

Increasing the Efficiency of Traveling Wave Ultrasonic Motor by Modifying the Stator Geometry

Fadhlur Rahman Mohd Romlay^a, Wan Azhar Wan Yusoff^b, Kamal Arifin Mat Piah^b

^a Faculty of Mechanical Engineering, Universiti Malaysia Pahang, Pekan 26600, Malaysia

^b Faculty of Manufacturing Engineering, Universiti Malaysia Pahang, Pekan 26600, Malaysia

ABSTRACT

Current traveling wave ultrasonic motor (TWUSM) utilizes comb-teeth structure as deflection amplifier. The position of the stator neutral axis to the stator contact surface is one of the factors that influences the deflection amplifier. Stator deflection directly effects on motor performance. In this study, the modification of the comb-teeth stator design is proposed to see its effect on motor efficiency. The modification is done so that the neutral axis position is further distance from the stator top contact surface. The proposed solution is to remove a selected mass element from the comb-teeth structure. Modeling, simulation and experimental work of the proposed concept is carried out utilizing Shinsei USR60 as the chosen TWUSM. The modeling and analyses are conducted through multi-physic finite element simulation MSC Marc Mentat. The results of the analyses and experimental work reveal that the modified comb-teeth stator increases the position of the neutral axis from the stator top surface. Due to the neutral axis shifting, the results also confirm that the proposed modified motor has higher efficiency compared to the non-modified motor.

KEYWORDS: Rotary ultrasonic motor; Piezoelectric; Stator design

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