On the Investigation of the Dynamic Characteristics of Transmission Mechanisms for Link Drive Presses

陳育斌、陳照忠

E-mail: 8701416@mail.dyu.edu.tw

ABSTRACT

The transmission mechanism for link-drive presses can provide a more stable impact force and a smoother working slider velocity. So the lifetime of gears and links can be longer and the wear of clutches will be less. In this paper, we first introduce the characteristics of the press and various pressing processes (e.g., drawing, shearing, compressing and bending) in current industry, then proceed to the freedom and motion analysis the EBS4-500 link-type press. The vector-loop method is used to analyze the kinematics and the dynamic characteristics is analyzed by means of the Newton's motion laws. This kind of press is suitable for deep-drawing process. When the working slider moves from the T.D.C. and approaches the pressed part, the velocity of the working slider is decelerated to the velocity for drawing. After the working slider touches the pressed part, the velocity is gradually accelerated. In this stage, the motion characteristics of the mechanism is suitable for deep-drawing process. The velocity is at the highest when the working slider is approaching the B.D.C. This way can minimize the non-working period and increase the production rate. After knowing the forces acting on each link, we use two methods to improve the shaking force and the shaking moment acting on the mechanism. One method is to add a "balance slider" in the transmission mechanism. Another method is to redistribute the mass on each link. Then we define their object function and constraint equations and proceed calculation to find out which method can be the most efficient way. Finally, we conclude that the second method can not efficiently lower down the shaking force and the shaking moment acting on the mechanism. That is because the weight of the working slider is too big in relation to each link, and it limits the efficiency to lower down them. However, the first method can be more efficient to improve them. The reason is the motion of balance slide is opposed to that of the work slide.

Keywords : Aerostatic bearing . Finite Difference Method . Finite Element Method . Numerical Method . Bearing . Stiffness .

Table of Contents

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