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Quality estimation of interference fits assembly based on press-fit curve

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Statement of the Problem: Press-fit assembly is one of the traditional methods for assembly of interference fitting parts, and its assembly quality has attracted the attention of many researchers. Generally, the strength of assemblies depends on various parameters such as interference value, physical dimensions, form error of contact surfaces, etc. Furthermore, the connection quality cannot be obtained directly by the press-fit method. Hence, many studies have been performed to investigate the effect of various parameters on the load bearing ability of interference fits based on finite element method (FEM) and theoretical method. But most of the researches focus on the contact status of finished interference fits. Since the press-fit curve can be used for real-time monitoring and evaluate the assembly quality, the purpose of this study is to obtain standard press-fit curves as an evaluation criterion to estimate the assembly quality.

Methodology: A theoretical model and simplified FE model were used to predict the standard press-fit curves. To verify the accuracy of the prediction results, assembly experiments were carried out using an automatic press-fit instrument which consists of binocular vision device, upper and lower fixtures, XY precision stages, and force-displacement measurement module, etc. Finally, the reasonable growth tendency and a reasonable range of maximum press-mounting force are obtained and used for quality estimation.

Results: The prediction results of the press-fit curve have sufficient accuracy, and the evaluation strategy proposed in this study can give a reasonable assessment of assembly quality whether the failure is caused by form error or alignment error, etc.

Conclusion & Significance: The theoretical model is more efficient than FEM in press-fit curve prediction. The evaluation strategy can be used to predict the assembly quality, which is of great significance to improve the reliability of interference fits.



Recent Publications

- 1. Wang X Y, Lou Z F, Wang X D and Xu C L (2017) A new analytical method for press-fit curve prediction of interference fitting parts. Journal of Materials Processing Technology 250:16-24.
- 2. You B, Lou Z F, Luo Y, Xu Y and Wang X D (2015) Prediction of pressing quality for press-fit assembly based on press-fit curve and maximum press-mounting force. International Journal of Aerospace Engineering 2015:1-10.
- 3. Lou Z F, Wang X D, You B and Xu Y (2015) Pressing-fitting technology and instrument for precision small parts. Optics and Precision Engineering. 23(6):16605-16611.
- 4. You B, Luo Y and Wang X D (2014) The application of computing methods for analysis of press-fit assembly in elasto-plastic field. Journal of Information & Computer Science. 11(9):3157-3166.

Biography

Xiaodong Wang has his expertise in precision assembly and automation in improving the assembly quality and efficiency for miniature devices. Currently his research work includes analysis of assembling process, design and manufacture automatic measuring instruments and assembly equipment for production of miniature devices. He has won the China Mechanical Science and Technology Award and China Aviation Industry Group Corporation Technology Award in recent years for his achievements in precision assembly technology and system development. He developed a variety of automatic assembly equipment and provided assembly solutions for research institutes and companies. He holds over 30 China invention patents in related research work.

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