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RESEARCH ARTICLE

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Energy management in Isabgul processing plant

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ABSTRACT

Energy audit was carried out in Isabgul processing plant to optimize power consumption. The power requirement of the traditional plant was 21.0 horsepower. The manufacturing of Isabgul processing machinery is not an organized industry. Actual need for power at each operation is not specified by the manufacturer resulting into wastage of energy by installing higher hp motor. Energy utilization efficiency can also be improved by identifying the federate and clearances between under runner disk, where maximum husk recovery is obtained. Study was carried out to determine total energy required for processing of Isabgul seed at each operation and identify the scope to conserve energy by technology upgradation, increasing efficiency of machinery by proper selection of feed rate, clearances between emery disk and reduction of process time. The result shows that the percentage of husk recovered was affected significantly due to different feed rate and clearances. The 175 kg/hr feed rate recorded highest husk percentage *i.e.*, 27.15 per cent under treatment combination of Set-3 (Clearances between under runner disk ranging from 1.55 mm. to 1.18 mm.) and total energy consumption was found 5.46 kwh.

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Key words : Isabgul (Psyllium), Feed rate , Energy, Clearance.

INTRODUCTION

India at present is the largest producer, consumer and exporter of spices in the world. India produces more than 50 varieties of spices and exports spices to some 120 countries in the world. The Isabgul husk has very good export potential among all crude drugs. According to trade estimates, 90 per cent of the domestic production of Isabgul husk is exported. Isabgul processing mainly involves cleaning, polishing, dehusking and aspiration. Presently most of the Isabgul mills are traditional type and locally manufactured and old design. The manufacturing of Isabgul processing machinery is not an organized industry. The capacity, operating parameters, power requirement and specification of machinery varies from industry to industry. Actual need for power at each operation is not specified by the manufacturer resulting into wastage of energy by installing more hp motor and other accessories. The power consumption is also vary high because of the large number of dehusking operation. The unit operation can be reduced to save the energy and time. The knowledge of energy management for production of a product enables one to produce more processed product with the same energy consumption. Energy utilization efficiency can also be improved by identifying the feed rate and clearances between under runner disk sheller, where maximum husk recovery is obtained. Therefore, emphasis is to determine the total energy required at each operation for processing of Isabgul seed and identify the scope to conserve energy by technology upgradation and increasing efficiency of machinery by proper selection of feed rate, clearances and reduction of process time.

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MATERIALS AND METHODS

This chapter deals with the selection of raw material, selection of Isabgul processing industry for experiment, specifications of machinery, performance evaluation of each unit of existing plant, energy measurement and experimental set-up to increase efficiency of unit operation thereby optimize energy requirement. Performance evaluation of existing Isabgul processing plant was carried out to determine total energy required at each unit operation and actual energy utilized. The basic data on plant performance was collected from the records maintained by plant owner and through personnel discussion with the owner and technical staff of the plant. The overall performance evaluation of the plant was carried out keeping in view the objectives of the study, flow chart and schematic diagram of the process and by identifying all mass and energy inputs and outputs (Singh, 1977).Different evaluation was carried out for cleaning unit and dehusking unit. The Energy balance was determined separately for cleaning unit and dehusking unit (for all feed rate and set of clearances- Table 1). by calculating total energy available (Input energy) and total energy consumed (Energy output) at each end of unit operation.Overall system efficiency has been calculated in order to achieve realistic energy input/output ratio of Isabgul processing plant. The system efficiency has been calculated considering individual efficiency of each component of the system under study.

Table 1 : Description of various set of clearance selected for the test (Clearance in mm.)

Set-1	Set-2	Set-3	Set-4
1.65	1.60	1.55	1.50
1.60	1.55	1.50	1.45
1.54	1.49	1.44	1.39
1.45	1.40	1.35	1.30
1.38	1.33	1.28	1.23
1.32	1.27	1.22	1.17
1.29	1.24	1.19	1.14
1.28	1.23	1.18	1.13

RESULTS AND ANALYSIS

This chapter deals with the results obtained during investigation regarding the physical properties of the Isabgul seed, performance evaluation of existing plant, energy measurement, experimental set-up to increase efficiency of unit operation thereby optimize energy requirement.The result shows that the Energy consumption was affected significantly due to different feed rate and clearances (Table 2). The 180 kg/hr federate recorded highest energy consumption *i.e.,* 5.62 kwh under treatment combination of Set-4 and minimum energy consumption of 5.34 kwh was observed in feed rate of 165 kg/hr under treatment combination of Set 1.All the sets *viz.,* Set-1, Set-2, Set-3 and Set-4 have influenced on the energy consumption and they all differ significantly due to different treatments. Data further show that the interaction effect of set and feed rate was also found significant. Fig.1 shows that Energy consumption increases gradually up to treatment combination of Set-4 and feed rate up to 180kg/hr when test carried out at various interactions between feed rate and set of clearances. Fig.1 further shows that energy consumption found was relatively low in case of treatment combination up to Set-4 and feed rate up to 175 kg/hr as compared to treatment combination up to Set-4 and feed rate 180kg/hr. Fig.1 shows that highest energy consumption *i.e.,* 5.62 kwh was observed in feed rate of 180 kg/hr under treatment combination of Set-4 and minimum energy consumption of 5.34 kwh was observed in feed rate of 165 kg/hr under treatment combination of Set-1. Results further show that energy consumption was 5.46 kwh under treatment combination of Set-3 and feed rate 175 kg/hr where husk

Table 2 : Energy consumption in (kwh) at various interaction between feed rate and set of clearances

Sr. No.	Feed rate	Set			
		1	2	3	4
1.	165	5.34	5.38	5.40	5.44
2.	170	5.35	5.40	5.44	5.46
3.	175	5.36	5.40	5.46	5.48
4.	180	5.38	5.50	5.56	5.62
	S.Em. ±	0.004			
	C.D. at 5 %	0.013			
	C.V. %	0.23			

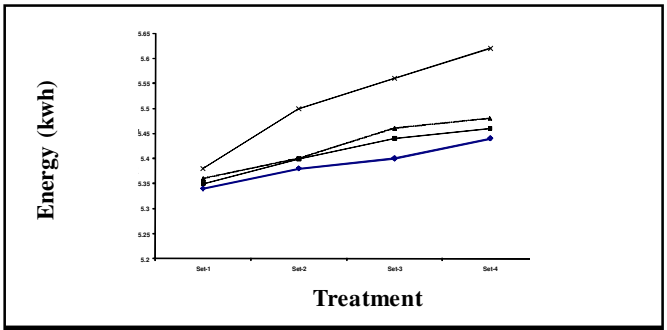

Fig. 1 : Energy consumption at various interaction between feed rate and set of clearances

recovered was maximum, which was found most suitable combination of set and feed rate.

Conclusion:

From the results obtained it may be concluded that highest energy consumption *i.e.,* 5.62 kwh was observed in feed rate of 180 kg/hr under treatment combination of Set-4 and minimum energy consumption of 5.34 kwh was observed in feed rate of 165 kg/hr under treatment combination of Set-1. Results further show that energy consumption was 5.46 kwh under treatment combination of Set-3 and feed rate 175 kg/hr where husk recovered was maximum (27.15), which was found most suitable combination of set and feed rate.

REFERENCES

Anonymous (1992). Engineering properties of Spices. Annual Report, CIAE, Bhopal.

Avalani, P.K.; Singh, R.P. and Chancellor, W.J. (1980). Energy consumption in sugarbeet production and processing in California *Trans. ASAE* **23** (3) : 783-787.

Chinnam, M.S.; Singh, R.P.; Pedersen, L.D.; Carroad, P.A. and Rose, W.W. (1980). Analysis of energy utilization in spinach processing *Trans. ASAE* **23** (2) : 503-507.

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