AP25794035 «Development and research of a method for cleaning cutting fluid with ultrasound for its reuse», sc.s. – A.S. Kim

Relevance

In mechanical engineering**,** metalworking fluids (MWF) are used during cutting operations. The purpose of MWF is to lessen the friction force between the workpiece and the cutting tool, thereby reducing workpiece deformation during machining, extending tool life, and ultimately boosting machining productivity.

The service life of working MWF solutions generally ranges from two weeks to three–six months; after that, if they are not properly regenerated, they are discarded and sent for costly neutralization and disposal processes. Under today's unfavorable environmental conditions, MWF disposal has become a significant ecological problem for modern mechanical engineering. Oils washed from machine slideways (when MWF is supplied to the cutting zone) convert nearly all types of MWF in use into hazardous, technogenic, oil-containing waste.

Known MWF-purification methods include flotation, filtration, and treatment in force fields. However, these regeneration techniques have several drawbacks—low throughput and cleaning efficiency, labor-intensive procedures, and complex equipment designs. Consequently, developing a new method that eliminates these shortcomings is an urgent and relevant task.

Project goal: to study and implement an economically efficient and safe ultrasonic method for cleaning cutting fluid.

Project objectives:

1. To conduct an analytical review of the existing methods of cleaning and regeneration of metalworking fluids.
2. Develop an experimental plan, experimental equipment, and experiment.
3. To analyze the physical processes of cleaning MWF by ultrasound, including cavitation, coagulation and sedimentation occurring during this process.
4. Mathematical modeling of cavitation conditions in a viscoplastic medium of MWF. Analysis of physical processes.
5. To develop a new method for the regeneration of MWF by ultrasound;
6. Testing of research results at machine-building enterprises of the Republic of Kazakhstan, as well as implementation in production.

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