



SUNFLOWER SEEDS DEHULLING & SIEVING COMPLEX WITH WINNOWER/ASPIRATOR

Application: to increase the oil content in processed raw materials, to increase the productivity of technological equipment at oil refineries.

SEEDS DEHULLING & SIEVING COMPLEX WITH ASPIRATOR

consists of R1-MRA SUNFLOWER SEEDS DEHULLING MACHINE and R1-MST SIEVING MACHINE with WINNOWER/ASPIRATOR

R1-MRA SUNFLOWER SEEDS DEHULLING MACHINE

Application R1-MRA:

Separation of the shell from the kernel of the sunflower seed by method of impacts (IMPACT DEHULLER) and subsequent separation into fractions:



- big sized, middle sized and small sized husk,
- unhulled seeds,
- partially dehulled seeds,
- whole kernel,
- kernel halves,
- small parts of husk and kernel (broken kernels),
- oil dust

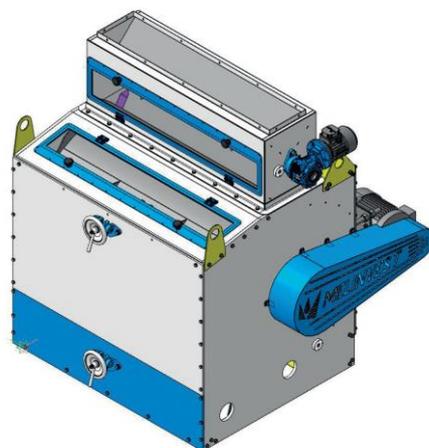
R1-MST SIEVING MACHINE with WINNOWER/ASPIRATOR

R1-MST consists of a SIEVING MACHINE (plansifter) and 5 chambers WINNOWER/ASPIRATOR. WINNOWER/ASPIRATOR separates the husk particles by inclined air flow. The result of separation: kernel, unhulled seeds, mixture of husk and kernels and husk.



Flow chart diagram

1



**R1-MRA SUNFLOWER
SEEDS DEHULLING
MACHINE**

2



**SIEVING MACHINE
R1-MST COMPLEX**

3

**WINNOWER/
ASPIRATOR
R1-MST COMPLEX**



R1-MRA SUNFLOWER SEEDS DEHULLING MACHINE

P1-MPA works on the principle of repeated impact and splitting of the shell (impact dehulling machine). The resulting product: mixture after dehulling: kernels, husk, broken kernels, oil dust, unhulled seeds, partially dehulled seeds.

P1-MPA machine consists of the following parts:

- 1) feeding (intake) hopper, corrugated roller, adjustable gate
- 2) rotating drum with 3 disks.
16 blades are fixed on each disk.
- 3) cast iron deck

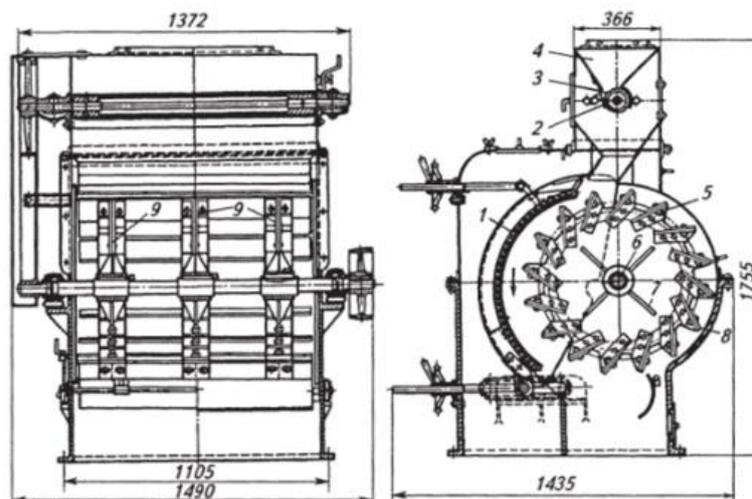


Рис. 10.5. Бичевая обрушивающая машина типа МНР:

- 1 — deck; 2— adjustable deck; 3 — corrugated roller; 4 — feeding (intake) hopper;
5 — blades' posts; 6 — angle; 7— disks frames; 8 — blades; 9 — disks

Operation: the seeds entering the feeding hopper are evenly distributed by a roller over the width of the working area. The flow of seeds, regulated by a gate, falls on an inclined surface in the feed hopper and then, sliding off, falls on the blades of a rotating drum. The blades are steel plates 972 mm long, 100 mm wide and 10 mm thick, fixed on a rotating drum. Seeds entering through the feed roller first hit the moving blades, and then are thrown onto the corrugated surface of the decks. As the result of repeated impacts on blades and decks, seed shells are destroyed.

The drum with blades and feed roller are driven by an electric motor through the belt drive.



Seeds must evenly flow and be distributed along the length of the drum with blades. The uniform distribution of seeds along the feed roller depends on the purity of the seeds. In case the distribution is not uniform, one part of the drum will be overloaded and there will be more partially dehulled seeds and the other part of the drum will be underloaded and there will be more broken kernels and oil dust.



The impact force depends on the speed of blades (from 23 to 26 m/s at a drum speed of 560 to 630 rpm) and the distance between the blades and the deck. The higher the frequency of the drum rotation with blades, the higher the blades' speed and the stronger the seeds' dehulling. The speed of the blades is adjusted by change of frequency rotation of the drum by changing the frequency rotation of the drum. High frequency of rotation is required for wet seeds, low frequency of rotation is required for dry, more frangible seeds.



The optimum moisture content of seeds during dehulling shall be from 6.5% to 7%.



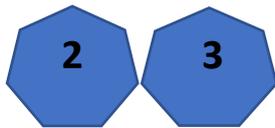
If required, the distance between the blades and the deck is adjusted by moving the deck closer or further away from the blades with the help of handwheels. During operation, the gap can be adjusted according to the moisture content and seed size. Wet seeds require less gap, dry seeds require more distance.



The distance between the deck and the blades should be equal along the entire length of the drum: when the deck approaches closer to the blades, there will be more broken seeds and when the deck is more distanced from the blades, there will be more partially dehulled seeds. The surfaces of the blades and decks must always be in good condition, since the wear of the outer edges of the blades and decks leads to increase of partially dehulled seeds.

TECHNICAL SPECIFICATION	
capacity (depending on the intensity of processing), t/day	80
Valid technical standards:	
unhulled seeds & partially dehulled seeds	Less than 25 %
oil dust	Less than 10 %
broken seeds	Less than 12 %
To correspond the above standards the moisture content of seeds during dehulling shall be from 6.5% to 7%.	
Speed, rpm with variable frequency drive	560-630
without VFD	630
Rotor diameter, mm	800
Rotor width, mm	1270
Installed power, kWt	11,0
Air consumption for aspiration, m ³ /h.	800
Service life before major repairs, years, min	5
Total service life, years	13
Overall dimensions, mm: length width height	1660 1610 1690
Net weight, kg	1750



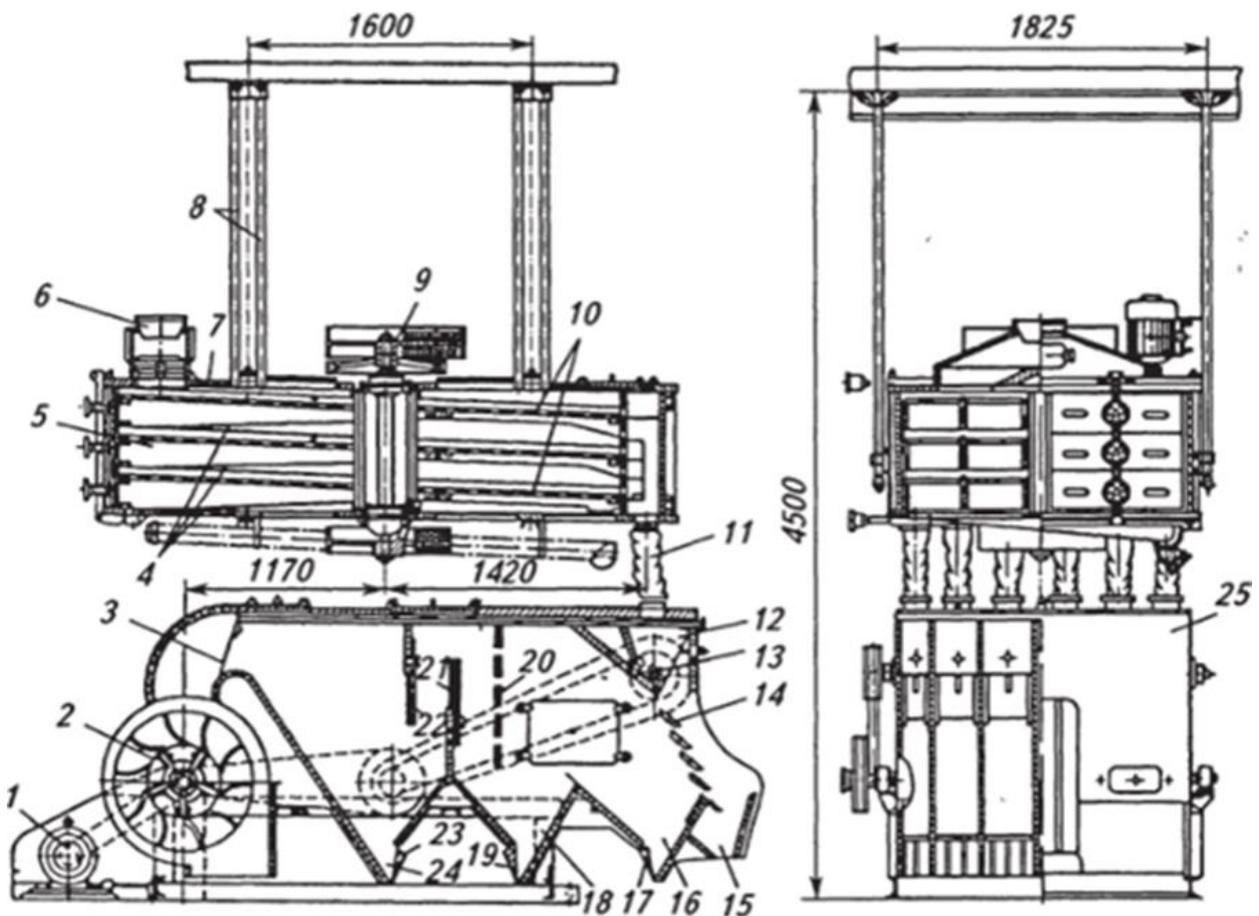


R1-MST SIEVING MACHINE with WINNOWER/ASPIRATOR

consists of two machines located one upon the other and connected by flexible pipes:

Above - SIEVING MACHINE (plansifter)

Below - WINNOWER/ASPIRATOR



1 — электродвигатель; 2 — вентилятор; 3 — шиберный механизм; 4 — поддоны; 5 — короб; 6 — приемная коробка; 7 — рассев; 8 — трос; 9 — приводное устройство; 10 — выдвижные сита; 11 — гибкий рукав; 12 — питающее устройство; 13 — подвижная заслонка; 14 — полочки-жалюзи; 15, 16, 18, 24 — конусы; 17, 19, 23 — автоматические клапаны; 20 — решетка; 21, 22 — перегородки; 25 — вейка

1	electric drive (motor)
2	fan
3	gate
4	tray
5	casing, housing
6	intake
7	sieving machine (plansifter)
8	cable
9	gear motor
10	retractable sieves

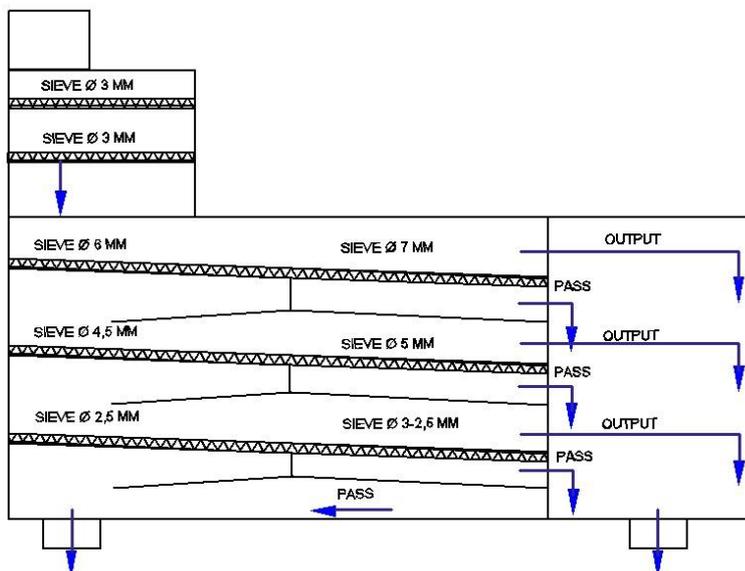
11	flexible hoses
12	feeding device
13	movable gate
14	shelves/blinds
15,16,18,24	cones
17,19,23	automatic valves
20	grate
21,22	partitions
25	WINNOWER/ASPIRATOR

2

SIEVING MACHINE (plansifter), suspended on four cables to the ceiling frame, is designed to separate the mixture after dehulling into several fractions. The structure is a box with three levels of retractable sieves located at an angle of 3 ... 5 °. A longitudinal vertical partition divides the box into two halves. Under each sieve there are trays with different slopes: in the initial sections of the sieve, the slope of the trays is opposite to the slope of the sieve, and in the final sections of the sieve it coincides with the slope of the sieve. Trays are designed to collect and transport particles that have passed through a sieve. The sizes of the holes vary from level to level, and also differ in the initial and final sections of sieves of the same level.

The sieving machine works as follows:

The product enters the pre-sieving intake box, and then is distributed onto the upper pre-sorting sieves (Ø 3 mm). The output from the sieves (the product that did not pass through the sieves) enters sequentially to the lower pre-sorting sieves (Ø 3mm), and the output from the upper and lower pre-sorting sieves (smallest part of the crushed kernels, which practically does not contain husks) enters the inclined trays and transferred to the separate output and removed from the machine. Without additional processing, it is mixed with kernels coming out from the WINNOWER/ASPIRATOR.



Mixture after presifting, enters a long upper sieve with holes \varnothing 6mm (2/3 of the level length) and moves to the front of the machine. Smaller particles of the mixture fall through the sieve (pass) to the second level; larger ones, having passed the upper long part of the sieve, fall on a short upper sieve \varnothing 7 mm (1/3 of the level length), where the largest particles (particles larger than 7 mm, large husks, whole unhulled seeds) move together, forming the first fraction and go to the first chamber of WINNOWER/ASPIRATOR . ①

\varnothing 6 mm product enters the second level. Pass after \varnothing 7mm sieves is directed to the second chamber of WINNOWER/ASPIRATOR (particles with diameter bigger than 6 mm and less than 7 mm, consisting of husks and kernels) ②

The second sieves' level has holes \varnothing 4.5 mm (2/3 of the level length) and \varnothing 5 mm (1/3 of the level length). The output from these sieves is directed to the third chamber of WINNOWER/ASPIRATOR (whole small kernels, large particles of husk and kernels).③

\varnothing 4.5mm product enters the third level. Pass after \varnothing 5 mm sieves is directed to the fourth chamber of WINNOWER/ASPIRATOR (kernel parts and medium-sized husk).④

The second sieves' level has holes \varnothing 2,5 mm (2/3 of the level length) and \varnothing 3 mm (1/3 of the level length). The output from these sieves is directed to the fifth chamber of WINNOWER/ASPIRATOR (kernel's and husk parts).⑤

\varnothing 2,5 mm and \varnothing 3 mm are transferred to the separate output from R1-MST SIEVING MACHINE, bypassing WINNOWER/ASPIRATOR and mixed with kernels going out of WINNOWER/ASPIRATOR.

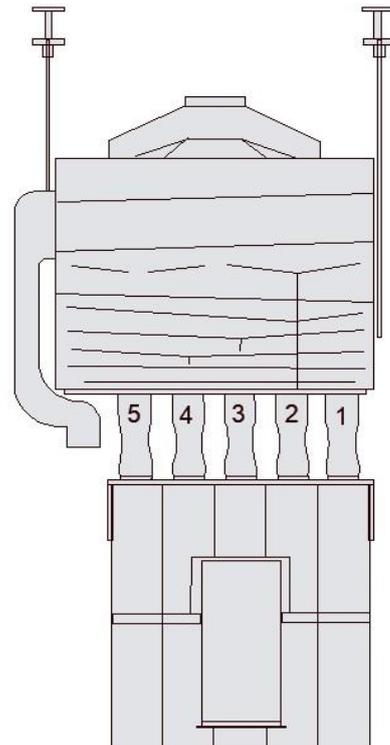
Thus, the mixture, after passing through the sieving, is divided into six fractions, of which five goes to the WINNOWER/ASPIRATOR, and the sixth is taken out of the SIEVING MACHINE, bypassing the WINNOWER/ASPIRATOR.





WINNOWER/ASPIRATOR

s the aspiration part of the R1-MST SIEVING MACHINE. The width of the WINNOWER/ASPIRATOR is divided into five independent chambers. Each chamber has: three conical parts with valves for the removal of husks; valves for control of the sucked air; feeding valves.



WINNOWER/ASPIRATOR drive consists of a fan and an electric motor mounted on a rigid frame. The fan is driven by an electric motor via a V-belt transmission.

Each of the five fractions of the product received on the WINNOWER/ASPIRATOR falls into the chamber intended for it, where the product is screened by the air flow and the husk is separated from the kernel by the difference in aerodynamic characteristics.

All fractions along the flexible pipes (sleeves) fall into the feeding device of the WINNOWER/ASPIRATOR and then on the inclined sticks. The fractions are falling from shelf to shelf, being exposed to air sucked by a fan into the gaps between the shelves. The light components (mainly husk) on the shelves are carried away by the air flow to the aspiration channels, and the heavy components (kernels, whole seeds) are poured from shelf to shelf and are removed into the lower opening of the WINNOWER/ASPIRATOR directly in front of the shelves.

In practice, there is no 100% separation of husk and kernels' parts and some kernels' parts are carried away with the husk. The air flow together with the entrained particles enters the expanded section of the channel, where the air flow speed is decreased. In this case, big parts of husk and

part of the kernels, carried away by the air flow, fall out in the first cone. The mixture of particles settled in the first cone contains kernels, so it is recyclable.

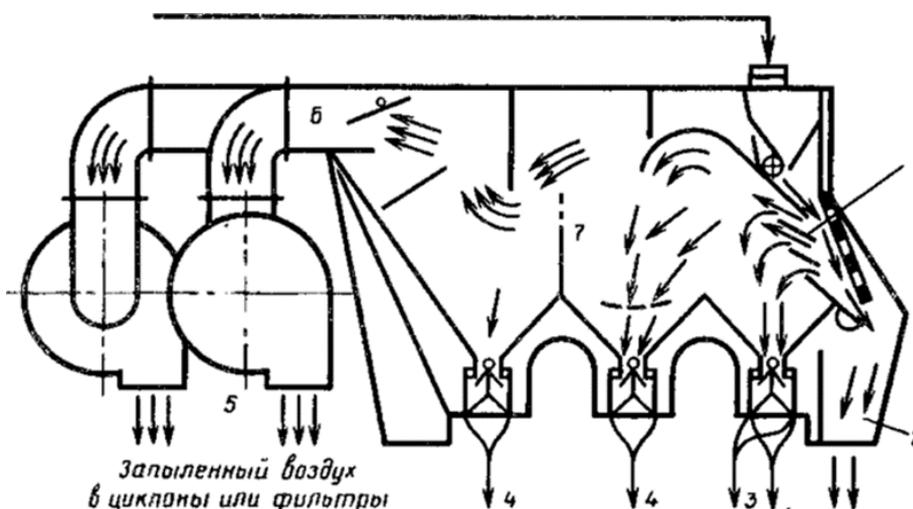
Air stream with particles runs over the sieve. The second cone is located in this section. Here, the main amount of husk falls into the cone as a result of the loss of air flow speed in the expanded section, as well as due to the loss of speed of particles when colliding with sieve elements.

The air flow changes its direction several times, going around two partitions, and the remaining husk particles fall in the third cone.

The air speed in the channels is regulated by opening the gate more or less, changing the height of the control valves and internal partitions, the slope of the shelves to the horizon. As a result of regulation, it is provided that in the second and third cones of all sections there is no kernels in the husk.



Thus, after the WINNOWER/ASPIRATOR, kernels are received (from the second, third, fourth and fifth sections of the aspiration chamber), oil dust (sixth fraction of the sieving), partially dehulled seeds (from the first section of the aspiration chamber), kernels in husk (from the first cone) and husk (from the second and the third cone of the aspiration chamber of the wake). The sediment from the air-cleaning devices, thrown out by the fan from the aspiration chamber of the WINNOWER/ASPIRATOR, depending on the texture (oil dust or small husks), is directed to kernels or husk.



1	shelves/blinds
2	channels for kernels
3	chamber for husk & kernels mixture
4	chamber for husk
5	fans
6	gate to control the speed of air flow in channels
7	partition

TECHNICAL SPECIFICATION	
Capacity,t/days	80
Ratio of the husk weight to the weight of the dehulled seeds, not more , %	12*
Kernels in husk, not more, %	1,1*
Installed power, kWt	10, 55
Quantity of fans, pc	1
Slope of sieves	1:33
Width of sieve frames, mm	2x700
Specific load per 1 cm sieve width, kg/day	570
Useful area of the sieve surface, m2	11,85
Quantity of chambers, pc	5
Air consumption, m3/h	7200
Overall dimensions, mm max	4000
Length	2100
Width	3665
Height up to the intake duct	Depends on the room height
Height from the floor up to ceiling bar	
Weight of the vibrating parts, kg	2100
Net weight, kg max	3600

* The value is valid for hybrid sunflower seeds in case:

- content of unhulled and partially dehulled seeds after SUNFLOWER SEEDS DEHULLING MACHINE up to 25%,
- content of oil dust up to 10%,
- content of broken seeds up to 15%

when the machine is operating on sunflower varietal seeds, absolute values of technological efficiency indicators should be improved (reduced) by 1.5 times, for example, instead of 12%, ratio of the husk weight to the weight of the dehulled seeds is reduced to 8%.

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