Optimizing the Displacement Volumes of External Spur Gear Pumps

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Abstract

The capability to displace volume is crucial in designing an external gear pump (EGP). Therefore, this study presents an optimization approach to the EGP. Through this systematically process, the design parameters of the spur gears in the pump with a largest displacement volume can be obtained. Firstly, the equations of the gear tooth profiles for the EGP are derived using the profiles of a rack tooth. Next, the displaced volumes of output and backflow are respectively deduced. Thus, the net output displacement volume is calculated. Then, optimization analyses for the EGP are performed. Through that, the optimal design parameters of the EGP which displaces the largest displacement volume can be obtained under the assigned constraints which include design and manufacturing requirements of the pump and gears. Additionally, relations of the module, pressure angle, and addendum correction factor of the gears to the net displacement volumes of the EGP are also investigated.

Keyword：External gear pump, Spur gear, Displacement volume, Optimization, Addendum correction factor