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基于碟形砂轮磨齿的面齿轮包络残差研究

Envelope residuals research of face gear based on disc grinding wheel tooth grinding

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中文关键词： 面齿轮 包络残差 碟形砂轮 磨齿 表面粗糙度

英文关键词:face gear envelope residual disc grinding wheel tooth grinding surface roughness

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中文摘要:

介绍了采用碟形砂轮磨削面齿轮的原理及过程,研究了齿廓包络和齿宽包络两种包络方式产生包络残差的机理.分别建立了两种加工方式下包络残差的计算模型和方法,并研究了所产生包络残差的特点.通过数值算例分析了包络过程中刀具周向进给角度、齿宽方向进给量以及碟形砂轮外径对齿面包络残差的影响规律.计算结果表明:齿宽包络比齿廓包络具有更高的效率.进行了以齿廓包络方式的面齿轮磨齿加工实验,当刀具周向进给角度分别取为2°,1°,0.5°及0.2°时,齿面表面粗糙度逐渐明显提高,齿面磨削加工印痕的数目和方向与包络仿真计算结果一致.初步证明根据包络残差计算结果选取合适的进给量参数,可以保证面齿轮磨齿加工的表面粗糙度水平并能提高加工效率.

英文摘要:

The principles and processes for grinding face gears with disc grinding wheel were described. The envelope residual mechanism was studied for two machining methods of profile envelope and longitudinal envelope. The envelope residual computing models for two kinds of cutting mode were established, and the generating characters of envelope residual were investigated. The influences of cutting parameters, such as circumferential feeding angle, longitudinal feeding and grinding disk diameter on surface envelope residuals were analyzed. Computing results indicates that longitudinal envelope has much higher efficiency than profile envelope. A grinding experiment of face gear by profile envelope was performed. When the tool circumferential feeding angles were taken as 2 degree, 1 degree, 0.5 degree and 0.2 degree, respectively, the tooth surface roughness was improved significantly, and the number and direction of the grinding traces were consistent with the envelope simulation results. The appropriate feeding parameters adopted according to the envelope residual computing results can ensure surface roughness level of face gear teeth by grinding.

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