastic material, which was selected after extensive testing and due to better thermal properties. The material selected is polypropylene a material with long term working temperature approx. 90oC. The target was to design paraffin TES tanks in a compact and modular manner taking into account easy scaling of the system to meet thermal energy needs of residential buildings with various sizes and for different climates. The tank design process took into account material compatibility, operating temperatures and expected load from content considering a design life. The design of the paraffin TES tanks was performed in compliance with the EN12573 standard for reinforced and non-reinforced tanks. The mechanical properties of the tank material (permissible stresses, etc.) were extracted from the standard EN 1778: 2000. Depending on the number of reinforcements used, tanks with different wall thickness were considered. The more reinforcements used the less wall thickness was required. As the service life of thermoplastic tanks depends on creep deformations, to simulate the effect of creep in the TES tanks, a long-term young modulus was used alongside with the normal young modulus, a common approach used in the plastic tanks industry. The designs used for the TES tanks, were verified using FEA structural analysis, to check and visualize the loads and deformations on the tanks. A FEA heat transfer analysis was also conducted to study the insulation and to visualize thermal losses. Due to the needs arising from the use of the tank (thermal energy storage) the thermal analysis is very important for the proper function of the tank. The final tank geometry incorporates one ST-37 Rim on the top of the tank, two ST-37 Ribs and five modulations as proposed by the manufacturer.

Short CV:	

He obtained his diploma from the School of Mechanical Engineering of the National Technical University of Athens (NTUA). Since 2017 he has been working in the Energy and Environmental Research Laboratory (E2ReLab), of National and Kapodistrian University of Athens (NKUA) as a research assistant. He has participated in the Tesse2b research project (Thermal Energy Storage Systems for Energy Efficient Buildings), having responsibilities regarding the FE Analysis and CFD simulations required in the design and development of the Tanks and Heat Exchangers.

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 (E2ReLab) of the National and Kapodistrian University of Athens (NKUA). 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 THErmal COMpressor operating in REFrigeration 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 (CO2) 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)