MODERN APPROACHES TO THE TRANSITION TO THE TECHNOLOGY OF MINIMAL LUBRICATION IN ABRASIVE MACHINING

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The decision on the use of lubricating-coolant, usually water or oil based liquid [1] is an integral part of the definition of machining process, particularly important with the use of abrasive tools when thermo-physical load of machining area is formed by mass abrasive micro-cutting.

An analysis of the activity of firms and research centers [2] shows that there is an intense search in the world for efficient technological methods of transition to low and waterless machining technologies in line with the global environmental challenge of drinking water. The problem of cooling systems in the process of grinding materials is updated by the modern European technology platform Industry 4.0 and is considered in the unity of technical, economic and environmental development.

In China and the USA, ideas about the thermodynamic mechanism of grinding processes are formed under conditions of minimal cooling and lubrication (M. Yang, et al.). In Iran, heat removal from the cutting zone using minimal liquid lubrication alternative to conventional approaches is investigating by finite element models (M. Hadad and A. Sharbati). In Japan, unconventional inclusion of the grinding wheel in the flow of cooling agents in the processing of difficult-to-process materials is developing (S. Toyokawa, et al.); various solid alternatives to liquid remedies that are grease-cooling and clean the grinding wheel surface down to hard water (dry ice) are considered (Yu. Ohta, et al.).

In Australia and Indonesia, new opportunities for comprehensive optimization of grinding operations in countries with fresh water problems are associated with the improvement of air cooling (B. Boswell, et al.). In Russia, air flow as a cooling medium when cutting materials is proposed to be pre-activated by ionization (M. Sh. Migranov, et al.).

Regional cultures of clean water savings and the global nature of the problem also stimulate international scientific and technical cooperation in the development and research of minimal lubrication techniques as a viable alternative to conventional irrigation (B. Sen, et al.; India, Bangladesh, Poland and the United Kingdom), as well as anhydrous processes of diamond-spark grinding of hard-to-machine materials using solid lubricants (A. K. Agu and M. D. Uzunyan; Nigeria and Ukraine), which is a priority development of the NTU "KhPI".

References:

1. *Winter, M.* (2016) *Eco-efficiency of Grinding Processes and Systems.* Springer International Publishing AG Switzerland.

2. *Gutsalenko Yu., C. Iancu, T. Tavrina, M. Rucki, and A. Rudnev* (2019) Environmental actuality, technological competitive environment and prediction of the prospects of anhydrous diamond-spark grinding using solid lubricants. *Annals of the „Constantin Brancusi" University of Targu Jiu, Engineering Series*, Iss. 2, pp. 13-17.