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# Features of manufacturing technology for turbine blades with effusion cooling

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*The article describes a turbine blade front edge sweat cooling system. The system provides cooling gas output onto the surface and enhances thermal protection. To implement the method of turbine blade cooling it is necessary to develop processes of manufacturing the porous material sheets with the desired properties, stamping and consolidating the membrane with turbine blade housing. The article presents the results of engineering developments and experimental research of the possibility of using the porous meshed material for the turbine blade cooling system in high temperature combined-cycle plants with superheated steam. Technological processes of manufacturing porous meshed material sheets by vacuum hot-rolling the steel 12X18H10T with variable permeability, bending when membrane shaping on the profile of the turbine blade leading edge, and brazing the membrane to the blade body are developed. The results of mechanical and thermal tests have shown that the developed technology of manufacturing turbine blades with effusion cooling ensures cooling method efficiency and eliminate the possibility of penetrating hot gas through the porous membrane into the inner cavity of the blade.*

**Keywords:** steam and gas turbine, blade, effusion cooling, steam, porous meshed material, rolling, bending, brazing.

## REFERENCES

- [1] Zeygarnik Yu.A., Polyakov A.F., Stratyev V.K., Tretyakov A.F., Shekhter Yu.L. *Ispytaniya poristogo setchatogo materiala v kachestve obolochki lopatok vysokotemperaturnykh gasovykh turbin* [Testing Porous Meshed Material as the Shell of High-Temperature Gas Turbine Blades]. Moscow, Preprint, Joint Institute for High Temperatures of the RAS Publ., 2010, no. 2–502, 64 p.
  - [2] Tretyakov A.F. *Remont, vosstanovlenie, modernizatsiya — Repair, restoration, modernization*, 2015, no. 1, pp. 22–26.
  - [3] Zeygarnik Yu.A., Polyakov A.F., Sukhoruchenko S.Yu., Shekhter Yu.L. *Teplofizika vysokikh temperatur — High Temperature*, 1996, vol. 34, no. 6, pp. 924–928.
  - [4] Belov S.V., ed. *Poristye pronitsaemye materialy: spravochnoe izdanie* [Porous Permeable Materials: Reference book]. Moscow, Metallurgiya Publ., 1987, 335 p.
  - [5] Tretyakov A.F. *Remont, vosstanovlenie, modernizatsiya – Repair, restoration, modernization*, 2015, no. 2, pp. 14–18.
  - [6] Polyakov A.F., Reviznikov D.L., Semenov V.N., Stratyev V.K., Tretyakov A.F. *Sposob okhlazhdeniya peredney kromki obtokaemogo tela i ustroystva dlya ego osushchestvleniya* [A Method of Cooling the Streamlined Body Front Edge and a Device for Its Implementation]. RF Patent no. 2186223, 2002, bulletin no. 21, 6 p.
  - [7] Tretyakov A.F., Kremenskiy I.G., Polyakov A.F., Reviznikov D.L., Semenov V.N., Stratyev V.K. *Sposob izgotovleniya poristogo listovogo materiala iz metallicheskiikh setok* [A Method of Manufacturing Porous Sheet Material from Metal Mesh]. RF Patent no. 2187392, 2002, bulletin no. 23, 3 p.
  - [8] Semenov V.N., Zeygarnik Yu.A., Polezhaev Yu.V., Polyakov A.F., Stratyev V.K., Tretyakov A.F. *Sposob izgotovleniya izdeliy slozhnogo profilya s setchatoy obolochkoy* [A Method of Manufacturing Products of Complex Profile with a Meshed Shell]. RF Patent no. 2179096, 2002, bulletin no. 21, 3 p.
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