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微纳技术与精密机械

高速点阵式脉冲喷射发生器的无传感器控制

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摘要： 为提高标识设备关键部件-高速点阵式脉冲喷射发生器的性能以改善喷印效果,在建立喷射器数学模型的基础上,设计了滑模观测器。通过观测器构成反馈系统,在不增加硬件成本的前提下实现对高速脉冲喷射器的无传感器控制,使其能够准确跟踪理想轨迹,降低阀芯与静铁的冲击速度,并消除振动和噪音。实验结果表明,喷射器工作过程中阀芯与定位静铁的冲击速度由开环控制的0.55 m/s降到了闭环控制的0.02 m/s,振动和噪音基本消失,喷射效果明显改善。对钢铁产品进行的喷码实验显示,设计的喷射器的性能可以满足实际生产需要。研究过程为高速脉冲喷射器控制单元的设计提供了理论基础。

关键词： 点阵式脉冲喷射发生器 滑模观测器 无传感器控制 喷印

Sensorless control of high-speed dot-matrix pulse jet generator

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Abstract: To improve the performance of a high-speed dot- matrix pulse jet generator in a printing machine and to optimize the printing effect of the machine, a mathematical model for the high-speed pulse jet generator was established and a sliding mode observer was designed. By building a feedback system based on the observer, the sensorless control of the high-speed pulse jet generator was realized to track the desired trajectory exactly, reduce the seating velocity of the valve core and to eliminate the vibration and noise greatly without increasing the cost of hardware. The experimental results show that the seating velocity has been reduced from 0.55 m/s for open loop control to 0.02 m/s for close loop one, the vibration and noise are almost eliminated, and the jet printing effect is improved obviously. The design result meets the industrial production demand when it is applied to a marking system for steel products and it provides theory foundation for design of the control units of high-speed pulse jet generators.

Keywords: dot-matrix pulse jet generator sliding mode observer sensorless control printing

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