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Simulation of Gas Jet Turbine

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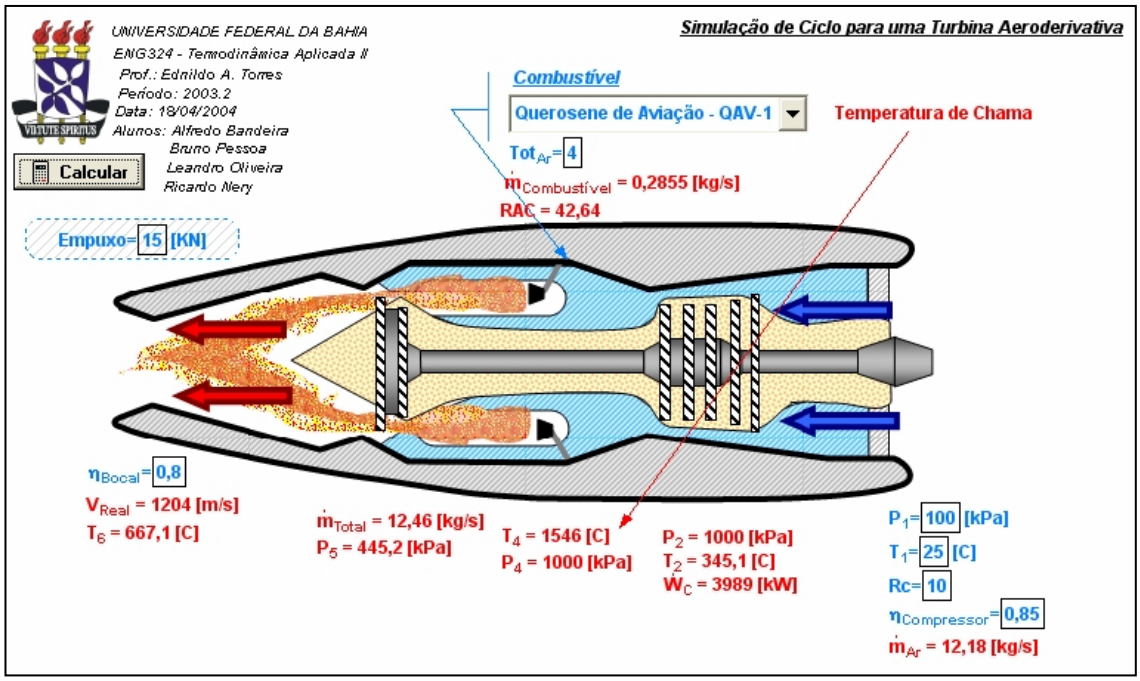
Since that human been reached the status of Homo-Sapiens, the man dreams in flying as the birds. Alberto Santos Dummont was one of the pioneers to get success in the aeronautics adventures, inventing airplane in the beginning of last century. He flied around the Eifel tower piloting the 14 Bis. Before Santos Dummont, approximately 150 A.C., an Egyptian called Hero developed a device, whose he called elopile. This was constituted of one spherical tank with two exits of vapor which stimulated it and made it to turn. After years of development the device of Hero would be called the matrix of the Gas turbine. Among others applications , it serves nowadays to stimulate the invents of Dummont, the airplane. The objective of this work is make one computational simulates of a jet turbine. The jet turbine consists of a central axle, which in one of its extremities has a compressor and in the other one a turbine. Between them exists one camber of combustion (normally exists several little cambers of individual burning), that they banish the gases to exhaustion, which passes for a nipple, before the pass by the turbine. These gases leave in high speed and provide a push that varies normally between 11,1 and 130 kN. The compressors normally are axial flow and increase pressure air in at 12 times the initial pressure. The stars is made with an auxiliary engine. The first burning is started for candle of ignition and, later, the mixture burns constantly while the engine will be functioning. Comparing with other types of engines the spurt, the jet turbine is not heavy, compact, greater potation and small vibrations. However it consumes more combustible in low speeds. Using the laws of the thermodynamics it is possible to analyzed the behavior of this turbine and, consequently to suggest improvements, taking themselves in consideration some conditions of work, such as type of fuel, temperatures and pressures, relation of compression, among others. To facilitate the calculations and to turns more dynamic the process a simulator was elaborated, with assists of an engineering software, EES (Engineering Equation Solver). Such simulator allows the resolution of a generic problem of analysis of the cycle for a jet turbine. The analyses, energy and exergetics, are carried through applying First and the Second Laws of the Thermodynamics for each volume of control separately. In the compressor, where air enters in the surrounding conditions, to the efficiency and the relation of compression are given. With this it is possible to define the real work, as well as the properties in the exit section. In the combustion chamber it is possible to simulate stoichiometric the Air/Combustible relation of the reaction. Moreover it is possible to define the temperature of flame considering that the enthalpy of the reagents (Hr) is equal to the enthalpy of the products (Hp). The proper EES identifies the equations that need iterative methods for its resolution and applies such procedure. In the turbine the produced mechanical work is strict the necessary one to set in motion the compressor. With this the real state in the discharge of the gases are gotten. Finally, with the efficiency of the nipple and the data in the gotten entrance of this already, essential parameters for it are defined flied such as speed of exit of the gases and the push to move the airplane in the daily pay-define conditions. These volumes of control could be visualized in figure 1. Thus, they can be made some theoretical simulations and be compared. With this one concluded that this simulator could be used with real data. To simulate a turbine, however, limitations for if

dealing with an initial version exist. However, with the analysis of the simulator it is possible to pre select the material, being simulated the temperature of flame, to use diverse operations conditions and still up to date the program when acquired new data entrance of fuel. The user supplies given operational, that will be processed in the simulator. The result (given of exit) is tested and analyzed. A time taken care of the necessities, these could be bought and in supplying to support technician to them to improve the simulated equipment.



Picture1

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