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TITLE: ⑥ On the use of centripetal gas turbines in ground transportation

PERIODICAL: *Trans. from* Referativnyy zhurnal, Silovyye ustanovki, no. 24, 1962, 16, abstract 42.24.139 (Uch. zap. Yaroslavsk. tekhnol. in-ta, 1961, v. 7, 245 - 262) pp.

TEXT: Formulae were obtained for work, efficiency, gas flow, torque, power and other parameters of a centripetal turbine. The peculiarity of the obtained equations lies in the fact that they do not contain the reaction degree in explicit form. Considering the fact that the reaction degree (as generally understood) strongly depends on the rpm of the centripetal turbine, the authors propose determining the reaction degree with the rotor blocked, and are of the opinion that under these conditions the reaction degree does not depend on the rpm. It is noted that, when the discharge edges of the rotor blades point in a radial direction, the use of zero reaction is the most advisable. In this case introduction of the reaction degree causes increasing losses with increasing dis-

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charge velocity, and also an increase of the axial forces on the rotor bearings. It is shown that the efficiency of a centripetal turbine increases with decreasing angles of discharge from the guide-vane assembly α_1 and increasing ratio of rotor inlet diameter to rotor outlet diameter. The rotor blade angles β_1 and β_2 only weakly influence the efficiency of a centripetal turbine. A formula is derived for calculating the limiting degree of gas expansion in a centripetal turbine, which shows that at a peripheral velocity of 350 m/sec this value reaches 6. Examination showed that the tractive properties of a centripetal turbine are worse than those of an axial turbine and close to those of a piston engine. When the rotor is completely blocked the torque of a centripetal turbine is increased by about 1.5 times as compared with the torque developed at design rpm. It is concluded that the centripetal turbine may be used for transportation purposes if provided with a gearbox. The advantages of a centripetal turbine include the possibility of runup under load, the lack of necessity for a friction clutch, the possibility of obtaining reverse operation by turning the nozzle blades, simplicity of design. With swivel nozzle blades ideal (hyperbolic) traction characteristics may be obtained if there is an excess amount of working gas available. Also given are the dependence of the power of a centripetal turbine

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on the angle α_1 and the peripheral velocity in the case of nozzle regulation, and also the traction characteristics of a centripetal turbine with swivel nozzle blades. There are 10 references.

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[Abstracter's note: Complete translation]