

DESIGN AND DEVELOPMENT OF A DESTONER FOR SMALL FOOD GRAINS

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Introduction

Food grains of small sizes such as gingelly (sesame), millet (kurakkan) and others produced in Sri Lanka have earned greater significance in value addition due to popularity of those. Cleaning of grains require removal of all impurities including sand which is mixed during postharvest operations. Destoner which functions on the basis of difference in specific gravity is used for sand separation in grain processing industry. Imported or locally manufactured destoners for larger grains such as paddy or rice are readily available for processing industry. Adhikarinayake and Navarathne (1984) investigated the possibility of using rice cleaning equipment other than destoner for cleaning sesame which usually consisted of a larger portion of impurities. The commercially available destoners designed for rice could not be used due to differences in size and density. Adhikarinayake (1985) attempted to develop a rice destoner that works on wet basis for small scale or domestic applications. There have been no attempts made to develop destoners for small food grains with specific application to small scale industrial needs in Sri Lanka. Due to the unavailability of small grain destoners, cleaning operations are done manually in the small and medium enterprises engaged in grain processing. The dependency on labour which is expensive and low in productivity has resulted in higher prices of food items coming to the market.

Destoners that are designed to suit the needs of SMEs in agro-processing in the

country will benefit industry by enhancing product quality and production capacities. There have been no recorded attempts in the country to develop destoners for these needs. This work was aimed to develop a destoner to clean smaller food grains which are used in value addition processes in Sri Lankan SMEs.

Material and methods

The essential features of the destoner includes the sieve, fan, vibration mechanism and drive mechanism. The sieve was developed by using a standard sieve that comes for paddy destoner. The openings of the slotted sieve were changed to suit smaller grains, on trial and error basis, by pressing it in a roller press. A series of sieves were prepared and tested to retain grains and to separate sand particles under operating conditions of air velocity and vibration. The fan is a simple design which consists four blades mounted on a rotating shaft. The vibration of the sieve was obtained by using an eccentric axel mechanism which is connected to the framework of the sieve. The fan and vibration mechanism are connected by a v-belt and pulley mechanism that is driven by a 0.5kW electric motor. The machine was fabricated at the Department of Agric. Engineering, Faculty of Agriculture, University of Peradeniya. Figure 1 depicts the construction of the sand separation unit.

The destoner was tested for its performance in cleaning gingelly and kurakkan. Grain samples were subjected to pre-cleaning to remove lighter particles by winnowing and

impurities of sizes smaller or greater than the food grain by using a set of sieves. The final samples assumed to be consisted of grains and other particles that are equal in sizes but differ in specific gravities.

Results

The tests of samples by manual cleaning to determine the remaining sand, after two passes through the destoner, showed complete removal and free of sand particles. The tests with larger samples of about 100kg showed the following capacities for the machine.

Gingelly 70 – 80 kg/hr with two passes

Kurakkan 45 – 60 kg/hr with two passes

Discussion

The equipment developed and tested indicate that it is capable of removing sand from small size food grains and perform at capacities suitable for small and medium scale grain processing facilities in the country. The production cost of the equipment is about Rs: 20,000.00 and can be fabricated in a workshop with moderate

facilities. Hence, the equipment could be used by the food grain processors in cleaning stage and reduce cost of production for value added items.

Conclusions

The destoner developed in this study is capable of removing sand from small food grains such as gingelly and kurakkan which are the ingredients of many popular food items. It meets the capacity requirements of SMEs in food grain processing industry in the country.

References

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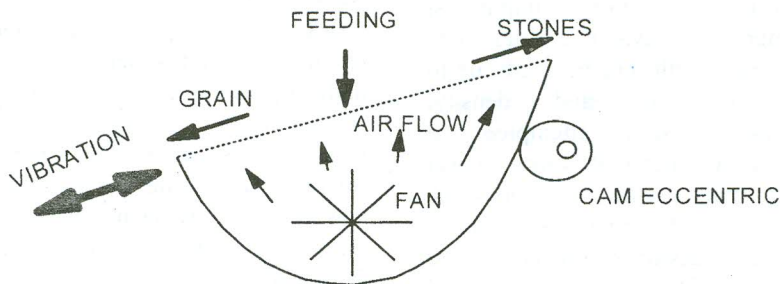


Figure 1. Assembly of the sand separation unit consisting sieve, fan and cam mechanism.