EFFICIENCY OF OPERATION OF TRANSPORTATION ENTERPRISES AT DIFFERENT OWNERSHIP

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Summary. The paper presents a study on an influence of the transmission ratio changes of rotating velocity rolls on the energy consumption process in the crushing machine. The effect of the transmission ratio changes from 1:1 to 1:1.1 and 1:1.2 is energy consumption rise at corn grain crushing of moisture content of 20 and 30%.

Key words: corn grain, crushing, energy consumption

INTRODUCTION

Energy consumption of crushing process is depend on technology and running methods. Crushing process absorbs 70% all energy demanded for feed mixtures preparing.

- Crushing machines can be divided into three groups:
- hammer mill,
- roller mill,
- crushing mill.

Crushing mills in differ on others characterizes less energy consumption. Crushing process depends on construction and operating and material factors.

Construction and operating factors are included:

- rolls diameter,
- rotate velocity,
- sort of surface,
- gap size between rolls.

Material factors are included:

- geometrical parameters,
- strength characteristics,
- internal structure,
- chemical composition,
- moisture content.

Crushing machines are equipped in two parallel rolls rotating in different directions. There are three sorts of surface: smooth, rough and groove. The diameter of the rolls is dependent on the machines function and their efficiency. The rolls diameters range from 150 to 600 mm at the grain crushing.

AIM AND RANGE OF THE STUDY

The aim of the study was energy consumption measuring during corn grain crushing process at moisture content of 20 and 30% and transmission ratio of the speed rolls at 1:1; 1:1.1; 1:1.2. It was applied five different distances between crushing rolls: 0.2; 0.5; 1.0; 1.5 and 2 mm.

METHODS

A study on the energy consumption of the crushing process was carried out on a crushing machine type H-765, specially modified for the research.

The crushing machine was equipped in two engines with the power of 1,1 kW. One of them was connected to the inverter for speed roll regulation in the range from 400, 440 and 480 r.p.m. The second roll velocity was constant and stabilized at 400 r.p.m. The energy consumption was determined by Lunel converter PP83L and interface card PCL711B.

A scheme of the energy consumption stand is shown in Fig. 1.



Fig. 1. Scheme of energy consumption stand of corn grain crushing

The feeding system was modified feeding system by an installation of the belt conveyor with the belt velocity of 0,2 m/s in the place of charring hopper. It distributes the load uniformly on the rolls.

RESULTS AND ANALYSIS

The results are shown in Fig. 2–6. The differences in energy consumption of corn grain crushing process were smaller for the moisture content of 20% then those for the 30% at the whole sped rolls transmission ratio and different gaps between rolls.

The energy consumption of the crushing process was similar at the sped rolls ratio of 400/480 and gap size of 0.5; 1.0; 1.5 mm for the grain moisture content of 20% (Fig. 2).

Identical relationships were observed during the crushing of the corn grain at moisture content 30%. Considerable differences between energy consumption were observed for the sped rolls ratio of 400/480 and the distance between rolls of 1.5 and 2.0 as well as 0.2; 0.5 and 1.0 mm (Fig. 3). A different value of energy consumption was achieved for all the other trials of the study for the moisture content of 20 and 30%.



Fig. 2. Energy consumption in the depend of speed rolls at moisture content of 20%



Fig. 3. Energy consumption in the depend of speed rolls at moisture content of 30%



Fig. 4. Energy consumption in the depend of speed rolls of 400/400 r.p.min



Fig. 5. Energy consumption in the depend of speed rolls of 400/440 r.p.min.



Fig. 6. Energy consumption in the depend of speed rolls of 400/480 r.p.min.

The effect of the distance between rolls and different speed rolls changes on the process of energy consumption is presented in Fig. 4–6. It was observed that at an increase of the gap size, energy consumption decreases at all transmissions ratio of the speed rolls.

Energy consumption of corn grain crushing process at the moisture content of 30% decreased by 74% when the distance between rolls changed from 0.2 to 2 mm and at rolls speed of 400/400 r.p.m. (Fig. 4). But it decreased only by 18% for speed rolls of 400/480 r.p.m. (Fig. 6).

Contrary relationships were observed for the grain crushing of moisture content 20%. Energy consumption decreased by 34% at rolls speed of 400/400 r.p.m. (Fig. 4) and by 59% at rolls speed of 400/480 r.p.m. (Fig. 6).

CONCLUSIONS

1. The lowest energy consumption of corn grain crushing process was achieved at identical speed rolls.

2. Effect of speed roll increases is energy consumption rise.

3. It was observed relationships between grain moisture content and energy consumption. Corn grain of moisture content 20% is less energy consumption then grain of moisture content 30%.

4. Increasing of distance between crushing rolls is cause of energy consumption decreasing.

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