

## **CONSIDERATIONS REGARDING THE PRE-CLEANING PROCESS OF CEREAL SEEDS**

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### **ABSTRACT**

*In order to obtain good results using cereal seed cleaning equipment, it is mandatory for the equipment to operate at maximum capacity, in good functioning conditions, and handled by qualified personnel. Seed cleaning increases seed quality by removing unwanted materials that may also attract certain insects or fungus. Cleaned seed also lower storage costs because only storage valuable material is stored and not straws, soil and other unwanted materials.*

### **INTRODUCTION**

Seeds coming from harvesting usually contain unwanted materials that must be removed during processing, in order to obtain clean seed suitable for food industry or for planting [1].

Companies frequently purchase specialized equipment for processing their seed, and they require professional help on how to use and maintain the various pieces of equipment to improve performance, reduce breakdowns, and extend machine life [2].

Farmers who cultivate large-scale agricultural crops in an ecological system are conditioned by law to reduce or eliminate the use of certain chemicals such as herbicides, insecticides, mineral fertilizers, etc. [3]. All these imposed conditions lead to obtaining harvests with a lower purity of the harvested seeds, thus arising the need for a more rigorous cleaning. That is why it is necessary for the obtained harvest to be subjected to a cleaning and sorting process, and then to receive a certain final destination. For farmers, the cleaning and sorting of agricultural products in order to store them in

silos is very important, because it ensures the reduction of the volume, helps transportation and storage but also helps eliminating several products that show depreciation characteristics of biological value and reduces the total price [2].

## **MATERIAL AND METHOD**

Within the harvested seed, both the pure seeds and any undesirable materials may present major differences in physical properties. The seed-cleaning operation exploits these differences to separate the desired seed from the contaminants. The most common properties used to make the separation are presented below:

- size (length, width, thickness)
- shape
- weight/density
- texture (rough, smooth, pointed)
- colour

For a good conditioning process, pre-cleaning is an important factor, especially for storage. The organic impurities present in the mass of seeds, represent a favorable environment for the development of the micro-fauna but also for the parasites that produce the alteration of the seeds and their self-heating [4].

Impurities in the mass of the seeds can be minerals (sand, stones, metal pieces, etc.), organic non-seeds (straw, pieces of plants, chaff, etc.) and organic seeds (dried seeds, broken seeds, seeds attacked by insects, etc.) [4].

Table 1 presents the conditions required for the reception of oilseeds [5].

Table 1

Quality conditions for oilseed raw materials

The type of seed	Foreign bodies, % max.	Moisture, % max.	Defective seeds, % max.
Sunflower	4	11	10
Soyseeds	3	13	5
Rape seeds	4	9	4
Flax seed	6	11	10
Ricin seeds	6	10	-
Pumpkin seeds	-	11	-
Wheat germs	-	15	-

Pre-cleaning requires removing items that are significantly larger or extremely light and much thinner than the crop seed

It may also include the removal of awns or beards - stiff bristles (e.g. wheat, barley, rye and many grasses).

Pre-cleaning is not always necessary, for example, with certain hand-harvested and winnowed seeds. The goal isn't always to get high-quality seeds, but to make following operations easier. Pre-cleaning:

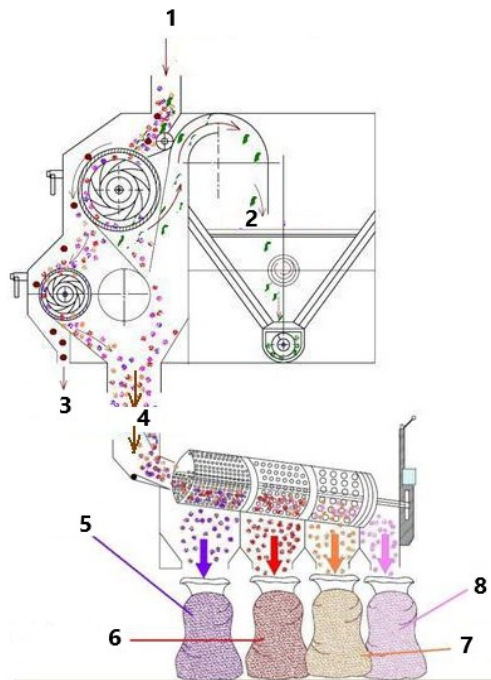
- reduces the size of seed lots;
- simplifies the cleaning process;
- decreases seed loss during cleaning; and
- removes particles that may be problematic during interim storage.

In the process of pre-cleaning cereals, a wide range of pre-cleaners are used: with suction, with drum (cylindrical sieve) and with flat sieve.

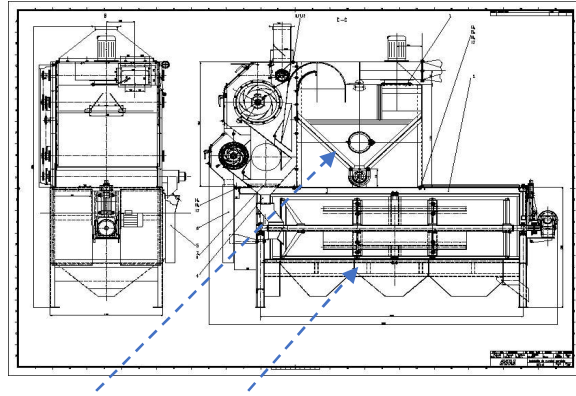
Suction cleaners use airflow to remove impurities that weigh less than cereals. The air flow generated by the fan passes through the mass of the product spread, taking over the impurities that are evacuated through a mouth in the settling cyclone. It is possible to adjust the amount of aspirated air, thus there is the possibility to determine the amount of impurities extracted from the grain mass. [6, 7].

## RESULTS AND DISCUSSIONS

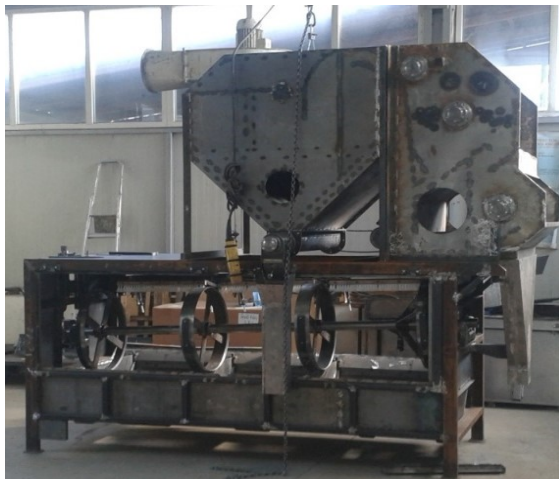
At INMA Bucharest, a technology was created (fig.1) which led to the design and construction of a pilot plant for the conditioning of ICS seeds, composed of a pre-cleaning module and another module consisting of a rotating cylindrical sieve. (fig.2, fig. 3).



**Fig. 1 - Seed conditioning technology [1]**  
**1 – material supply; 2 – light impurities; 3 – gross impurities; 4 – pre-cleaned grains; 5 – broken seeds; 6 – cleaned seeds; 7 – cleaned seeds; 8 – evacuation of large impurities**



1                      2  
**Fig. 2 - General assembly: Seed conditioner ICS type [1]**  
**1 - Pre-cleaning module MPS; 2 - Cylindrical sieve CS**



**Fig. 3 - Seed conditioner ICS**

The main technical and functional characteristics of the seed cleaning module MPS-0, are presented in table 2:

Table 2  
Technical specifications MPS-0

Productive capacity for a standard product of the type:	max. 8 t/h
- - wheat, with hectolitre weight:	min.75 daN/hl
- humidity	max. 17%
- impurities	6...8%
Degree of cleaning (for impurities compatible with machine functions)	40...50%
Overall dimensions (Lxlxh)	2300x1515x3000 mm

Akyurek manufactures produces the cleaning equipment AKDS-1000 (fig.4) composed of a rotating cylindrical sieve.

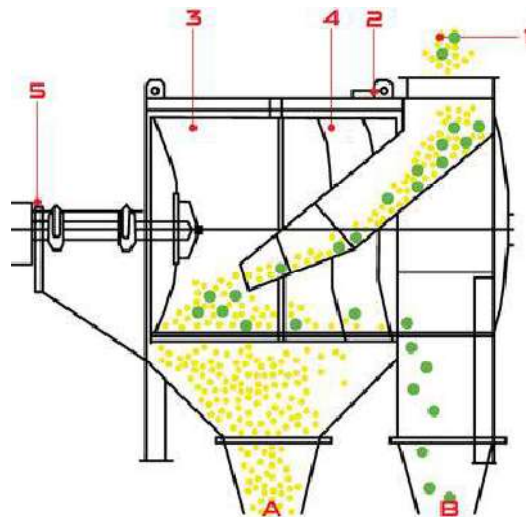
The cylindrical sieve is effective for removing oversized impurities such as pieces of wood, stone, etc., from the product.



**Fig. 4 - Cleaning equipment AKDS-1000**

The use of high quality components makes the machine extremely resistant to wear, leading to a decrease in maintenance requirements and an increase in service life[7].

Diagram of the cleaning operation AKDS-1000, is presented in fig.5



**Product inlet; 2- Exhaust air; 3- Inlet cylinder; 4- Discharge cylinder with guide screw; 5- Motor; A- Main Product; B- Oversize particles**

**Fig. 5 - Technical Drawing**

The main technical and functional characteristics of the cleaner AKDS-1000 are presented in table 3:

Table 3

Cleaning Capacity	Plant Pre-Cleaning	5-15 t/h
	Storage Pre-Cleaning	up to 200 t/h
Overall Dimensions	A (mm)	1000
	B (mm)	2000
	C (mm)	1500
	D (mm)	180
Air Volume	3.00	
Weight	360 [kg]	

## CONCLUSIONS

The cleaning process of various types of seeds ensures:

- separation of good seeds from coarse impurities (straw, chaff, lumps of earth, etc.)
- separation of impurities based on the difference in aerodynamic properties between seeds and impurities;
- depending on the seeds subjected to pre-cleaning with the help of the sieve drum, an optimal regime for entraining the mass of seeds and impurities is ensured;

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