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NASA TECH BRIEF

Radial Inflow Turbine Design Charts

Radial inflow turbines are suitable for a variety of applications in aircraft, space vehicles, and other systems where compact power sources are required. Since the shape of a radial inflow turbine varies greatly for different applications, a correlation between the design features and turbine performance is required in order to select the optimum design features for a given application. As a consequence, a set of design charts was developed for rapidly determining optimum shape and size for a radial inflow turbine for any given application.

The design charts are used to select turbine geometry corresponding to maximum turbine efficiency. From these charts, the optimum values of rotor-inlet tip diameter, stator-exit angle, stator blade height, rotor-exit hub diameter, and rotor-exit tip diameter can be determined as functions of specific speed. Specific speed is a design parameter relating speed, work, and flow, and its value can be computed for any given application requirements. The value of specific speed provides a general index of flow capacity relative to work, with low values associated with relatively small flow passages and high values associated with relatively large flow passages. Specific speed has also been widely used as a general indication of achievable efficiency.

The charts are based on the results of computer calculations of turbine losses for a large number of combinations of the geometry variables. The calculated losses include the stator viscous loss, rotor viscous loss, rotor tip-clearance loss, rotor windage loss, and exit kinetic-energy loss. These losses are added in order to calculate the turbine efficiency, which is also presented in the design charts.

Notes:

1. Documentation for this innovation is available from:

   Clearinghouse for Federal Scientific and Technical Information
   Springfield, Virginia 22151
   Price $3.00
   Reference: B68-10567

2. Technical questions concerning this innovation may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135

   Reference: B68-10567

Patent status:

No patent action is contemplated by NASA.

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Category 05