

THERMODYNAMIC ANALYSIS OF VAPOR COMPRESSION REFRIGERATION SYSTEM FOR AIRCRAFT WITH REFRIGERANT R134a

K.V. Ramana Murthy; C. Ranganayakulu
Aeronautical Development Agency
Vimanapura Post
Bangalore-560 017, India
Email : katabathuni@jetmail.ada.gov.in;
ranganayakulu@jetmail.ada.gov.in

T.P. Ashok Babu
Department of Mechanical Engineering
NITK, Surathkal
Mangalore-575 025, India
Email : tpashok@rediffmail.com

Abstract

The Environmental Control System (ECS) for a typical fighter aircraft is used for cabin cooling and pressurization, demisting operations, and for avionics cooling. Most of the passenger and fighter aircrafts use Bleed-Air Cycle for ECS. In this paper a new ECS called All Electric Environmental Control System (AEECS) is presented which works on Vapor Compression Refrigeration System using ram air as medium. It is called a power optimized system. The sizing of the system is based on the heat load calculations of the cabin and avionics for different flight conditions. A generalized software program is developed for evaluating system performance which includes key results regarding air compressor capacity, thermodynamic properties of refrigerants and Vapor Compression Refrigeration System. The AEECS is found to reduce the power requirement of the system to 80 kW compared to the Bleed Air Cycle ECS which requires a power of 0.8 MW to run the system. The results are presented in the form of graphs.

Paper Code : V68 N1/897-2016.