Assessing the possibility of predicting the temperature dependence of fracture toughness for materials of VVER-1000, based on the probabilistic aspects

© A.A. Silaev¹, N.A. Silaeva², A.Yu. Loginova², A.K. Gorbunov²

- ¹ Public corporation Scientific and Production Association "Central Research Institute of Machine Building Technology", Moscow, 155599, Russia
- ² Kaluga Branch of Bauman Moscow State Technical University, Kaluga, 248000, Russia

The article examines the possibility of applying the concept of the master curve for predicting the temperature dependence of fracture toughness on the basis of small-scale test samples for the material used in the manufacture of VVER-1000.

Keywords: master curve, base curve, fracture toughness, fracture probability, compact sample.

REFERENCES

- [1] ASME *Boiler and Pressure Vessel Code*. New York, American Society of Mechanical Engineers, Section IX, 1968.
- [2] Wallin K. Recommendations for the application of fracture toughness data for itructural integrity assessment: Proc. of the AEA/CSN1 specialists meeting on fracture mechanics verification by large scale testing, 3ak Ridge, 26–29 Oct. 1992, pp. 465–494.
- [3] Wallin K. Eng. Fract. Mech., 1985, no. 22, pp. 149–163
- [4] ASTM E 1921-97. Standard Test Method for Determination of Reference temperature *T* for ferritic steels in the transition range. *Annual Book of ASTM Standards*, vol. 03.01, vol. 1068–1084.
- [5] Ritchie R.O., Knott J.F., Rice J.R. J. Mech. Phys. Solids, 1973, no. 21, pp. 395–410.
- [6] Beremin F. M. Mel. Trans., 1983, no. 14A, pp. 77-87.
- [7] Margolin B.Z., Gnlenko A.G., Shvetsova V.A. J. Pres. Ves. & Piping, 1998, no. 75, pp. 307–320.
- [8] Weibull W.A. Roy. Swed. Inst. Eng. Res., 1939, vol. 151, pp. 5-45.
- [9] Bolotin V.V. Statisticheskie metody v stroitel'noi mekhanike [Statistical methods in structural mehanics]. Moscow, Stroiizat Publ., 1961, p. 202.
- [10] Freidental' A.M. Statisticheskiy podkhod k khrupkomu razrusheniyu [A statistical approach to brittle fracture]. *Razrushenie, sbornik statey* [Destruction. Coll. articles]. Moscow, Mir Publ., 1975, vol. 2, pp. 616–645.
- [11] Wallln K. The scatter in K_{lc} result. Eng. Fract. Mech., 1984, vol. 19, pp. 1085–1095.
- [12] PNAEG-7-002–86. Normy rascheta na prochnosť oborudovaniya i truboprovodov atomnykh energeticheskikh ustanovok [RRNI G-7-002–86. Calculation norms based on the strength of equipment and pipelines of nuclear power plants]. Moscow, Energoatomizdat Publ., 1989, 528 p.

Silaev A.A. (b. 1972) graduated from Kaluga Branch of Bauman Moscow State Technical University in 2000. Ph.D., the Head of Mechanical Properties Laboratory. Author of several articles on the study of the materials strength. e-mail: a.a.silaev@inbox.ru

Silaeva N.A. (b.1968) graduated from Kaluga Pedagogical Institute named after K.E. Tsiolkovsky. The senior lecturer of the Physics Department in Kaluga Branch of Bauman Moscow State Technical University. Author of several articles on strength characteristics of the material properties. e-mail: silseva1968@list.ru

Loginova A.Yu. (b. 1959) graduated from Mendeleev Institute of Chemical Technology of Russia in 1981. Ph.D., Assoc. Professor of the Industrial Ecology and Chemistry Department in Kaluga Branch of Bauman Moscow State Technical University. Author of 60 research papers in the field of physical and inorganic chemistry. e-mail: kf_mgtu_fiz@mail.ru

GorbunovA.K. (b. 1947) graduated from Moscow Institute of Physics and Technology in 1971. Dr. Sci. (Phys.&Math.), Professor, the Head of the Physics Department in Kaluga Branch of Bauman Moscow State Technical University. Author of several articles on condensed matter physics. e-mail: kf_mgtu_fiz@mail.ru