ME 433 Design Project Summer Quarter 2005

The purpose of this project is to develop design operating conditions for a series of GE axial flow fans (the "prototype") that will be used to ventilate a relatively long tunnel through which motor vehicles pass. The prototype fans are geometrically similar to the smaller-scale, GE axial flow fan (the "model") which is located in the Heat Power Laboratory of the Mechanical Engineering Building. The inside and outside diameters of the prototype rotor ($D_i = 22 - 7/8$ ", $D_o = 33 - 5/16$ ") are 1.85 times larger than the inside and outside diameters of the model rotor ($D_i = 12 - 3/8$ ", $D_o = 18$ "). The prototype is to provide a design flow rate of 4500 cfm when operated in a relatively cold environment at 40°F at standard atmospheric pressure intake conditions. The model also operates at standard atmospheric pressure intake conditions, but in a higher temperature environment (typically 80°F in the lab).

Before obtaining model flow data, specify the following quantities for the prototype at its point of maximum overall efficiency.

1. the rotor speed at which the prototype should be operated to provide the design flow rate,

2. the total pressure head rise in inches of water across the prototype at this rotor speed (this total pressure head rise will exactly balance the total pressure head loss through the downstream ductwork, which must be designed to meet this criterion),

3. the brake horsepower (bhp) that must be supplied to the prototype in order to provide the design flow rate.

Implementation of the project will consist of the following components:

a. development of a game plan by each student team which justifies how the model should be operated and the types of data that will be taken,

b. model data taking by each student team,

c. preparation of figures and calculation based on the data which provide design operating conditions for the prototype,

d. preparation of a final report on the project (a single report from each student team).