

عنوان مقاله:

Design A Novel Ultrasonic Horn Using Electro-Mechanical Circuit Method and Optimization Algorithm

محل انتشار:

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خلاصه مقاله:

In this paper, an ultrasonic horn based on the PSO algorithm for emulsion homogenization is optimized and fabricated. The application of various ultrasonic instruments such as horns in different industrial procedures is increasingly expanding and developing. Horn is a tool that has played a crucial role in the energy transfer to fluid. Longitudinal frequency, vibration amplitude, length-to-diameter ratio, a distance of frequency from other frequency modes, wide distribution of cavitation along with the horn's length, and increasing the area of acoustic energy transfer are the main characteristics of the horn design procedure. Therefore considering these important features with using the PSO algorithm and electro-mechanical circuit method to finding resonance frequency, the design procedure of the optimized horn is performed. The definition of the objective function is based on the horn's amplification factor, and the rest of the other characteristics are defined as design constraints. The simulation results show a ۱۵% improvement in the natural frequency compared to the target frequency and a suitable frequency distance of ۲.۵ kHz between the previous and next modes. According to the barbell part of the horn, the amplification factor of ۱۴ was obtained for the proposed horn, the frequency and amplitude of the vibration were evaluated. The experimental results were very close in terms of amplification factor and frequency to the simulation results with reasonable accuracy.

کلمات کلیدی:

Optimization, Ultrasonic Instrument, Barbell Horn, PSO Algorithm, Electro-Mechanical Circuit Method

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