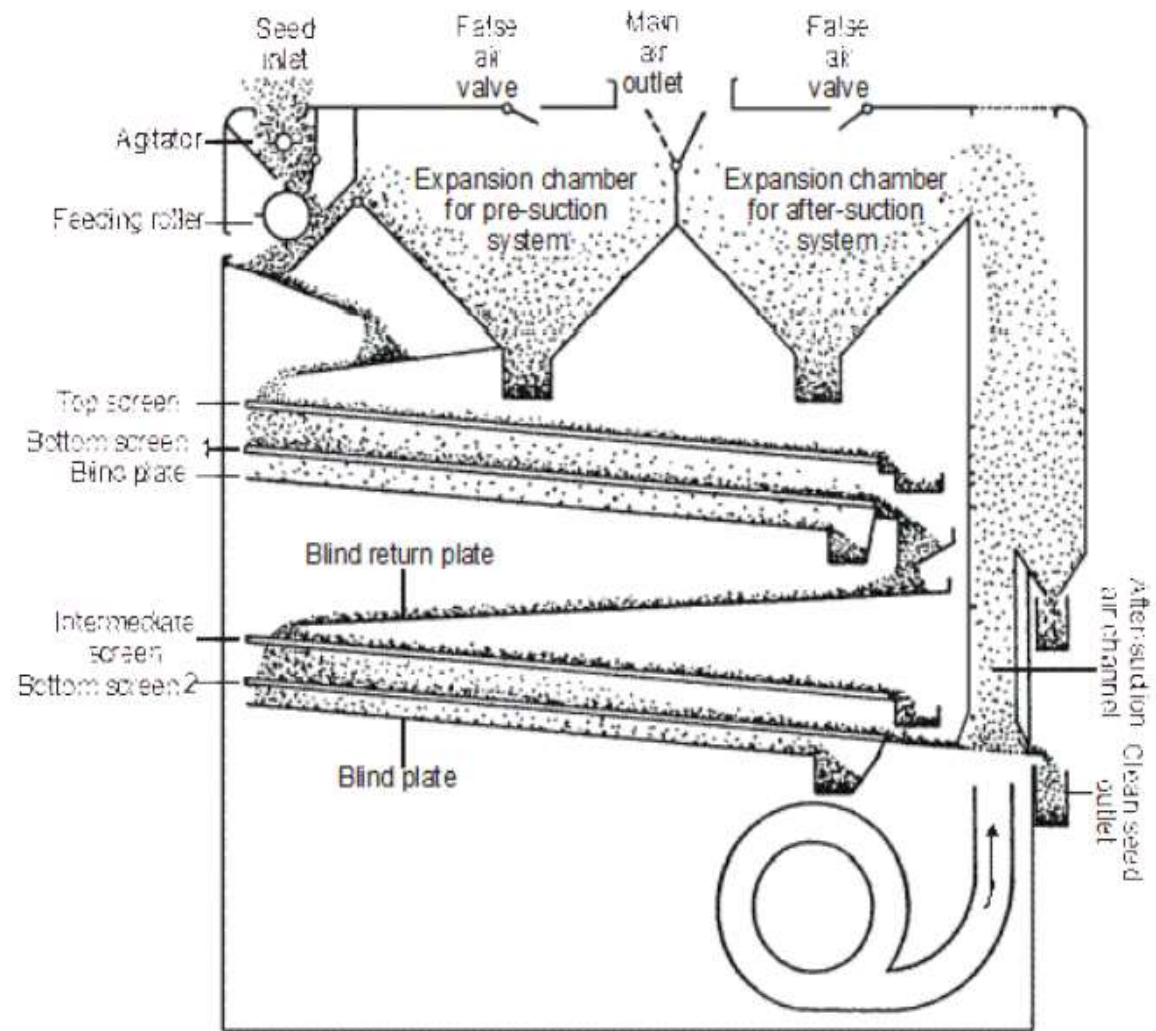


**SEED PROCESSING EQUIPMENT-
CLEANER CUM GRADER**

SEED CLEANING

I. Air screen cleaner

- This is the most important machine of every cleaning plant. It uses screens and aspiration (air blow) for two separations
- A coarse upper screen removes larger material, a lower fine screen stops the seeds and lets through fine matter and then the seed fraction passes through a transverse or nearly vertical air stream which can separate light impurities such as empty or partly filled seeds, husks and glumes from the seed
- In most cases a number of sieves with different sized perforations are used and the cleaning is a process of gradually shifting out smaller particles
- Factors which determine the quality and quantity of seed cleaned include
 - (i) size of the perforations
 - (ii) the precision of the perforation
 - (iii) the angle at which the sieves operate
 - (iv) the amplitude and speed of movement of the sieves
 - (v) correct cleaning and maintenance of the equipment



Air screen cleaner

II. Cleaner cum grader

The dried seeds should be cleaned and graded with help of a cleaner cum grader. For large scale cleaning and grading the commonly available machine is the “Crippen Model Seed Cleaner cum Grader”.

It consists of the following parts

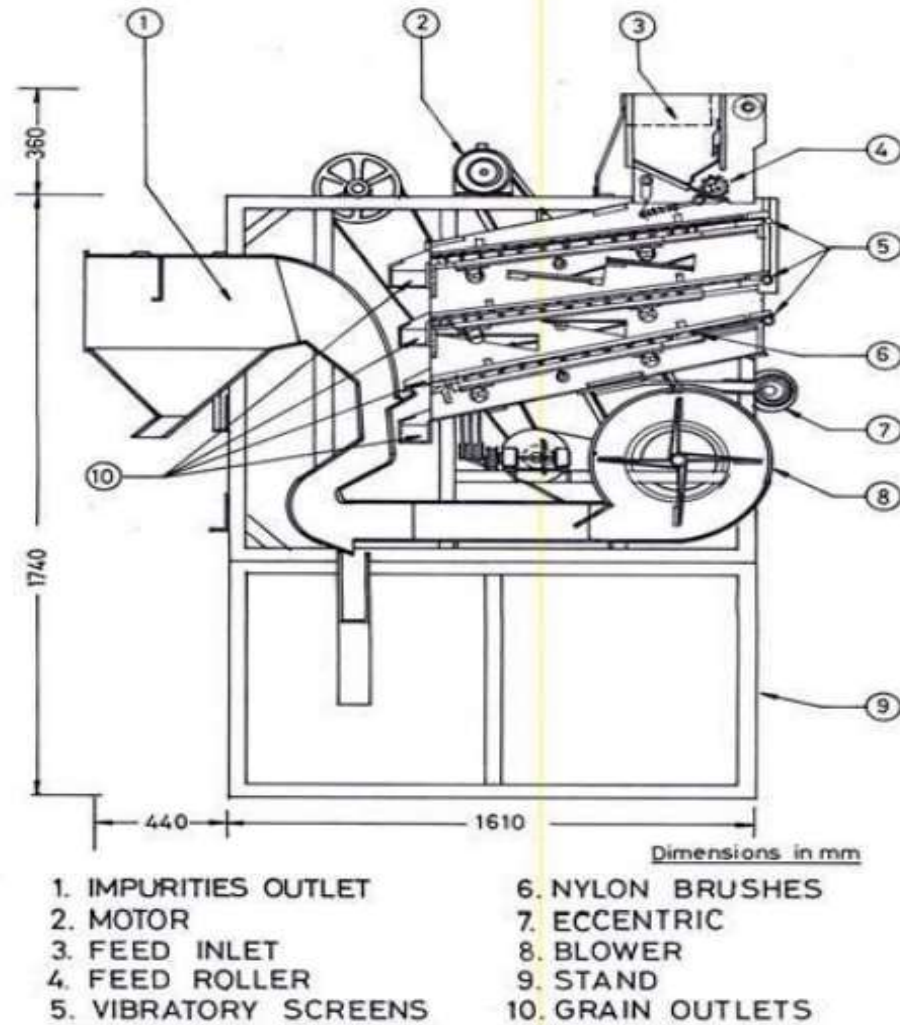
- A hopper in the top for seed filling
- A fluted roller below the hopper to regulate the seed flow to the screen
- Screen (or) sieves: Perforated metal sheet with specific size of perforation in which there are two types
- Rectangular perforations for paddy
- Round perforations for seed other than paddy
- Screen shaking unit : for oscillating the sieves to move the seeds on the screens
- Screen brushes to remove the blocked seeds
- Air blower with adjustments for air outlet
- Collecting outlet
- Air duct for directing the blown up light particles to outside
- Collecting bins.

- **Adjustments:**

1. **Fluted roller:** The speed of this roller can be adjusted so as to increase (or) decrease the flow of seeds to the hopper of the sieves.
2. **Slope (or) inclination of the screen:** The angle of inclination of the screens can be adjusted according to the nature of seeds. Rate of vibration of sieve This can be adjusted either to increase or to decrease the speed of the rolling seeds on the screen.
3. **Volume of air flow:** By increasing (or) decreasing the air inlet. Choice of screens: According to variety we have to change the screen
4. **Screen dams:** Small check dams, which can be provided here and there on the screens so that the seeds can be stopped a while and takes the charge either to pass or to roll

- **Types of seed cleaner cum grader**

- i) Crippen model cleaner cum grader
- ii) Clipper model cleaner cum grader
- iii) Petkas cleaner cum grader



Cleaner cum grader

Seed upgrading equipments

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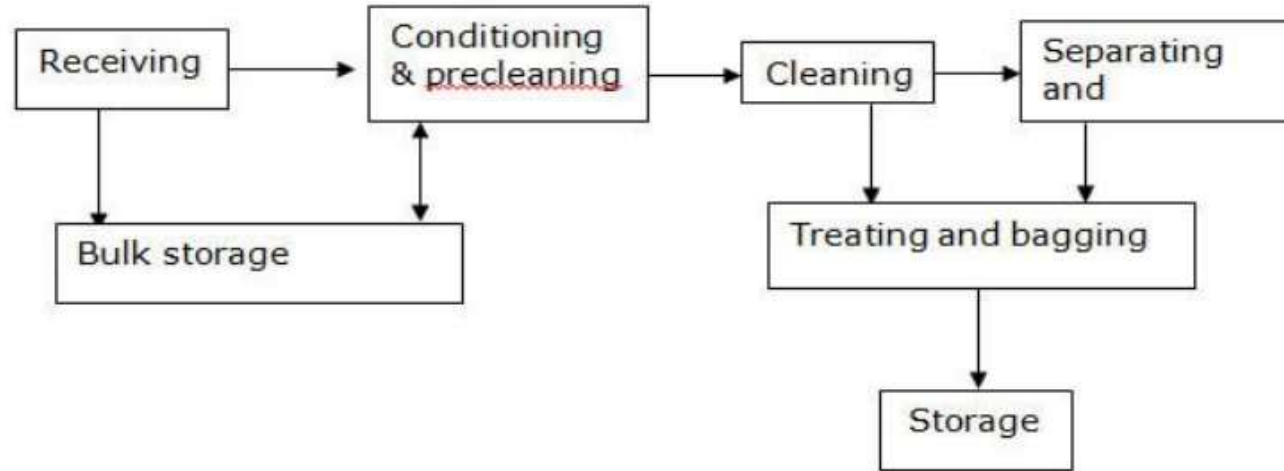
3. Air separations		
1. Pneumatic Separator	It uses the movement of air to divide seeds according to their terminal velocities. Terminal velocity refers to the velocity of air required to suspend particles in a rising air current. Many factors such as density shape and surface and texture effect resistance of a particle to airflow. When the seed is introduced into an air stream all the particles with lightweight are lifted by the velocity of the air, while the seeds with heavy weight fall below. In pneumatic air separator the air is blown through the fan which lifts the light material and the seeds which are light in weight	1.General cleaning 2. Close grading 3. Specific separation
2. Aspirator	In aspirator the fan is at discharge end and induces a vacuum, which allows the atmospheric pressure to force air through the separator	
3. Fractional Aspirator	In fractional aspirator when a seed mixture is introduced into the lower end of an expanding air column, heavy seeds fall against the airflow and light seeds are lifted. Air velocity through the expanding columns lessens and gradually drops out seeds with lower terminal velocities. Each outlet along the column receives a lighter fraction of seeds the mixture is thereby separated into several grades	

4. Surface Texture Separation		
1. Roll Mill	The velvet roll mill classifies seeds according to a difference in texture of seed coat. When a seed mixture is fed on to the upper end of the rolls, the smooth seeds travel down hill between them and are discharged at the lower end. Rough-coated seeds caught in the velvet take a bouncing path between shield and rolls and are thrown over sides. The discharge from the sides of the rolls is caught in several directions. The roughest seeds are ejected first	Separation of smooth clover seeds eg. From rough seed coats, seeds with irregular shape, wrinkle or shrivelled seeds, broken, clipped or damaged seeds rough or irregular shaped inert material
2. Magnetic separator	Magnetic superiors take advantage of the surface texture and stickiness of seed to make a separation. A seed mixture and proportionate amount of water and finely ground iron powder are mixed in a screw conveyor or other mixing device. In the presence of moisture, the iron powder will adhere to rough cracked and sticky seeds. When the mixture is fed to the top of a horizontal revolving magnetic drum smooth or sticky seeds that are relatively free of iron powder all from the drum, while the rough textured seeds with iron powder stick to the drum until they are removed by a rotary brush	
3. Inclined Draper	The inclined draper separator senses differences in shape and surface texture to separate seed on an inclined plane. A mixture to be separated is metered on to the center of an inclined draper belt travelling in an uphill direction. Round or smooth seeds, which roll or slide down the draper, faster than the draper travelling upwards. Flat or rough-coated seeds are carried to the top of the inclined plane and dropped into a separate hopper	

5. Electronic separation		
Electric color sorters	The electric color sorter separates the seeds on the basis of difference in color brightness. One type of machine picks up the seeds on a series of suction fingers and carries them to a phototube where they are judged for colour brightness and ejected into separate containers one at a time	Separation of off coloured seeds
6. Other Separators		
1. Spiral separator	The spiral separator makes a division of seed according to shape or the degree of its ability to roll. The separator resembles a stationary open screw conveyor standing on end. The mixture fed onto the spiral at the top, slides or rolls down the inclined surface. The fast rolling seeds gain speed and are thrown by centrifugal force into an outer housing, which directs them to a chute below. The slow rolling seeds remain on the inner inclined surface and enter a second chute at the bottom	Separation of rape and soybean seeds from wheat, oat and rye grass. Similarly, separation of flat and wrinkled seed of soybean from smooth seed
1. Polishers	Polishers use a polishing agent such as sawdust or bran to remove discoloration. In some of the polishers mild mechanical rubbing action is provided	To improve the lusture of the seeds. Eg. Beans peas, popcorn etc
1. Picker belts	Separations that cannot be made by machines may be made by hand on hand picker belts. The maize cobs are fed on one end of the moving belt. Operators examine the cobs and that which are of offtypes are removed by hand	Removal of undesirable ears of corn, pods from shelled peanuts and other specific contaminants

Movement of seed in a processing plant

Handling of seed at the processing plant adheres to a definite path irrespective of crop for easy management of seed which is sensitive at each and every step of handling and ready to lose or gain its quality all through the steps.

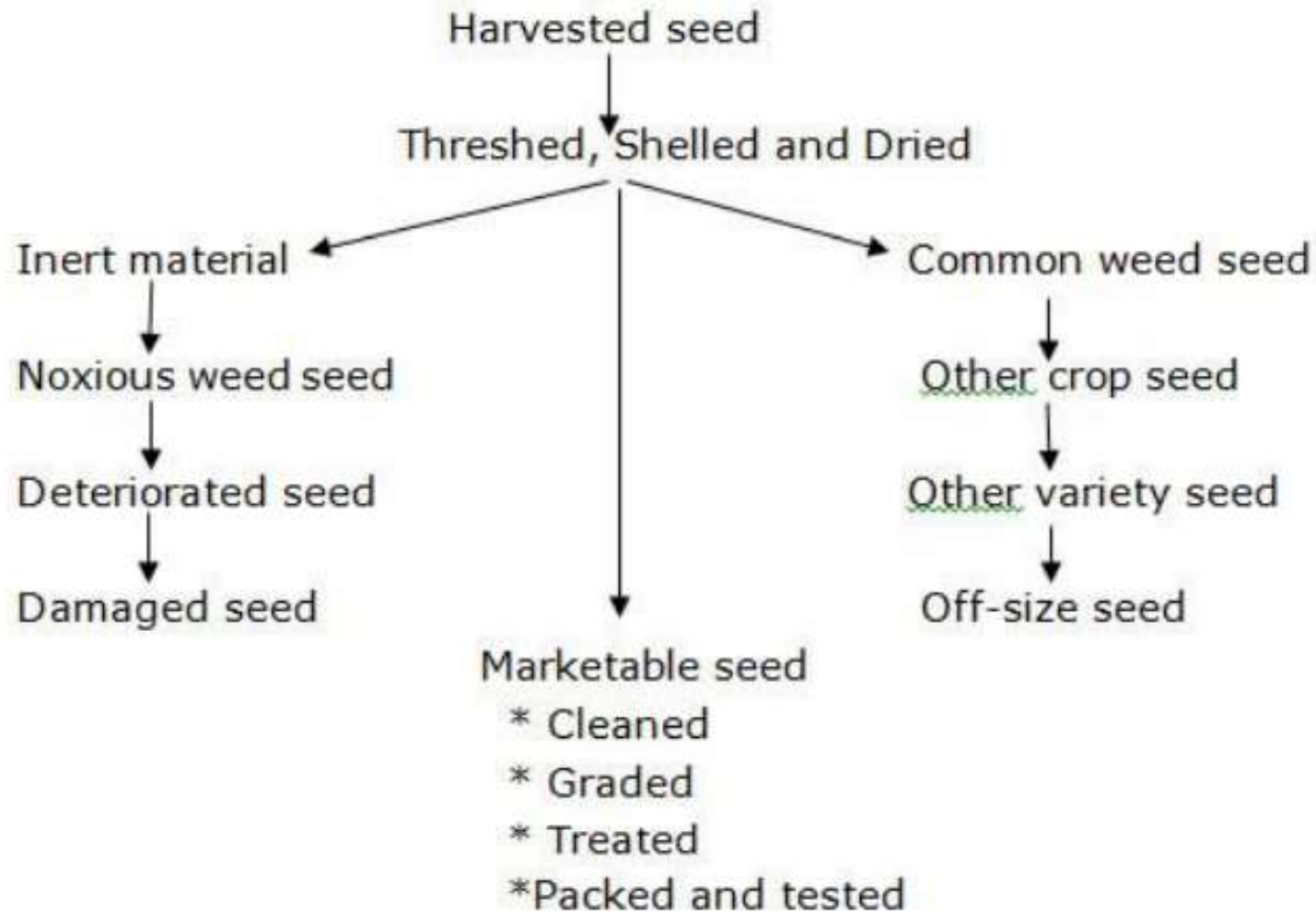


Physical characteristics used to separate seeds are

1. Size grader : Based on size it can be separated with air screen cleaner cum
2. Length : Disc or indented cylinder separator
3. Weight : Specific gravity separator
4. Shape : Spiral separator or draper separator for round and flat seeds
5. Surface texture : Rough from smooth surface seed- dodder mill
6. Colour : Electronic colour separator
7. Electrical conductivity

Seed differing in their ability to conduct electrical charge can be separated with electronic separator.

The flow charts illustrating the types of materials removed from harvested produce during processing.



S.No.	Processing equipments	Usage with reference to specific seed management
A.	Threshing with extraction equipments	
1.	Thresher	To remove the seeds from the inflorescence especially in cereals
2.	Ginning machine	To separate the lint and seed from kapas in cotton
3.	Maize sheller	To shell the seed from the cobs
4.	Pulse thresher	To remove seed from the pods
5.	Tomato seed extractor	To extract tomato seed from fruit without wasting the pulp
6.	Chilli seed extractor	For easy removal of seed from chilli fruits
7.	Groundnut decorticator	To shell the kernel (seed from the pods
8.	Sunflower thresher	For removal of seeds from the head
9.	Debearder	To remove the awns form (Barley) the seed
10.	Mechanical scarifier	To scarify the hard seed mechanically to improve the germination of seeds
11.	Pebble mill	To remove webby hairs from grasses
12.	Timothy bumper mill	To remove weed seed from timothy seed
13.	Hammer mill	To remove the hook or appendages from the seeds (i.e. Stylosanthus)
B.	Driers	To reduce the moisture content to lower or needed level for safe handling both for processing and for storage at the final stage
C.	Grading equipments	
14.	Cleaner cum grader	This homogenize the precleaned seed based on size and is known as basic grading in seeds. The sieve sizes requirement vary with crop
15.	Precleaner and aspirator	This remove the inert material and dust particles from seed and improve the grading efficiency

D.	Upgrading machines	
16.	Specific gravity separator	Improve the quality of graded seed further using its weight or specific gravity. Heavier seeds are good storers and expresses maximum field establishment
17.	Indent cylinder	In lengthier seeds it maintains the size of seed (breadth and length). The broken / damaged are removed and good seeds are selected
18.	Disc separator	It is for removal of weed seeds and to improve the general appearance of seed
19.	Roll mill	To separate smooth seed from rough seed based on the surface texture especially the weed seed
20.	Magnetic separator	Removal of weed seed from clovers, alfalfa, trefoils and vetch
21.	Inclined draper	Separation of smooth or round seeds from rough, flat or elongated seeds
22.	Electronic colour sorter	Separation of off-coloured seed
23.	Electrostatic separator	Based on electrical properties removes Johnson grass from sesamum seeds (Specific utility)
24.	Spiral separator	Separation of seeds based on shape (eg.) separation of rape, vetch and soybean seed from wheat, oat or rye grass
25.	Polishers	To improve the luster of seed
26.	Picker belts	To remove undesirable ears / pods from shelled seeds (eg.) Groundnut, Corn
27.	Vibratory separator	Removal of weed seed
28.	Seed treater	To treat the seed with fungicide and pesticide
29.	Seed packing machine	To easier the work and to avoid human error of mixing
30.	Conveyors / Elevators (Belt , Bucket)	Easier the transfer of seed from machine to machine and avoids the contamination of seed at various level.

THANK YOU