

THE PELLETING PROCESS OF DIFFERENT MATERIALS AND IMPACT ON ENERGY CONSUMPTION

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Abstract

The paper presents effects of moisture methods of different raw materials process and influence on energy compounds in pelleting process. There are many benefits to pelleting of food. Improving feed conversation in animal, easier handing of feed and storage, balanced diet of animal, less wastage of food and many other benefits. The experimental materials involved maize wheat and barley. The raw materials was ground throught a 3 mm hammer mill. Condition materials was with cold procedure. Moisture of materials were 14, 16, 18, 20, and 22%. Moisture is important step in hight quality pellet production. The experimental materials (maize, wheat and barley) were brought to temperature of 70 ° C. The pelleting process were done in Metalac-Ostojic, pellettizing produced in Obrenovac – Srbija capacity 2-2.5 t/h. Important consideration in feed industry is per tone of pellet production. One factor is to reduce input such is energy consumption. In peper is present different moisture and getting appropriate parameters can influence on the amount of power consumption in maze, wheat and barley. The test materials (maize, wheat and barley) before milling processes humidity was 13 percent.

The relationship between parameters of moisture and energy consumption in this process analyzed statistical procedures analysis of Varansa (ANOVA).

One of the primary objectives of all commercial feed manufactures is to economically produce the best pellet quality possible. There are numerous factor that affect pellet quality, cost pellet and many are inter-related.

Key words: energy, pelleting, moisture

Introduction

The pelleting process is the most expensive and complicated process in feedmill, however the benefits of pellets include: decreased feed wastage, reduced selective feeding, distribution. However pelleting increasing the cost of feeds because cost pelletires is relativety high compared to grinders or mixer. The energy requirements is high and additional care and skill is necessary for that operation. The Scoch (1981.) found that steam conditioning led to decrease is mechanical fruction during pelleting, as determined by low temperature across the pellet decreased electric energy consumption. Jean-Jacques (2005.) show a variation power consumption in fodder factories.

Pellets average 74 kwh/t minimum 59,5 kwh/t and maximum 101,8 kwh/t consumption. Properly conditioned with good durability , hardness and hygienie quality together with improved nutritional value of feed (Thomas, 1997).

Water and steam addition reduced energy cconsumption of pellet press (Djuro Vukomirovic, 2010.) in process pelleting moisture of material must be in optimum between 15-18%. (Slavica Sredanovic, 2000.)

Conditing is one of the key unit operation in pellet production. High moisture contains conditioned material resulted in decreasing of energy consumption during pelleting process (Djuro Vukomirovic, 2010.)

Heat treatment during the pelleting process reduces microorganisms. The overall hygiene state is improved storage periods may be extended – up to storage conditions decay is deferred. (Raine Lowe, 2010.)

Amount of time it takes to produce a given quantity of feed and calculate t/h . Then apply the following formula to calculate power (Kw) being take by pellet press motor.

$$Kw = \text{average pellet press} \times \text{motor amperage} \times \text{voltage} \times 1,73 \times \text{power factor} / 1000$$

Power factor 0,93.

Materials and methods

Examination mill is done on agricultural firms in Kaonik-Srbija in Ekomlek in the unit Ekofarm. The pelleting process was done in Metalac-Ostojic pelletizing produced in Obrenovac capacity 2,5 t/h. The experimental materials were maize (*zea mays*), wheat (*triticum aestivum*) and barley (*hordeum vulgare*).

In this study samples were taken moisture of materials 14, 16, 18, 20, and 22%. The test material (maize, wheat, and barley) before milling process were 13% moisture.

The used temperatures in pelleting were 70-80%. The raw materials was ground throught 3 mm hammer mill.

The analysis of dependen between the parameters of pelleting process was carried using statistical procedures (ANOVA).

Results and disscussion

Conditie is an important step in high quality pellet production. The optimum temperatures in pelleting process is 70-80%. Higher temperature affect the chemical structure of pelleting materials.

Table 1.Average chemical composition of the tested materials

Grains	Carbon hydrates		Cellulase	Fat	Protein
	Starch	Remaining			
Wheat	64,08	6,30	2,5	1,75	12,35
Maize	62,57	8,33	2,1	4,62	9,85
Barley	61,76	7,60	5,4	2,16	11,14

In table 1 as can be seen that tested materials barley has most celluloses (5,4%) and corn most fat (4,62%) it impact to pelleting process.

Examining the impact of individual grains on the energy consumption during pelleting, may influence the composition of complete diets in animal nutrition and therefore the price of production.

Energy consumption during pelleting separate studies in each case. Raw material moisture was 14%. Final moisture contains 14%, 16%, 18%, 20%, and 22%.

Table 2. Dependence of the energy consumption (Ec-kWh/t) during pelleting of different raw materials (wheat, maize, barley)

Energy consumption (Ec-kWh/t)			
Moisture %	Wheat	Maize	Barley
14	43,90	43,00	44,50
16	43,00	42,40	43,60
18	41,90	41,00	42,60
20	41,80	40,80	42,80
22	41,80	40,80	42,80
X	42,48	41,60	43,10
—	0,942	1,03	0,97
X ave-	42,393		

	<i>df</i>	<i>ss</i>	<i>ms</i>	<i>F</i>	<i>P-value</i>
<i>Source treatments</i>	2	5,681	2,841	2,9519	0,0907
<i>Error</i>	12	11,548	0,962		
<i>Total</i>	14	17,229			

The results between mixture of raw materials (wheat, maize, barley) and consumption electrical energy in pelleting process show in table 2. The results point a very strong linear dependency between analysis parameters. The smallest energy consumption was observed for maize and highest in barley.

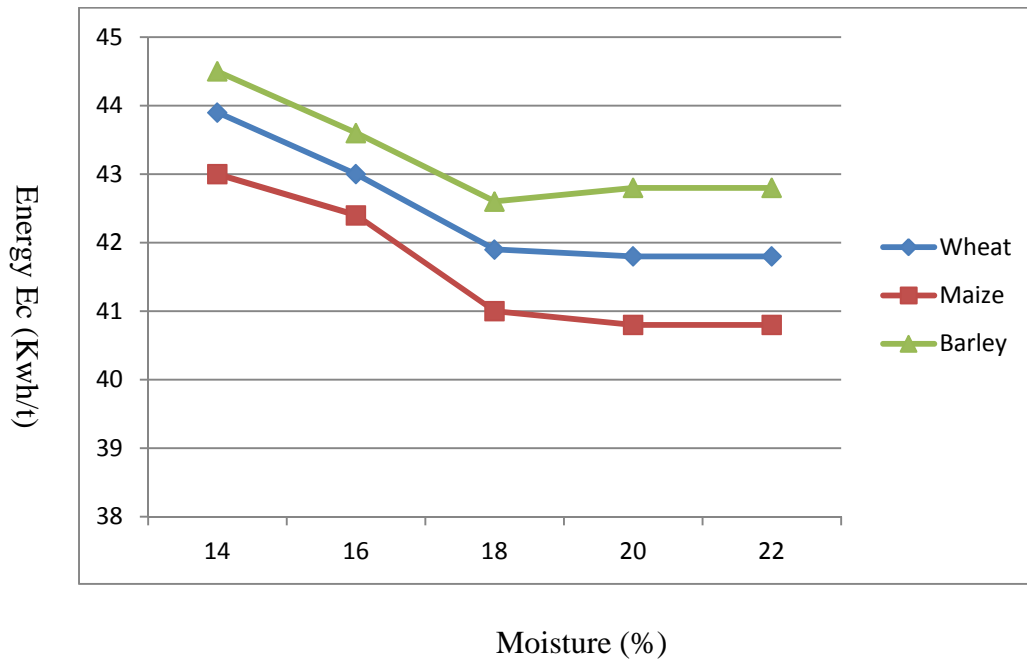


Figure 1. Relationship between moisture of raw materials and consumption electrical energy in pelleting process.

The results of the study investigation, the effect of moisture different raw materials show in f

Conclusion

Condition is very important in pelleting process choosing of properly conditing parameters and raw materials provide saving of electrical energy consumption.

The optimum condition for raw materials (wheat, maize, barley) were 16-18% moisture.

Properties raw materials and moisture in pelleting process is good predictor of energy consumption of the pelleting process, it is very strong dependency between those parameters.

The higher humidity of material is not significant for energy consumption.

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