New technology of machining pistons rings and cylinder surface of pistons for passenger car engines

Summary

The main objective of dissertation was development a new technology of machining pistons rings and cylinder surface of pistons for passenger car engines.

The introduction presents a brief description of the pistons used in engines and the essence and function of the piston rings. The next chapter analyzes the literature on piston technology and in particular the machinability of materials used for pistons, turning stability and optimization of cutting parameters.

Next chapter presents the research results of problem correlated with the machining of piston engines of passenger cars. Based on this data, objectives and hypotheses of work were formulated, as well as the plan of preliminary and fundamental research. The next chapter presents the proposed changes to piston machining technology, in order to correctly fit the groove in the cast iron insert under the piston rings at the right time (the stroke of the production line) and longitudinal turning of the piston's cylindrical surface preventing the breakage of the intermetallic bonding between the cast iron insert and the aluminum piston body.

The main chapters show the results of forces and vibrations during machining of selected piston fragments, tool life and optimization of turning parameters. A detailed analysis of static and dynamic parameters of the machining system selected for industrial tests was carried out. Additionally, structural modifications of some special tool attachment subassemblies, and the geometry of the insert used to machine the grooves under the rings has been proposed. All these results were used to select cutting parameters affecting the improvement of machining results and to shorten the machining time of the cylindrical surfaces of the pistons and grooves under the piston rings. Selection of new parameters was made due to the roughness of the machined surface, tool life and vibration. The developed new technology was verified in industrial conditions, completed successfully.