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COMPUTATIONS OF COOLER DISCHARGE FROM HEAT-STRESSED CHANNELS

The fundamentals of a procedure for a discharge of a two-phase heat carrier from the drain channels of heat exchangers that heat up to the temperatures exceeding the boiling point of the heat carrier are presented. The procedure considers a state of aggregation of the heat carrier and a configuration of the drain hole when damaging the drain holes. The parametric analysis determining the form of the drain hole is carried out by the analytical formula that approximate the tabular data with a high degree of accuracy.

The procedure was used for a numerical study of the thermohydrodynamic parameters of the cooler while draining the heat-stressed cooling channels of the specific liquid-rocket engine. The study results demonstrated that the procedure reflects accurately the physic processes through a cut-off drain cavity of the oxidizer passage with engine stopping. The time characteristics derived are close to the characteristics measured during the flight tests of a simulated object.

The method of division of a computational domain and the major computational elements for digitizing a simulated object can simulate any heat exchanger. The procedure can be used to compute the discharge of a two-phase fluid through heat exchangers for a wide range of the power plants with a various degree of complexity.

Keywords: *power plants, discharge of two-phase heat carrier, numerical simulation.*

1. *Idelchik I. Ye.* Handbook of Hydraulic Resistances *(in Russian) / I. Ye. Idelchik.* – Moscow : Mashinostroyenie, 1975. – 559 p.
2. *Tokareva Ye. L.* Approximation of properties of heat carrier in numerical simulation of hydrodynamics and heat-mass exchange through heat-stressed passages with variable mass of cooler *(in Russian) / Ye. L. Tokareva* // Tekhnicheskaya Mekhanika. – 2013. – No 2. – P. 80. – 88.
3. *Chisholm D.* Two-Phase Flows through Pipes and Heat Exchangers *(in Russian) / D. Chisholm.* – Moscow : Nedra, 1986. – 204 p.
4. *Tokareva Ye. L.* Numerical simulation of hydrodynamics and heat-mass exchange through heat-stressed cooling passages with variable mass of cooler *(in Russain) / Ye. L. Tokareva, N. D. Kovalenko* // Proceedings of the 4th International Conference on Applied Problems of Aerohydrodynamics and Heat-Mass Exchange, November 1 – 3, 2012. – Dniepropetrovsk. – P. 38 – 40.
5. Determination of side forces within LRE engine in injecting propellant component into supersonic section after stopping engine using telemetric information of flight tests *(in Russian) / N. D. Kovalenko, A. L. Makarov, O. A. Aksyuta, A. N. Belikov, A. D. Ignatyev, G. N. Kovalenko, R. N. Temchenko, Ye. L. Tokareva* // Kosmicheskaya Tekhnika. Raketnoe Vooruzhenie. – 2009. – No 1. – P. 146 – 159.