Effect of number , thickness of the blades and feed rate on the capacity and power consumption of the hammer mill

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Abstract

The research aims to manufacture of hammer mill with the least number of parts, suitable thickness of blades, lowest energy cost and suitable capacity. A experiment was conducted with three factors(Number , thickness of blade and feed rate) the first with three levels 2, 3 and 4 blade , the second with three levels 6, 9, 12 mm with a weight of 98 grams for each and the third feed rate are levels of 90 and 180 $kg.h^{-1}$. The results showed a significant effect of number(A) , thickness of blade(B) and feed rate(C) on the production capacity and specific energy consumption. A significant effect of the combination of A with B and A with C on the production capacity and specific energy consumption. the superiority of the number of the four blades with lowest of thickness . Hammer mills can be designed with the lowest blade thickness, when using a large number of blades, in order to reduce the cost of materials used in manufacturing, as well as reduce the cost of the energy requirements of the production unit.

Key word: Hammer mill, blade of miller , mill capacity.

Introduction

There is an increasing demand at the present time to purchase small hammer millers for domestic use or to prepare fodder in small poultry projects. Since these machines have limited productivity, it is better to have a low cost of purchase, maintenance and operation. The smaller the moving parts in the machine and its size (such as the rotating blades), the lower the energy consumption and the maintenance cost. Studies have been carried out with the aim of reducing operating costs. Oluwole et.al (2019) tested a small milling machine powered by a small petrol engine, where the speed of the grinder can be controlled with the stability of the drive train (weight of the rotating parts).

Nwadinobi (2017) also carefully studied power needs, spindle selection and motor power. Increasing the grinding speed can eliminate the effect of the rotor weight and the force required to grind the grains, as the speed is a major factor in the kinetic energy, as well as the possibility of reaching a high grinding capacity of the grinder when using the high speed as the opportunity to use larger sieve openings (Ibrahim et. Al, 2019)). Reducing the thickness of the blades reduces their weight, size, and hence the required motion energy. Vigneault.et al., (1992) found that the efficiency of the machine increased