

# POST HARVEST AND AGRO PROCESSING

Almost all the food, feed, fibre and fuel commodities go through a number of post harvest processing operations such as cleaning, grading, separation, drying, storage, milling, food processing, packaging, transport and marketing before it reaches the consumers. Agricultural processing is directed towards conservation of produce and value adding to make the material more readily usable and economically more remunerative.

## **Cleaning/grading/separation**

Harvested grain (threshed / shelled / dried) needs further processing to get rid of various types of contaminations or undesirable matter, viz., inert material, common and seeds of noxious weeds, other crop/variety seed, decorticated seed, damaged seed and/or off-size seed. Cleaning and grading result in reduced bulk of the material, high value products, safe and longer storage, more out-turn of better quality milled products.

## **Drying and dehydration**

Drying of agricultural products is an important unit operation. It refers to removal of moisture from grains and other products to a predetermined level, whereas dehydration means removal of moisture to very low levels usually to bone dry condition. Drying is a thermo-physical and physico-chemical operation by which the excess moisture from a product is removed. Drying makes the food grains and other products suitable for safe storage and protects them against attack of insects, moulds and other microorganisms during storage.

## **Sun Drying**

This is a traditional method of drying of crops and grains. Major portion of crops is left in the field and threshing yard for drying under sun. Solar drying of agricultural products is better alternative to sun drying. It can be a means of supplementing or replacing artificial dryers with consequential savings in fuels and costs. Solar drying provides higher air temperatures and lower relative humidity than simple sun drying. It enhances the drying rate and lowers the final moisture content of dried products.

## **Milling**

Milling is a general trade name, which normally means reduction of food grains into various and products like meal, flour, split products etc. Milling includes pearling, dehusking, grinding / size reduction, mixing, polishing etc. The meaning of the term milling vary with the crop for example milling of wheat refers to a grinding operation to produce flour, whereas in rice industry, milling refers to overall operation in a rice mill from cleaning of paddy to rice gradation. Milling also refers to extraction of juice and oil. Dehulling involves removal of the fibrous seed coat that tightly envelops the cotyledons. It is the major primary process, and improves the cooking quality, digestibility and appearance of the product. In India there are about 10,000 dal mills mostly located in urban areas. About 75% of the total production of pulses is milled in dal mills.

Pulses are more susceptible to damage due to insects (5%) as compared to major cereals like wheat (2.5%), Paddy (2%) and maize. Whole grain stored over a longer period is reported to give lower dal yield compared with fresh grain. Dal milled from freshly harvested pigeon pea can be stored for a longer period. Establishment of dal mills in the villages would enable milling of pulses soon after harvest, resulting in the storage of dal rather than whole grains. Dal has better storage life than whole grains, although proper protective measures are required.

# TOMATO SEED EXTRACTOR

## Features

Tomato or lime fruits are crushed in the crushing assembly and goes in to a separator assembly, which separates the seeds and juice from skin. The seeds and juice are separated using vibratory sieve mechanism and collected separately. Thus the seed, juice and skin are obtained separately at three separate outlets.

## Specifications

Size of machine (mm)	1580×1000×900
Capacity of machine (kg/h)	45-60 kg/hour of fruits
Seed recovery (%)	98 %
Juice recovery (%)	80 %
Electric power (hp)	1.5 hp, 3 phase motor
Man power	2 workers



## Uses

To extract seeds from Tomato

## Sources (Appendix)

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# BRINJAL SEED EXTRACTOR

## Features

The whole brinjal fruit is fed into hopper from where it is cut by cutting device and then crushed in a crushing assembly and goes into a separator assembly that separates the seed and skin. The seed and brinjal pieces are separated by use of water spray jet inside the separating chamber. Seed with water goes into settling tank, from where seeds are collected at the bottom outlet of the tank while brinjal pieces are collected at a separate outlet.

## Specifications

Size of machine (mm)	:	1000×610×1640
Capacity of machine (kg/h)	:	200
Seed recovery (%)	:	97 %
Electric power (hp)	:	1 hp, 3 phase motor
Man power	:	2 workers



## Uses

To extract seeds from brinjal

## Sources (Appendix)

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# CHILLI SEED EXTRACTOR

## Features

Dry chillies are crushed in crushing assembly and goes to the drum separator assembly where the seeds and powder are separated from dry skin shell. The collected seeds and powder are fed to the cleaning unit where cleaned seed is obtained. The small pieces of skin and powder are obtained at the end of a cyclone separator. The skin shell also has high market value.



## Specifications

Size of machine (mm)	1450×920×600
Capacity of machine (kg/h)	60-70, dry chillies
Seed recovery (%)	98 %
Electric power (hp)	1, 3 phase motor and 0.5 one each
Man power	2 workers

## Uses

To extract seeds from chillies

## Sources (Appendix)

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# AXIAL FLOW VEGETABLE SEED EXTRACTING MACHINE

## Features

It consists of frame, feeding chute, a primary chopping chamber, a crushing chamber, seed collecting chamber, rotor, concave screen a seed outlet, a waste (pulp) outlet, water sprinkler and power transmission system. The fruit are cut into small pieces in the primary chamber. Thereafter, these are cut and crushed by means of axially arranged blades attached to a rotor shaft. The shaft is rotated at a speed between 250-300 rpm. Apart from the cutting blades, conveying rakes have also been provided on the shaft to move the pulp and coarse material along the axis to eject it out. The concave screens are of different sizes viz. fine, medium and with large opening and these can be easily removed and re-fixed for different seed sizes. The machine can extract seeds at the rate of 5.49, 3.78, 9.42, 4.68, 3.60, 6.60 and 1.42 kg/h respectively of brinjal, tomato, chilli, summer squash watermelon, squash melon and cucumber. Seed germination is higher with mechanically extracted seeds as compared to manually extracted seeds.



## Specifications

Length (mm)	1950
Width (mm)	950
Height (mm)	1400
Length of rotor (cm)	174.5
Diameter of rotor (tip to tip of blades) (cm)	32.5
No. of blades on the rotor	12

Spacing between blades (cm)	6.8
Tip to tip diameter of conveying rakes (cm)	30
Width of concave (cm)	36
Total weight of machine (kg)	164

### Uses

Axial flow vegetable seed extracting machines are used for extracting seeds from the fruits of different vegetables like brinjal, chilli, watermelon, summer squash, cucumber, tinda etc. Seed germination is higher with mechanical extraction in comparison to manual extraction.

### Sources (Appendix)

995

## GROUNDNUT DECORTICATOR

### Features

It consists of an oscillating sector with sieve bottom and a handle. Ten numbers of cast iron peg assemblies are fitted in the oscillating sector unit. The groundnut pods are shelled between the oscillating sector and the fixed perforated concave screen. The decorticated shells and kernels fall down through the perforated concave sieve, are collected at the bottom of the unit, and separated manually by winnowing.



### Brief Specification

Length (mm)	625
Width (mm)	310
Height (mm)	1320
Type	Hand operated
Power requirement	Manual, one person
Capacity (kg/h)	200

### Uses

To shell groundnut pods and separate kernels.

### Sources (Appendix)

183, 382, 1187, 1656, 1671, 1683, 1736

## GROUNDNUT DECORTICATOR

### Features

The groundnut cum castor decorticator is simple equipment and easy to install and operate. The decorticator consists of an angle iron frame the two sides of which are covered with mild steel sheet, a perforated mild steel sieve the openings of which are designed to suit a particular grade of groundnut or castor, decorticator shoes made of cast iron or nylon, a handle made of mild steel flat iron, hand grips attached to the handle made of wood and a mild steel rod which acts as a fulcrum for providing reciprocating motion to the handle. The shoes and sieve are important components of the decorticator. The shoe has conical projections at the bottom face, arranged in staggered fashion. The top face is flat. Three shoes are arranged along the arc with the



help of flat iron pieces. The sieve has rectangular openings with rounded corners. The openings are also staggered in the sieve. The sieve is fitted in the frame in the shape of semi circular arc. The sieves are available with different openings for decortication of different grades of groundnut and castor. The shoes are joined to the handle and can be raised or lowered to suit the size of pods. Four mild steel pieces with holes are joined to the legs of the decorticator for installing it on the wooden board or anchoring it to the floor.



For operation, the decorticator is mounted on the wooden board or on the floor to provide stability during decortication. The sieve is selected according to pod size and crop and mounted in the decorticator. The clearance between the bottom of the shoes and sieve is adjusted according to size of the pod. If the clearance is less, there will be breakage of the kernels and in case the clearance

is more, the crop will be partially decorticated or shelled. The decorticator is filled to the capacity so that the shoes are fully covered by the pods. The operator holds the handle of the decorticator and gives it a reciprocating motion. With the motion of the handle, the shoes move in a semicircular arc and the pods, which are trapped in between the shoes and sieve get decorticated or shelled. The decortication takes place due to the friction between the pods and sieve, pods and shoes and between the pods. The sieve opening is kept greater than the size of the pod and less than the size of the kernels; therefore the kernels and broken shells pass through the sieve and fall on the board or floor. Further cleaning, separating the shells from the kernels is done manually by sifting or other methods.

For effective decortication, the pods should be dry which can be judged by breaking the pod between the fingers.

### Specifications

#### Overall dimensions

Length (mm)	500
Width (mm)	250
Height (mm)	1110
Weight (mm)	15
Groundnut sieve size (mm)	45 × 9
Castor sieve size (mm)	45 × 6 or 20 × 6
Broken grains (%)	2.30-2.65
Total grain loss (%)	2.30-2.65
Capacity (kg/h)	60-68

### Uses

The groundnut cum castor decorticator is used for decortication of groundnut and castor crops.

### Sources (Appendix)

254, 403, 885, 1633, 1690, 1763

## GROUNDNUT DECORTICATOR FOR WOMEN

### Features

It is a manually operated equipment to separate kernels from groundnut pods for rural women, who are accustomed to work in a sitting posture. The unit consists of frame, handle and oscillating arm sieve with oblong hole. The pods are fed in batches of 2 kg and crushed between concave and oscillating arm having cast iron/nylon shoe to achieve shelling.

## Specifications

### Overall dimensions

Length (mm)	500
Width (mm)	270
Height (mm)	640
Weight (mm)	5.7
Groundnut sieve size (mm)	45 × 9
Broken kernels (%)	2.30-2.65
Total grain loss (%)	2.30-2.65
Shelling efficiency (%)	93-98
Capacity (kg/h)	35-40



### Uses

The groundnut decorticator is used for to separate kernels from groundnut pods.

### Sources (Appendix)

254, 403, 885, 1633, 1690, 1763

## POWER OPERATED COCONUT DEHUSKER

### Features

The machine is used for dehusking of coconut. It consists of semi-circular stationary concave and rotating drum with knives. The electric motor (3 hp) with 10:1 speed reduction unit is used to drive the drum. The power is transmitted from motor to reduction unit using V-belt and further power from reduction unit to rotating drum is transmitted with chain and sprockets. During operation, the small knives bite the coconut fed through the inlet. At the outlet the nut is fed through two rollers to remove parts of husk remaining on the nut after dehusking.



### Specifications

Stationary concave width (mm)	250
Rotating drum width (mm)	250
No of rollers	2
Size of roller (l × diameter) (mm)	280 × 955
Number of teeth on rollers	15
Frame (l × b × h) (mm)	1020 × 380 × 970
Length of knives (mm)	12
Power source (hp)	3, Electric motor

### Performance results

Rotary drum speed (rpm)	22-32
Time taken for dehusking one coconut (s)	10-20
Moisture content (%)	25.40-60.2
Torque (kg-m)	67.1-96.35

### Uses

It is used for dehusking of coconut

**HAND OPERATED PULSES DEHUSKING MACHINE****Features**

The machine consists of an inverted emery coated cone fixed to a vertical shaft. The shaft can be raised or lowered by a clearance adjustment screw with a wheel and a check nut. The emery cone is enclosed in a steel wire mesh segmented cone strengthened by radial frames fixed on the main frame of the machine concentric to the emery cone, provide with an opening at the top to feed the grains through a conical hopper having micro system for smooth flow of pulses into the machine. Segmented inverted cone of wire mesh is covered with a cone made of mild steel sheet. Just below the inverted cone, another cone made of mild steel sheet is provide which is connected to a discharge outlet at the bottom to discharges the mill stream through the same in bag or container placed under it. The main frame is supported on four supports made of mild steel angle sections. The shaft is operated through bevel gears manually by a handle and the r.p.m of the machine is 60-70. It can process about 30-60kg of pulses per hour. It requires additional arrangement for cleaning and grading.

**Specifications**

Recovery of head pulses (%)	78-80
Recovery of brokens (%)	1-3
Dehusking percentage (%)	98-100
Capacity (kg/hr)	
Bengal gram	50-60
Kesari, soyabeans	50-60
Pigeon pea	40-50
Lentil	35-45
Black gram	25-30
Greengram, moth	25-30
Power requirement	One person

**Uses**

It is used for dehusking various pulse grains for making dal. Cleaning and grading has to be done separately.

**Source (Appendix)**

75, 746, 1388

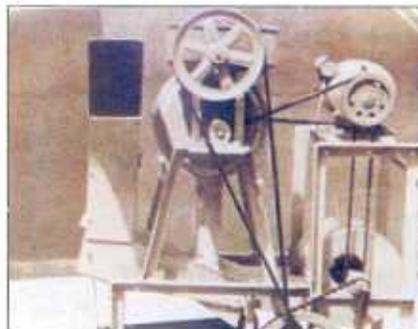
**SUNFLOWER SEED SHELLER****Features**

It consists of a rotor, elevator, blower and two sieves. The rotor consists of two wooden discs with hard rubber of which one is stationary and the other, revolving. The seeds fed into the hopper get graded initially and shelled at rotor assembly. It is used for shelling of sunflower

seeds. Use of this machine results in generation of 23 per cent additional income through superior quality oil and oil cake.

### Specifications

Dimensions l × w × h (m)	2.8 × 2.0 × 1
Weight (kg)	130
Disc dia (mm)	230
No. of discs	Two
Blowers	Centrifugal, One No.
Power source (hp)	3, electric motor



### Performance results

Crop	Sunflower seeds
Disc speed (rev/min)	3400
Shelling efficiency (per cent)	90
Separation efficiency (per cent)	96
Output capacity (kg/h)	100
Labour requirement (man-h/q)	1.4

### Sources (Appendix)

195, 1287, 1589, 1656

## MOTORISED RUBBER TYPE SHELLER

### Features

The rubber type groundnut sheller consists of a rubber tyre, which rotates inside a concave. The abrasion action between the moving and stationary surface splits open the shells. Below the main cylinder is placed a blower by which the light shells are thrown away. Shelled kernels fall on the sieve, which separates the broken and whole kernels in separate chutes. It is operated by a 2.0 hp three-phase electric motor. Some of the major components are the mainframe, hopper, rubber tyre assembly, blower, trough, three-layer sieve, concave etc.



### Specifications

Overall Dimensions	
Length (mm)	860
Width (mm)	710
Height (mm)	1120
Weight (kg)	100
Groundnut screen size (mm)	45×9
Outer cylinder diameter (mm)	226
Broken (%)	5
Operating speed (rpm)	200
Cleaning efficiency (%)	99
Shelling efficiency (%)	98
Capacity (kg/h)	300
Labour requirement (man-h/q)	0.33

## Uses

Used to separate kernels from groundnut pods.

## Sources (Appendix)

254

# RUBBER ROLL RICE SHELLER

## Features

The rubber roll rice shellers give significantly higher output and have been made compulsory by the government of India for all rice mills. It consists of rubber rollers driven by alloy steel gears. Belt drive models are also available. The output from the sheller does not get heated due to the provision of double action cooling air blower cum exhaust system. Some machines have integral husk separators.

## Specifications

Dimensions l×b×h (mm)	720 × 670 × 1300
Capacity (kg/h)	1000
Length of rubber roll sieve (mm)	154
Dia. of rubber roll sieve (mm)	220
Gross weight (kg)	200
Power required (kW)	2.2



## Uses

Used for shelling rice with high efficiency and without overheating.

## Sources (Appendix)

412, 1200, 1201

# MANUAL SOYBEAN DEHULLER

## Features

It is a manually operated equipment for obtaining soy splits (dal). It consists of a hopper, two concentric cylinders, driving mechanism and a blower fan mounted on a inclined frame. The whole soybean is broken or split into dal and passes through the screen to remove the brokens. The fan blows away the hulls and other light material. Dehulling takes place in the annular space between rotating and stationary cylinder.

## Specifications

Overall Dimensions	
Length (mm)	1700
Width (mm)	620
Height (mm)	1330
Weight (kg)	35
Outer cylinder diameter (mm)	300
Inner cylinder diameter (mm)	286



Cylinder inclination (degrees)	29
Operating speed (rpm)	100-150
Hulling efficiency (%)	98
Broken (%)	3-4
Capacity (kg/h)	35
Labour requirement (man-h/q)	3

### Uses

Used to separate hull and broken from the soy splits (dal).

### Sources (Appendix)

## MOTORISED SOYBEAN DEHULLER

### Features

It is similar to the manually operated equipment for obtaining soy splits (dal). It consists of a hopper, two concentric cylinders, driving mechanism and a blower fan mounted on a inclined frame. The whole soybean is broken of split into dal and passes through the screen to remove the brokens. The fan blows away the hulls and other light material. Dehulling takes place in the annular space between rotating and stationary cylinder. Suitable drives with V-belt and pulley have been provided for its operation. It consists of two concentric cylinder, belts and pulleys, power transmission system, blower, hopper, mainframe and perforated screen. Clearance between outer and inner cylinder can be adjusted with the end screw.



### Specifications

#### Overall Dimensions

Length (mm)	1600
Width (mm)	610
Height (mm)	1250
Weight (kg)	80
Outer cylinder diameter (mm)	226
Inner cylinder diameter (mm)	216
Outer cylinder length (mm)	400
Inner cylinder length (mm)	375
Operating speed (rpm)	450
Hulling efficiency (%)	95
Broken (%)	3-4
Capacity (kg/h)	80
Labour requirement (man-h/q)	1.3

### Uses

Used to separate hull and broken from the soy splits (dal).

**RICE HULLER****Features**

The rice huller consists of a rectangular hopper which feeds the unpolished rice into the hulling unit. The hulling unit consists of an enclosed cylinder in which a special rotor having helical and longitudinal ribs operates. The clearance between the cylinder and the rotor is carefully adjusted to prevent grain breakage and to obtain high hulling efficiency. The rotor is mounted on ball bearings and operated with an electric motor and flat belt pulleys.

**Specifications**

Output of cleaned rice (kg/h)	225-300
Output of cleaned rice from shelled rice (kg/h)	500-600
Size of Driving Pulley (mm)	305×152
Speed in (rpm)	700-800
Power Required (hp)	12-14

**Uses**

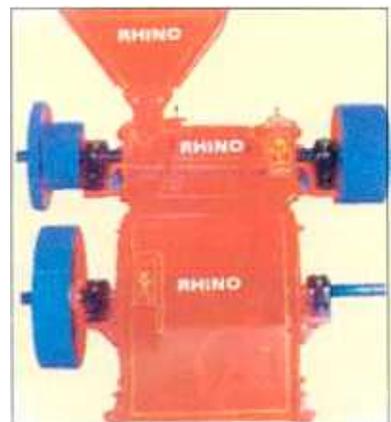
Used for removing the hulls from paddy

**Sources (Appendix)**

412, 745, 1200, 1201

**RICE HULLER POLISHER****Features**

The rice huller polisher is similar to the rice huller but also has a polishing unit built into it. It consists of a rectangular hopper, which feeds the unpolished rice into the hulling unit. The polishing unit is placed below the huller and consists of emery rollers to obtain clean and polished rice. The hulling unit consists of an enclosed cylinder in which a special rotor having helical and longitudinal ribs operates. The clearance between the cylinder and the rotor is carefully adjusted to prevent grain breakage and to obtain high hulling efficiency. The rotor is mounted on ball bearings and operated with an electric motor and flat belt pulleys.

**Specifications**

Output of cleaned rice (kg/h)	225-300
Output of cleaned rice (kg/h)	225-300
Size of Driving Pulley (mm)	305×127
Speed in (rpm)	700-800

**Uses**

Used for removing the hulls from paddy and also for polishing in a single operation.

**Sources (Appendix)**

412, 745, 1200, 1201

**RICE DEHULLER****Features**

The rice dehuller is composite machine which performs both dehulling and cleaning for which independent units are provided. The dehulled grains is automatically conveyed to the cleaning portion for removing the bran and other dust particles. It is a high speed machine operating at 1000-1200 rpm and has high capacity. The drive to various units is by means of V-belt and pulleys. It is a light weight machine and can be easily moved to the site of operation by means of wheels provided on its frame.

**Specifications**

Length×Width×Height (mm)	625×575×405
Power required (hp)	3
Speed (rpm)	1150-1250
Capacity (kg/h)	2000-2300
Net weight (kg)	97

**Uses**

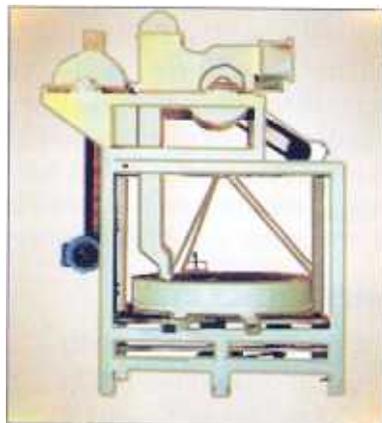
Used for dehulling and obtaining cleaned rice in one operation.

**Sources (Appendix)**

745

**COFFEE HULLER****Features**

The Huller consists of a cross beater, which rotates inside a perforated cylinder. The coffee to be hulled is fed into the hulling cylinder where the cross beater forces the coffee to pass through the perforated screen. This results in the complete separation of the husk from the coffee beans. The coffee beans and husk then pass through a powerful aspirator, which can be precisely adjusted for the perfect separation of husk and peels from the coffee beans. An oscillating screen is also provided for the separation of un-hulled coffee from the clean, hulled coffee beans by utilizing the difference in their specific gravity. The oscillating screen consists of a conical swinging sieve suspended by a universal joint. The frequency of oscillation can be adjusted by means of a step-less adjustable drive. In the



oscillating screen, the un-hulled coffee moves towards the center of the screen, is collected through a duct while the hulled coffee beans move towards the outer rim of the screen, and is discharged from the machine through the adjustable outlet duct. Swing down type doors are provided for quick and easy access to the hulling cylinders for the purpose of cleaning or replacement of blades and perforated screen. Individual motors have also been provided for the Huller, Aspirator and Oscillating Screen, so as to maintain their constant speeds irrespective of variations in each other, thus ensuring optimal and smooth performance. The generation of coffee dust or breakage of coffee beans is also minimal because the friction between the coffee beans is maintained at a minimum.

### Specifications

Overall dimension

Length (mm)	2250-3000
Width (mm)	1000-1500
Height	1750-2500
Power required (hp)	6.25-17
Capacity (kg/h)	1000-8000
Net Weight (kg)	475-1550

### Uses

Coffee huller is used for hulling both parchment and dry cherry coffee.

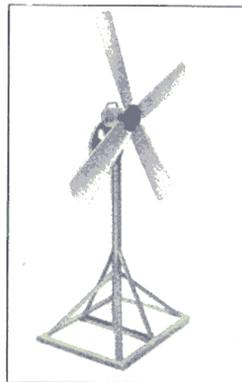
### Sources (Appendix)

461, 1493

## WINNOWING FAN

### Features

This is a mechanical device for generating winds for cleaning of grains from chaff when natural wind is not available. It consists of a frame, 3-bladed fan, bicycle pedal drive arrangement with seat, pulley-belt transmission system and a grill partition. The frame is mounted on the wooden board. Motion of the pedal is transmitted to the sprocket mounted on the frame. A pulley is also mounted on the same shaft and transmits the rotary motion to the larger pulley. Fan is mounted on the shaft of a larger pulley and it creates a draft of air.



### Specifications

Size of fan (mm)	1200-1250
Weight (kg)	22
Power	One or two persons

### Uses

It is used for cleaning of grains by the winnowing action.

## Sources (Appendix)

13, 67, 117, 155, 206, 209, 325, 385, 387, 420, 457, 555, 557, 569, 633, 658, 662, 700, 701, 712, 783, 857, 858, 859, 870, 884, 917, 938, 1009, 1010, 1129, 1154, 1272, 1282, 1283, 1291, 1509, 1521, 1528, 1536, 1683, 1684, 1743

## PRECLEANER

### Features

The precleaner is used in modern grain handling and storage systems for preliminary cleaning



of all kinds of grains and cereals. It is especially suitable for cleaning of cereals and other grains, which undergoes further processing in rice, flour and dal mills. The equipment consists of a sturdy frame, body, centrifugal fan, expansion chambers, magnetic separator and sieving assembly. The magnetic separator removes ferrous impurities like nails, pins, screws etc. from the grains before it enters the cleaning system. The centrifugal fan removes dust, chaff, immature grains and all other light impurities from the grain. An aspiration box collects the immature grains and delivers them through seal gate flap for bagging. The unit has dual aspiration at entry and exit, which ensures thorough cleaning and also creates a dust free atmosphere in the working area. The triple sieving mechanism removes stones, clay lumps, straw, leaves, sand and other impurities from grain. A beater-type cleaning device prevents sieve clogging and maintains a high sieving efficiency. These sieves are replaceable and can be selected according to type of grain.

### Specifications

Length (mm)	2005-2250
Width (mm)	992 - 1830
Height (mm)	2330-2350
Capacity (kg/h)	1000 – 3750 (depending upon type of grain)
Power requirement (kW)	2.3 – 3.7
Sieve length (mm)	1800
Sieve width (mm)	400- - 1220
Weight (kg)	510 - 1210

### Uses

It is used for cleaning of wheat, paddy and other grains, which undergo further processing in the mills.

### Sources (Appendix)

210, 283, 406, 412, 924, 1637, 1642

## SEED CLEANER

### Features

The seed cleaner consists of frame, feed hopper, aspiration system, prime mover and drive. Seed/grain is fed into the hopper, which passes through the feed gate into the aspiration chamber for removal of light dust. A simple mechanism controls the feed rate of the seed/grain, which is evenly distributed on to the scalping screen by a feed roller. The material on the scalping screen is subjected to vibration and the impurities such as stones, chaff etc. get separated and fall through the outlet. The partially cleaned seed/grain is sieved on to the grading screen. The seed/grain is again sifted through the second screen for removal of final impurities such as fine stones, sand, dust etc. and are removed through the outlet. The totally clean and graded seed/grain is discharged through another outlet provided in the cleaner. The screens are designed in a manner, which avoids plugging of the perforations, and can be quickly removed and replaced.



### Specifications

Length (mm)	:	2000-2500
Width (mm)	:	1200- 1850
Height (mm)	:	2000-2500
Capacity (kg/h)	:	5000 – 20,000 (depending upon type of grain)
Power requirement (kW)	:	4.5 – 6

### Uses

It is used for cleaning different types and sizes of grains.

### Sources (Appendix)

210, 283, 406, 412, 924, 1637, 1642

## SEED CLEANER

### Features

The seed cleaner consists of a hopper below which oscillating trays are provided for cleaning. A separate blower is used to drive away light and fine dust particles. The sieving trays are arranged one over the other for separating materials having different sizes. The unit is operated with electric motor and V-belt pulleys. The frame is made of mild steel angle sections. The trays are made of perforated mild steel sheets fitted on wooden frames. A dust collector is also provided for pollution free operation.



### Specifications

Overall dimension		
Length (mm)	:	2290
Width (mm)	:	1220
Height (mm)	:	1470
Power required (hp)	:	2
Capacity (kg/h)	:	2000

## Uses

It is used for cleaning of wheat, paddy and other grains, which undergo further processing in the mills.

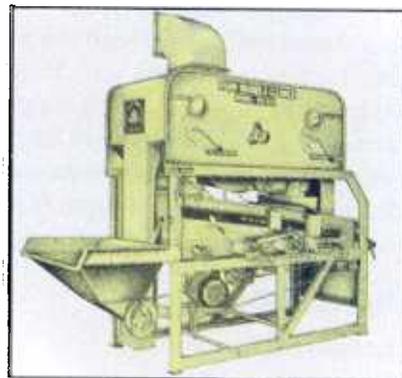
## Sources (Appendix)

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# SEED CLEANER-CUM-GRADER- 2 SCREEN

## Features

The machine is an air screen cleaner cum grader. The unit consists of frame and body, sieve assembly, screens, traveling screen brushes, feed hopper, air chamber, eccentric mechanism, spouts for impurities and transmission system. The grain mass to be cleaned and graded is fed into the feed hopper manually. The feed roll conveys the grain mass into the feed air trunk where it is lifted by means of the feed air and falls down on the top screen, fitted in the sieve assembly, through the pendulum type flap. The feed air removes light impurities and dust whereas heavier impurities such as stony matter etc. are removed from the grain mass by force of gravity through the feed air trunk.



While passing over the top screen the good grains fall over the bottom screen through the top screen and the coarse impurities such as thistle heads, eyes, stalk etc. are removed as an overflow material of the top screen. Bottom screen discharges the smaller impurities such as blighted grain, sand etc. and the finally graded but not cleaned grain passes over the lifter screen. Within the zone of lifter screen air trunk, further impurities such as weed seeds, immature grains, hollow kernels etc. the floating speed of which being slower than that of the fully sound grain (seed), are removed by means of the lifter screen air stream. Finally cleaned and graded grain (seed) moves further and falls into the bags held on the bag holders, through chutes and spouts.

The light impurities removed within the lifter screen air trunk are separated in the lifter screen-separating chamber and discharged into the chute through pendulum type flap.

The air containing dusty matter flows into a dust chamber or atmosphere by rotary blower through exhaust pipes.

## Specifications

Length (mm)	:	2515 – 3160
Width (mm)	:	914– 1460
Height (mm)	:	1930- 2560
Number of screens	:	2
Power requirement (kW)	:	2.3 – 3.7
Capacity (kg/h)	:	500-1000 (depending upon the grain)
Weight (kg)	:	745 – 800

## Uses

It is used for cleaning and grading of all type of grain and seeds.

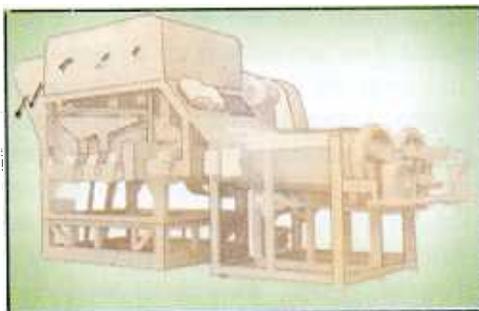
## Sources (Appendix)

210, 283, 406, 412, 924, 1637, 1642

# SEED GRADER- 2 SCREEN WITH INDENTED CYLINDER

## Features

The seed grader is similar to the seed cleaner cum grader 2-screen type attached with two indented cylinders. It consists of feed hopper with feed roller and feed control gate, set of sieves, dynamically balanced aspirator fan, stepless variable air controls, air chamber, sieve deck assembly, spouts, and indented cylinder grader. All these are mounted on a sturdy steel frame. Seeds/Grains are fed into a feed hopper where they are evenly distributed by a feed roller and drop



through a controlled gate on the top sieve. Before falling on top screen, grains are subjected to primary aspiration, which drains off chaff, straw, dust, deceased grains etc. Material is then passed through two sieve layers for separation according to width and thickness. After passing through screens, cleaned/graded material again passes through air sifter and aspiration where remaining light particles are sucked off by a strong upward draught of air. After size grading, material passes through indented cylinder grader for removing impurities based on length. Final product and impurities are collected separately through discharge chutes.

## Specifications

Length×Width×Height (mm)	:	3160×1460×2560
Capacity (t/h)	:	2
No. of screen	:	2
Size of each screen (mm)	:	1120 ×1430
Screen inclination	:	Fixed
No. of cylinders	:	Two
Size of each cylinder (mm)	:	1220 × 470
Cylinder inclination	:	Fixed
Rotational speed of cylinders	:	Variable
Screen Perforation cleaning device	:	
Top	:	Beaters
Bottom	:	Nylon Brushes
No. of aspiration	:	Two
Fan Capacity (m <sup>3</sup> /min)	:	185
Fan Speed (rpm)	:	980
Electric Motor (kW)	:	7.1

## Uses

It is used for cleaning and grading of seeds of all crops such as wheat, paddy, barley, maize, millets, sunflower, soybean, oilseeds, pulses, vegetable seeds etc.

## Sources (Appendix)

210, 283, 406, 412, 924, 1637, 1642

## SEED GRADER-2 SCREEN

### Features

The seed grader has built-in cyclone dust collectors, various air regulations arrangement, adjustable feeding level and feed control, interchangeable screens and double air aspiration

system, pneumatic feeding, dynamically balanced double aspirator fans, air chamber and sieve deck assembly. All these units are mounted on a sturdy machine frame. For operating the machine the seeds/grains are fed into a low level feed hopper where they are sucked up by double aspirator fans and drop on the top sieve. Before falling on top screen, grains are subjected to primary aspiration, which drains off chaff, straw, dust, deceased grains etc. Material is then passed through two sieve layers for separation according to width and thickness. After passing through screen, cleaned/graded material again passes through air sifter and aspiration where remaining light particles are sucked off by a strong upward draught of air. Final product and impurities are collected separately through discharge chutes.



### Specifications

Length×Width×Height (mm)	3060×2500×2470
Capacity (t/h)	1.5-2
No. of screen	2
Size of each screen (mm)	1120×1430
Screen Perforation cleaning device	
Top	Beaters
Bottom	Nylon Brushes
No. of aspiration	Two
Fan Capacity (m <sup>3</sup> /min)	185
Fan Speed (rpm)	1080-1440
Electric Motor (kW)	5.6

### Uses

It is used for cleaning and grading of seeds of all crops such as wheat, paddy, barley, maize, millets, sunflower, soybean, oilseeds, flower seeds, fodder/forestry seeds and various spices etc.

### Sources

210, 283, 406, 412, 924, 1637, 1642

## SEED CLEANER-CUM-GRADER- 4 SCREEN

### Features

The seed cleaner-cum-grader consists of sturdy frame, body, ball bearing eccentrics, screens, travelling screen brushes, auxiliary shoes, spouts for screens, feed hopper, two air separating chambers, variable speed unit and drives. It is 4- screen precision machine. For removing fines, the top screen does the work of scalping and the bottom three screens remove fines thereby ensuring 100% cleaning and grading of the grains. The machine can be adjusted for the conditions where the removal of fines and wheat seeds smaller than the main product is of prime importance.



In this case the top two screens are used for scalping whereas bottom screens remove fines. By opening the tailgate the material after scalping is directed to the bottom screen.

### Specifications

Length (mm)	:	3070
Width (mm)	:	2060
Height (mm)	:	2180
Number of screens	:	4
Power requirement (kW)	:	6
Scalping screens	:	1st or 1st and 2 <sup>nd</sup>
Grading screens	:	2 <sup>nd</sup> , 3 <sup>rd</sup> , and 4 <sup>th</sup> or 3 <sup>rd</sup> and 4 <sup>th</sup>
Screen length (mm)		
Scalping	:	1120 and 2240
Grading	:	3360 and 2240
Screen width (mm)	:	1370
Capacity (kg/h)		
Wheat	:	Precleaned 1900-2000, Uncleaned 1400-1600
Paddy	:	Precleaned 1600-1700, Uncleaned 1200-1400
Maize	:	Precleaned 2400-2500, Uncleaned 1800-2000
Bajra	:	Precleaned 1900-2000, Uncleaned 1400-1600
Sorghum	:	Precleaned 1900-2000, Uncleaned 1400-1600
Weight (kg)	:	2000

### Uses

It is used for cleaning and grading of all type of grain and seeds.

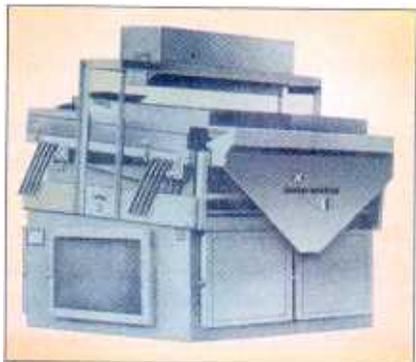
### Sources (Appendix)

210, 283, 406, 412, 924, 1637, 1642

## DRY DE-STONER

### Features

The equipment consists of frame, body, hopper, fan and vibratory inclined screen system. The dry de-stoner efficiently removes heavy particles such as stones, magnetic and non-magnetic metals, field impurities etc. from cereals and other grains. The equipment is used in rice, oat,



wheat and corn milling units, in silos and food processing plants. The separation of impurities from the grain is achieved due to difference in specific gravities. The machine uses forced air-reversing principle, in which many factors combine to make the material act like a fluid on the vibratory inclined screen. The grain with contaminants floats upwards in the lower section of the grain bed. During this action the heavier particles settle and the lighter particles rise to top of the bed. Prior to reaching the upper screen end, the cleaned top section of the material

is forced to reverse due to air current, which is precisely controlled. The heavier particles continue to travel upwards to the corresponding stone collecting tank. The operation of the dry de-stoner is regulated entirely by a scavenging air gate valve.

### Specifications

Length (mm)	1115
Width (mm)	590 - 1200
Height (mm)	1420 - 1675
Air requirements (m <sup>3</sup> /min)	20 - 55
Power requirement (kW)	1.1 - 2.2
Capacity (kg/h)	
Grain and pulses	1000 - 3000
Paddy and oats	500 - 2250

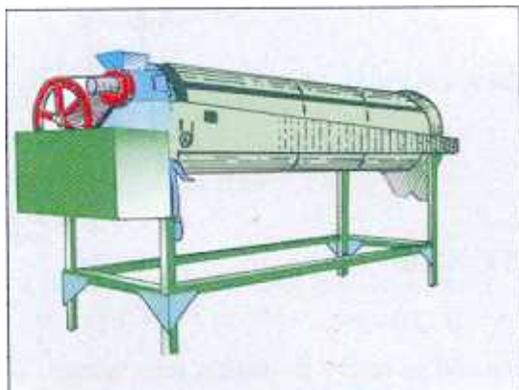
### Uses

It is used for removing heavy particles such as stones, magnetic and non magnetic metals, field impurities from cereal and other grains.

### Sources (Appendix)

412, 1637

## INDENTER CYLINDER GRADER



### Features

The indented cylinder grader consists of a hopper and indented cylinder. The cylinder is built with two semi-circular segments, which are bolted together. The cylinder has a number of indents or pockets into which broken grains are caught. The unbroken grains being of longer length flow over the pocket. The cylinder is rotated in horizontal or slightly inclined position. The particles small enough to lodge in the pockets are raised to a certain point, after which they drop out into a catch trough and are removed by a worm conveyor. Large particles tail over to the end of the cylinder. The material, which is fed into the cylinder, tends to stratify, bringing the smaller particles into contact with the indented surface. It is specially used for grading grains for seed purposes. The indented cylinder can also be attached to the cleaner grader also for grading of the seeds.

### Specifications

Length (mm)	3400-4000
Width (mm)	900
Height (mm)	1800-2600

Diameter of the cylinder (mm)	405-710
Length of cylinder (mm)	510-2740
Power requirement (kW)	1-2.2
Weight (kg)	560-1300
Capacity (t/h)	1-4

### Uses

It is used for removing weed seeds, broken grain, round seeds, short grains etc. from wheat and other cereal crops.

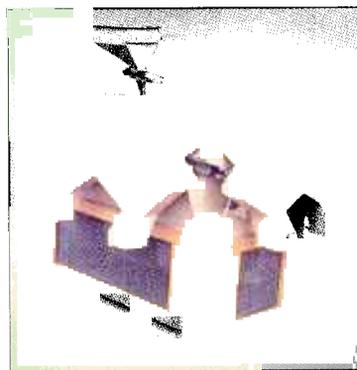
### Sources (Appendix)

210, 283, 406, 412, 924, 1637, 1642

## GRAVITY SEPARATOR

### Features

The equipment is made of steel frame and body and has features like centrally located control for feed rate, speed of deck oscillation, volume of air and side and end inclination of deck. It has large gravity feed hopper with gate for controlling the feed rate and quick shut off. The machine is designed to efficiently separate particles of the same size but differing slightly in specific gravity by taking advantage of differences in their specific weights. Usually five adjustments are provided in a machine. The mixture to be separated is fluidized on a film of compressed air for stratification. The light particles flow by gravitational force to the lower end of the deck while the heavy particles move upward into separate compartments by the motion of the deck. The parameters can be adjusted while the machine is in motion such as adjusting airflow, adjustment for speed of eccentric motion, side and length tilt of the deck and rate of product field.



The light particles flow by gravitational force to the lower end of the deck while the heavy particles move upward into separate compartments by the motion of the deck. The parameters can be adjusted while the machine is in motion such as adjusting airflow, adjustment for speed of eccentric motion, side and length tilt of the deck and rate of product field.

### Specifications

Length (mm)	1065-3403
Width (mm)	1065 - 1626
Height (mm)	1674 - 1753
Power requirement (kW)	1.5– 11.2
Deck size (mm)	760 × 915-1200 × 3000
Capacity (kg/h)	
Particle size 6-10 mm	50-225 to 3600-6800
Particle size 3-6 mm	50-140 to 2250-4550
Particles size 1.5-3 mm	30-50 to 1200-2250

### Uses

It is used for separation of light grains from good grain of same variety, separation of noxious weed seeds from grain, separation of diseased seeds, separation of cracked and damaged seeds, removal of sand and other foreign particles from food grains. The machine can be used for crops like wheat, coffee, seeds, spices, sesame, groundnut and other crops.

### Sources (Appendix)

210, 283, 406, 412, 924, 1637, 1642

# SPECTRUM VIRBO CLEANER

## Features

Spectrum vibro cleaner is provided with two vibrating screens- the top screen removes oversize material while the bottom screen eliminates fine dirt and sand. The vibration of the deck containing the screens is provided by means of vibratory motors mounted in the center of the machine. The deck inclination, stroke and angle of throw are adjustable for optimum performance. The vibrating deck is mounted on four hollow rubber springs thus ensuring that the vibration of the machine frame is reduced to a minimum. A swing down type door is provided for easy change or cleaning of screens. The construction is such that there



is easy access to the screens for cleaning and changing. The deck inclination, stroke and angle of throw can be easily adjusted. Use of vibratory motors ensures trouble-free operation. It is quiet in operation and free of vibrations.

## Specifications

### Overall dimension

Length (mm)	:	2000-3000
Width (mm)	:	1000-1500
Height	:	1500-2000
Power required (hp)	:	1.0-2.5
Capacity (kg/h)	:	1000-8000
Net Weight (kg)	:	400-1000

## Uses

Spectrum Vibro Cleaners are used for removing large impurities like stick, buck and leaves as well as fine dirt and sand from products in seed cleaning and processing plants.

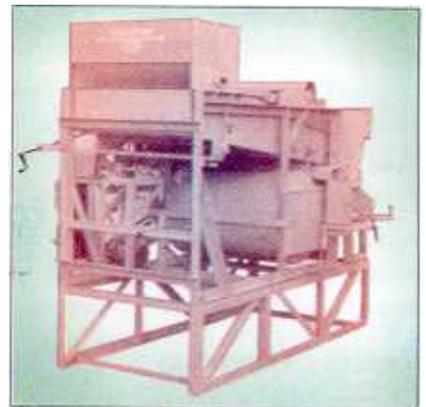
## Sources (Appendix)

1493

# AIR SCREEN GROUNDNUT POD CLEANER

## Features

The frame of the cleaner is made of mild steel angle iron section and body of mild steel sheet. The feeding hopper is provided with a special feed control gate so that uniform layer of the groundnut pods fall over the screen. A dynamically balanced bower fan is provided in the cleaner. High carbon strips are provided for shaking screen decks. All other moving parts are covered with safety guards. In the expansion chamber, lighter pods are separated from the air and collected separately as rejects. The air is discharged only with light impurities. The cleaned groundnut pods are discharged into the shaking spout, which delivers these pods at one side of the cleaner. The cleaner can be fitted with inclined belt conveyer for feeding the cleaner.



## Specifications

Length (mm)	:	2830
Width (mm)	:	1400
Height (mm)	:	1600
Number of screen	:	1 flat oscillating type
Screening area (m <sup>2</sup> )	:	1.64
Oscillation speed	:	Variable
Number of aspirators	:	1
Power requirement (kW)	:	2.3
Capacity (kg/h)	:	1000

## Uses

It is used for cleaning of groundnut pods, removes undersize impurities, lighter impurities, undersize hollow pods from the raw mass.

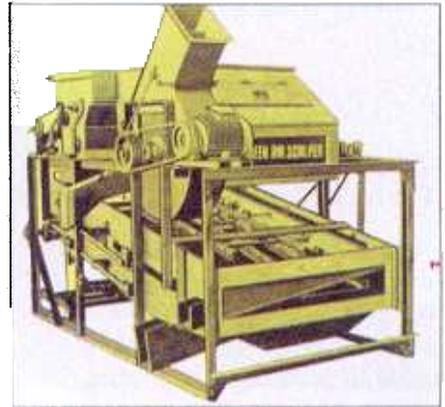
## Sources (Appendix)

210, 283, 406, 412, 924, 1637, 1642

## GRAIN-SEED SCALPER- WITH AIR SEPARATION

### Features

The grain-seed scalper is designed for cleaning all kinds of seeds and grains. The unit consists of frame, body, feed hopper, eccentric drive, variable speed unit, screens, travelling screen brushes, air separation chamber, spouts for screens and drive system. The air separation system removes light impurities before the seed/grain is subjected to screening process. It has two oscillating screens; one for removing coarse material and second screen removes the fines.



### Specifications

Length×Width×Height (mm)	:	2667×1956×2080
Number of scalping	:	1
Number of screening	:	1
Power requirement (kW)	:	3.7
Capacity (kg/h)	:	5000-10000 (depending upon the grain)
Weight (kg)	:	1200

### Uses

It is used for cleaning of all type of grain and seeds.

### Sources (Appendix)

210, 283, 406, 412, 924, 1637, 1642

## MANUAL DOUBLE SCREEN CLEANER

### Features

It is manually operated equipment used to sieve the grains for cleaning. Batches of 5-10 kg can be loaded at a time. It consists of mainframe scalper/grading screen, draper rod, handle, shutter etc. Eyelets are provided the top to hang the unit thereby eliminating the weight of the unit coming on the arms of the worker. After filling, it is operated by swinging action. It

separates impurities like stubbles, chaff, dirt and broken from wheat, Bengal gram, soybean and other cereals and pulses crops.

### Specifications

#### Overall Dimensions

Length (mm)	900
Width (mm)	600
Height (mm)	140
Weight (kg)	14
Top screen size (mm)	5.0-8.5
Bottom screen size (mm)	18×20-32×20
Screen effectiveness (%)	75.4-86.3
Cleaning efficiency (%)	99.0-99.8
Capacity (kg/h)	150-225
Labour requirement (man-h/q)	0.5



### Uses

It is used to separate dust, impurities and broken from grains.

### Sources (Appendix)

254

## PEDAL-CUM-POWER OPERATED GRAIN CLEANER

### Features

The machine consists of an angle iron frame on which the other components are mounted, grain hopper having slant bed with feed control mechanism, cleaning box with sieves, blower unit, power transmission system and cycle type pedaling unit. The cleaner can also be operated with electric motor in place of pedals. The eccentric



mechanism on main shaft is driven by pedal shaft or motor shaft through sprocket-chain drive and provides reciprocating motion to the cleaning box. The pulley on blower shaft receives the power from main shaft pulley by V-belt. Air draft is created by the blower, which is directed at the free falling grain from the hopper and thus separates the grain from the chaff or light impurities.

The grain cleaner separates impurities from the grain on the basis of difference in size and weight. For operation the grains are filled in the hopper. The feed control mechanism is adjusted so that the grains fall in the form of sheet in the cleaning box. The sieves in the cleaning box are selected according to the grains and mounted in the cleaning box at their positions. The cleaner is operated either by pedal or electric motor. A sheet of grain due to gravity drops on the top-scalping sieve. The blower creates a strong draft of air, which directs on the falling grain. The lighter grains and lighter foreign material like chaff, leaves etc; are blown away in suspension and the heavier material and grains falls on the top sieve of the cleaning box. The cleaning box with sieves is in reciprocating motion and thus separate grain in grades according to size and removes the heavier and large impurities from the top sieve.

13 mm rods with a pitch of 25 mm. The rubber spools of the sizing conveyor are mounted on 13-mm mild steel rods and two endless link chains at a spacing of 102 mm. The rods carrying the rubber spools rest on the mild steel railings on both sides. Power to the sizer is provided by 2-hp electric motor mounted on a platform.

### Brief Specifications

Source of power (hp)	2, motor
Length (mm)	5200
Width (mm)	1640
Height (mm)	1280
Width of the elevator feed conveyor (cm)	56
Length of elevator feed conveyor (cm)	169
Angle of the elevator w.r.t. horizontal (degrees)	38
Speed of feed elevator conveyor (rpm)	45
Speed of intermediate conveyor (m/min)	61.2
Speed of helical driving shafts (m/min)	7.3 - 7.8
Weight of the machine (kg)	550

### Uses

Potato graders are used for grading potato tubers into different grades. The grader can grade the potatoes into four different grades and its capacity is 2.5 t/h. The performance of the grader in terms of sizing accuracy is observed to be better for potato tubers between 20 and 60 mm diameter.

### Sources

367, 939, 1199

## APPLE / MANGO GRADER

Grading is an important post harvest operation. Graded produce fetch more price in the market and it is also convenient to pack the graded fruits in cases / boxes. The grader is a power operated, differential speed, expanding pitch V-belt apple grader. It consists of six V-belts with 24 wooden pulleys mounted over four shafts. The distance between adjacent belts increases gradually from 2 cm at the feed end to 5.5 cm at the delivery end. The upper portion of the belts between the upper pulleys act as grading section and the whole grading length is divided into three parts to obtain three different grades. Changing the position of partition walls provided to separate grades could change the size range of various grades. The separation efficiency of the machine is 76 per cent at a grader speed of 40 rpm and feed rate of 1500 kg/h. To increase the separation efficiency of the grader, differential speeds have been provided to adjacent belts. Due to difference in speed of belts over which an apple moves, there is a rotational effect imparted on the apple, which helps in better separation. The machine can also be used for potato grading.



### Sources (Appendix)

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