PIK REACTOR CASSETTES COOLING DURING REFUELING

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Cooling of the reactor PIK fuel elements by a small water flow provides a good visibility of the core and a minimum oscillations of the fueling machine long boom but it is connected with the essential influence of the gravity on the water down flow. That leads to the flow instability and to the flow reversal near the hot fuel elements. This phenomenon, as a rule, is accompanied by the water boiling in interfuel gaps, that is a violation of technical conditions of a fuel element exploitation.

This paper presents a dependence of a stable down flow rate through the reactor PIK cassettes as a function of the residual power when the active core is bypassed by the big cross-section cold channel formed by unloading of one hexahedral fuel cassette [1].

By means of the cassette model with the electrically heated full scale fuel elements the hydraulic head of the natural convection was measured as a function of the power release. On the fuel assembly model with the cold bypass the dependence of the thermal load corresponding to the flow reversal and flow down recovery on the pressure drop on the cassette (Fig.1) was measured. This investigations together with the hydraulic characteristics of the fuel elements for the small water flow rate allowed to estimate the boundary values of the water flow in the primary circuit when one hexahedral fuel cassette is unloaded to determine the minimum stable flow rate as a function of the residual power and the heat generation irregularity coefficient.

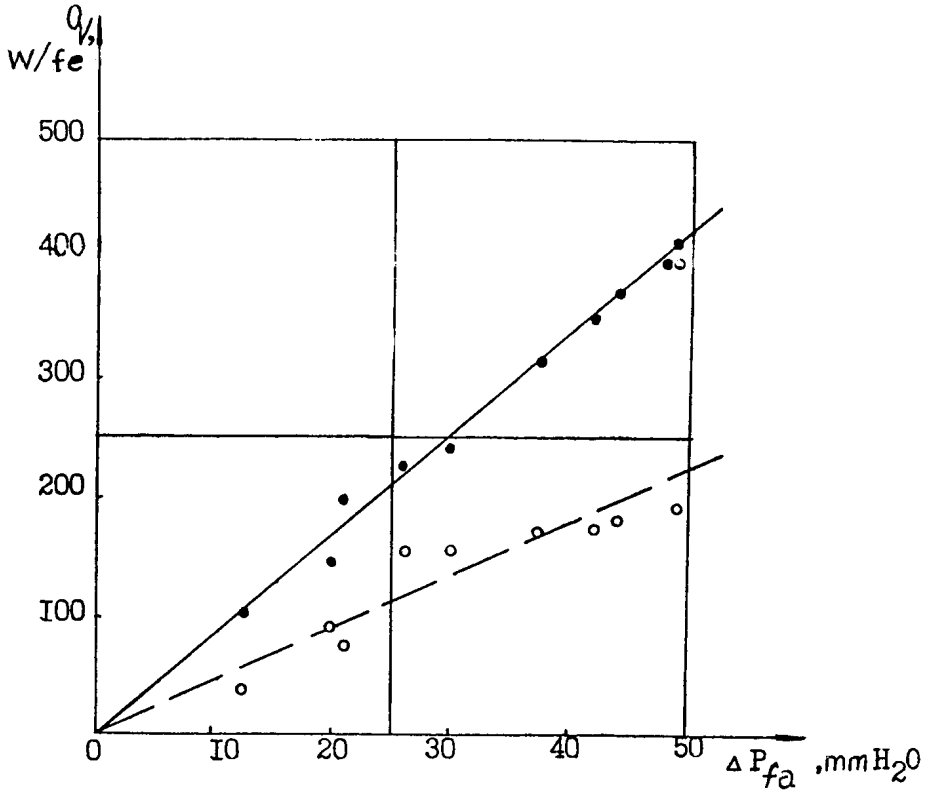

Fig.1. Dependence of thermal load corresponding to flow reversal and flow recovery on pressure drop

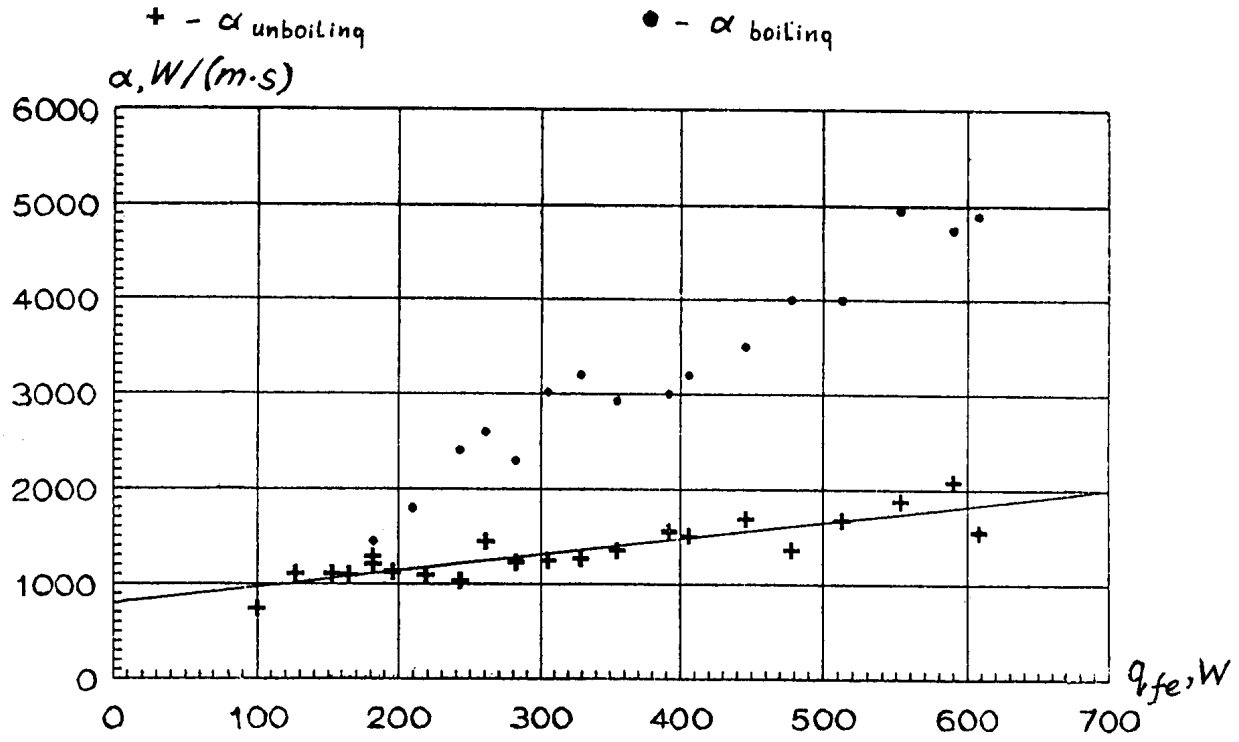

Fig.2. Dependence of heat transfer coefficient for boiling and unboiling ranges of fuel assembly on the residual power

Fuel cassettes unloaded from the reactor are transported to the cooling pond. Here their cooling is carried out only by the natural convection. On the electrically heated model of the reactor PIK cassette measurements of cladding temperature of the fuel element and water temperature in the interfuel space were carried out as functions of the height and the power release. Heat fluxes of incipient boiling (250 Wt/fuel) and burn out (2320 Wt/fuel) were defined [2].

In the Fig.2 the heat transfer coefficient for boiling and unboiling ranges of the fuel is presented. These investigations allowed to obtain the exhaustive information for solving all practical tasks connected with refueling the reactor PIK.

REFERENCES

1. *Grosheva N.A. et al.* Preprint PNPI–1851. SPb., 1993. 19 p.
2. *Grosheva N.A. et al.* Report of PNPI №ER-201. Gatchina, 1993. 22 p.