2. Кузнецов В.Л. и др. Ремонт крупных и центробежных насосов: Справочник / Кузнецов В.Л., Кузнецов И.В., Очилов Р.А. – М.: Энергоатомиздат – 1996. – 240 с.:ил.3.

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PROCESS OF BRAZING IN CONDITIONS OF LOCAL HEATING OF THE JOINT ZONE

Brazing is the process of permanent joining of parts by heating a joint zone to the temperature where filler melts. The brazing process could have stationary and non-stationary conditions. Brazing process considered as stationary when heat energy supplied steadily and constantly to the whole assembly being joined. Process is considered as non-stationary when the joint zone of parts being brazed is heated up by contact with hot solid body used as heat source. Propagation of heat flow from the heating zone across parts imposes certain restrictions on the possibility of implementing this process, especially in the case of brazing materials with high thermal conductivity. Fast local heating of joint zone could be achieved, for instance, using heat source that can generate intense heat flux from exothermic reactions of high temperature synthesis (gaseless burning). Alumothermic-based reactions in powder compounds are considered as appropriate materials for such heat source [1].

However, when choosing parameters for the heat source one should take into account not only the size of parts being brazed, but also properties of parts material and properties of filler braze being used. This restricts the choice of parameters of the heat source as it, on the one hand, should ensure melting of the filler, and on the other – it should prevent heating of the core material to the temperature of its melting.

This work considers a model of brazing for flat plates combined into one system with a heat source by mechanical compression. The redistribution of heat in such system are presented in the form of finite difference equations, taking into account the thermal resistance at the borders between components: the heat source and the plate, the plate and the braze.

Based on this computational model, the software which provides possibility to study the effects of the system parameters on the conditions of braze meting and process duration was created. The possibility to determine the parameters of heat source necessary to melt the braze, for a given system parameters is demonstrated. Using self-consistent calculation based on experimental data on temperature changes in specific points of the system, which consists of limited size aluminum plates, during its local heating, thermal parameters of the system could be defined [2].

The effects of porosity were studied using alumothermic heaters compacted at different pressure to ensure different levels of porosity. The calculation of temperature fields for the assembly during heating and brazing was made and thermal parameters including heat source thermal conductivity were determined. A technological scheme of practical implementation for brazing in non-stationary conditions during the joint zone heating is proposed.

List of References

1. Merzhanov A.G. Self-propagating high-temperature synthesis of refractory inorganic compounds / A. G. Merzhanov, I. P. Borovinskaya // Dokl. Akad. Nauk. SSSR .– 1972. – Vol. 204. – P. 366 – 369.

2. Calculation-experimental Investigation of Thermal Fields in the Process of Nonstationary Soldering / [Kulinich M.V., Bezpalchuk V.N., Kosintsev S.G., Gusak A.M., Zaporozhets T.V. and. Ustinov A.I.] // The Paton Welding Journal. – 2018. – No. 1. – P. 14–19.