عنوان مقاله:

A Numerical Study on the Performance of a Magnesium-Based Automotive Cooling Fan with Bead Structure

محل انتشار:

دوماهنامه مکانیک سیالات کاربردی, دوره 14, شماره 1 (سال: 1400)

تعداد صفحات اصل مقاله: 11

نویسندگان:

K. H. Hur - *School of Mechanical Engineering, Kyungpook National University, Daegu, ۴۱۵۶۶, Korea*

B. A. Haider - *School of Mechanical Engineering, Kyungpook National University, Daegu, ۴۱۵۶۶, Korea*

C. H. Sohn - *School of Mechanical Engineering, Kyungpook National University, Daegu, ۴۱۵۶۶, Korea*

خلاصه مقاله:

This paper presents the numerical analysis of three types of magnesium-based, axial-flow automotive cooling fans. The numerical modeling is conducted for geometrically modified fan designs with and without bead structure. The effect of geometric modifications of the fan blades on the fan performances (P-Q curve), fan efficiency, and energy efficiency is investigated using unsteady Reynolds-Averaged Navier-Stokes (URANS) equations with the sliding mesh methodology. The baseline fan having no-beads is fabricated using ۳D printing technology and tested to measure the flow velocity and volumetric flow rate which shows good agreement to the numerical results. Subsequently, fans with beads are further optimized to achieve a significant increase in fan performances. To investigate the fan vibrations, modal analysis is also carried out using magnesium-alloy AZ۳۱ as the fan material. The modal analysis gives natural .frequencies of all types of fans which are beyond the fan rotational frequency and seems satisfactory

کلمات کلیدی:

Axial, flow cooling fan, Bead structure, Fan performance, CFD, Modal analysis, Passive control