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# DEVELOPMENT OF TURBO JET ENGINE HEAT EXCHANGER CODE FOR TBCC USING TIME-DIMENSIONAL ADDED Q1D MODEL

**Abstract**

In the TBCC engine is all flight situations, the air is inhaled and it uses as oxidizer. This engine does not require an oxidizer tank, and is capable of horizontal takeoff and landing. It consists of an air intake, diffuser, turbojet engine, ramjet engine, mixer, and nozzle. In this study, a code for the performance analysis of the heat exchanger of the TBCC turbojet engine unit was developed. A cylindrical multi-tube heat exchanger was used. This has several advantages. It can be fabricated at low cost. It can be used at a high pressure of 1000 bar or more from vacuum, and at a high temperature of 1000 degrees Celsius or more from a very low temperature. Even in case the big volume flux, the big flux difference, and temperature and pressure difference big between the fluid, it is usable and it is nearly able to manufacture to all materials. It is usable in the fluid in which toxicity, high-viscosity, and the contamination severe and the reliability highs in the state change of all types. However, the performance is relatively low. The characteristics of this heat exchanger performance analysis code are that the time dimension is added to the Q1D analysis to calculate the state value, especially the time when the temperature converges, and the boiling calculation of the low temperature fluid is added. Several analyses are possible with this code. First, the performance of the heat exchanger can be confirmed by analyzing each state value. Second, the performance limit range of the heat exchanger can be found. The range that the cooling performance does not better even if the time flows is found and the heat exchanger state value hiting for the design condition can be found. The jet engine exhaust gas temperature (high temperature) is constant, and fuel (low temperature) is used as a regenerative cooling fluid. In order to calculate the state quantity of each section, the isentropic relation, the ideal gas state equation, the mass conservation equation, the energy conservation equation, and the Rayleigh relation were used.