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Gear-Grinding Temperature Modeling and Simulation

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Abstract

New trends in the manufacture of gears are associated with the use of new gear-grinding technologies. Discontinuous profile gear grinding by a profile wheel, compared to the continuous generating gear grinding by a grinding worm, provides for a higher accuracy (DIN 3-6) but yields less performance through both the higher grinding temperature and possibility of grinding burns. The grinding temperature is one of the factors limiting the performance of the profile gear-grinding operation. There are two most commonly used methods involved for determining the grinding temperature: a fully analytical method based on analytical models and the simulation one based on the similar set of models which are working under computer control with the temperature field monitoring. However, the continuity and interrelation of these methods for determining and studying the profile gear-grinding temperature have not yet been investigated. The relevance of this problem is currently the most pronounced in the connection with the development of appropriate technological preconditions and gear-grinding subsystems for the grinding operation designing, monitoring, and diagnosing which allow adapting the elements of the grinding system to higher productivity. The software for these subsystems can be created on the basis of the analytical mathematical models of the temperature field because simulation modeling takes a lot of time. That is why, in other equal conditions, the comparison of the results of analytical and simulation modeling helps choosing the right way for further improvement of the profile grinding technology on CNC machines.

Keywords

Profile gear grinding Grinding temperature Modeling Simulation

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