

Pre-Cleaning and Air-Screen Cleaning

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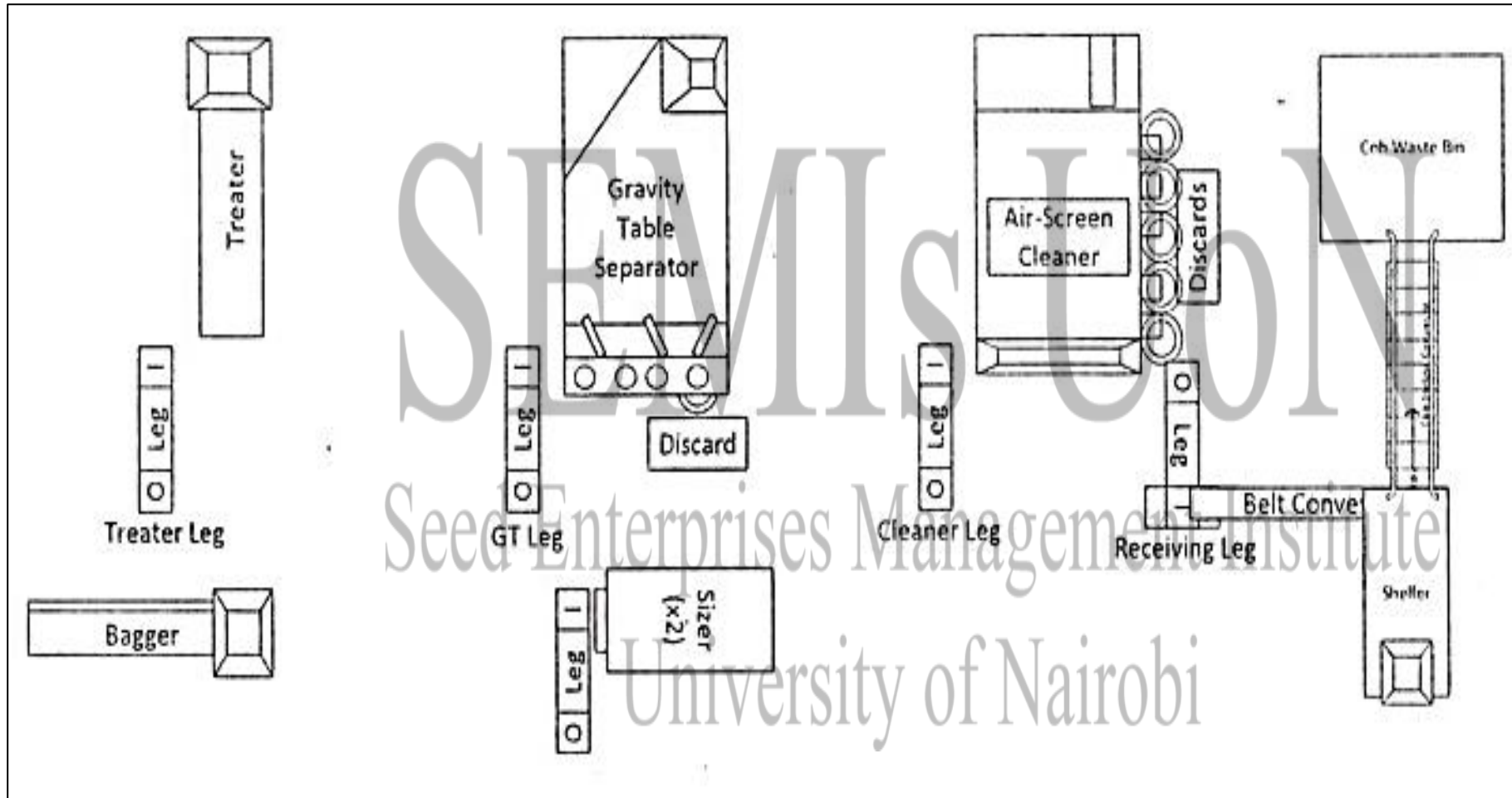
Seed Enterprises Management Institute

University of Nairobi

Factors to consider before processing seed

1. Seed is alive
2. Who are your customers
3. The more you process
 - (a) The more the seed becomes expensive and the less your profit (**Cost of seed vs grain**)
 - (b) The more the risk of damaging seed

Layout and order of seed processing machinery



Pre-Cleaning Operation:



- Before harvest



- Before cleaning



- After cleaning



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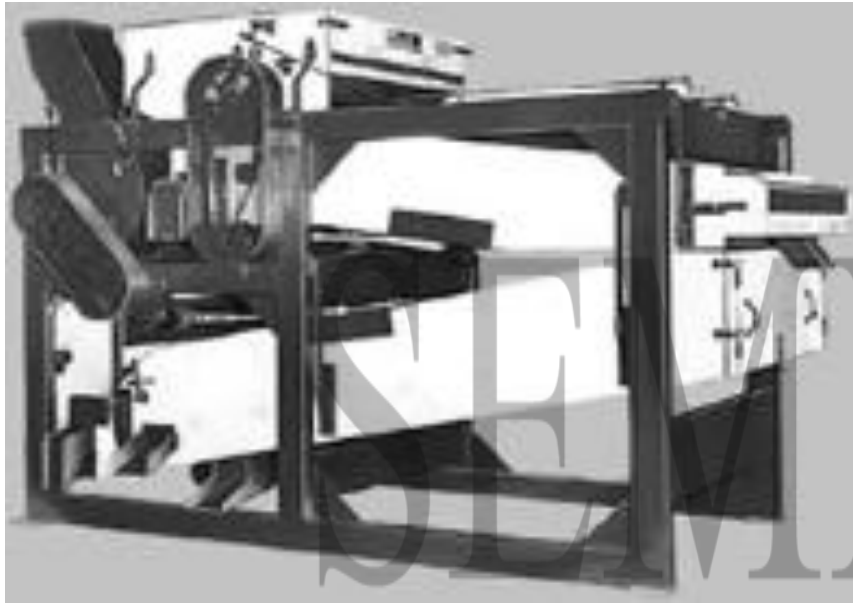
Manual Pre-Cleaning Operation



Why Pre-Cleaning Operation?

- Enough trash is removed to permit bulk storage and processing
- Seed fed more evenly through down-stream equipment
- High moisture, green material is removed decreasing time and cost of drying
- Removal of bulk of trash permits finer top screens to be used resulting in precise separations
- Cleaning machines are more efficient
- Most commonly done by a scalper

What is a scalper?



Removes **light**, **large**, and **small waste**. It begins with two screens that allow the top screen always serves as a scalper and the bottom screen functions as a **sifter**.

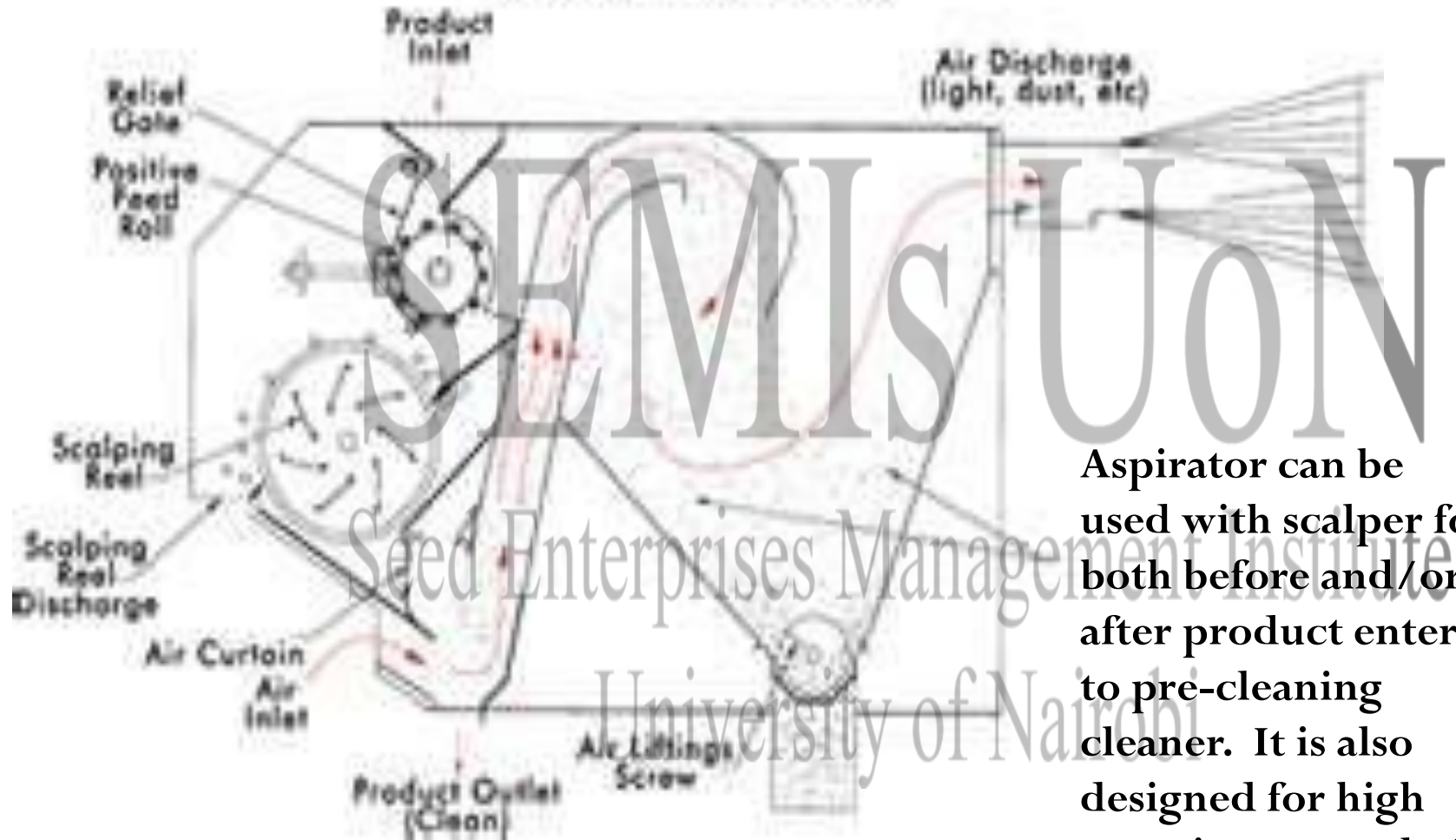
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Field scalper leaves waste in the field



Pre-Cleaning Operation:

Open Circuit Scalper Aspirator

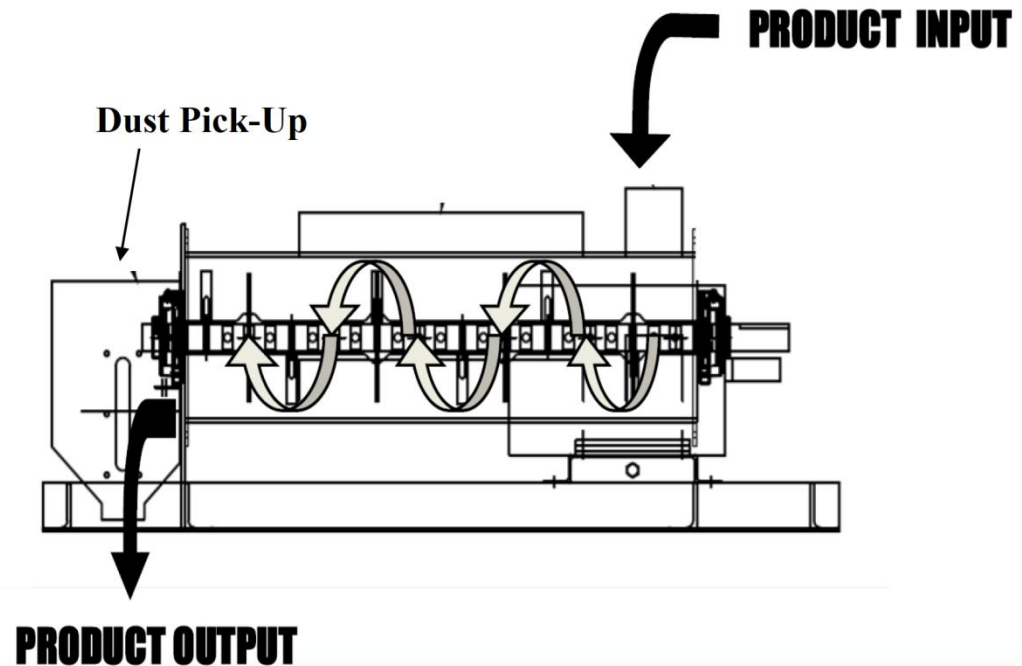


Aspirator can be used with scalper for both before and/or after product enters to pre-cleaning cleaner. It is also designed for high capacity removal of trash from seed.

Pre-Cleaning Operation: Debearders



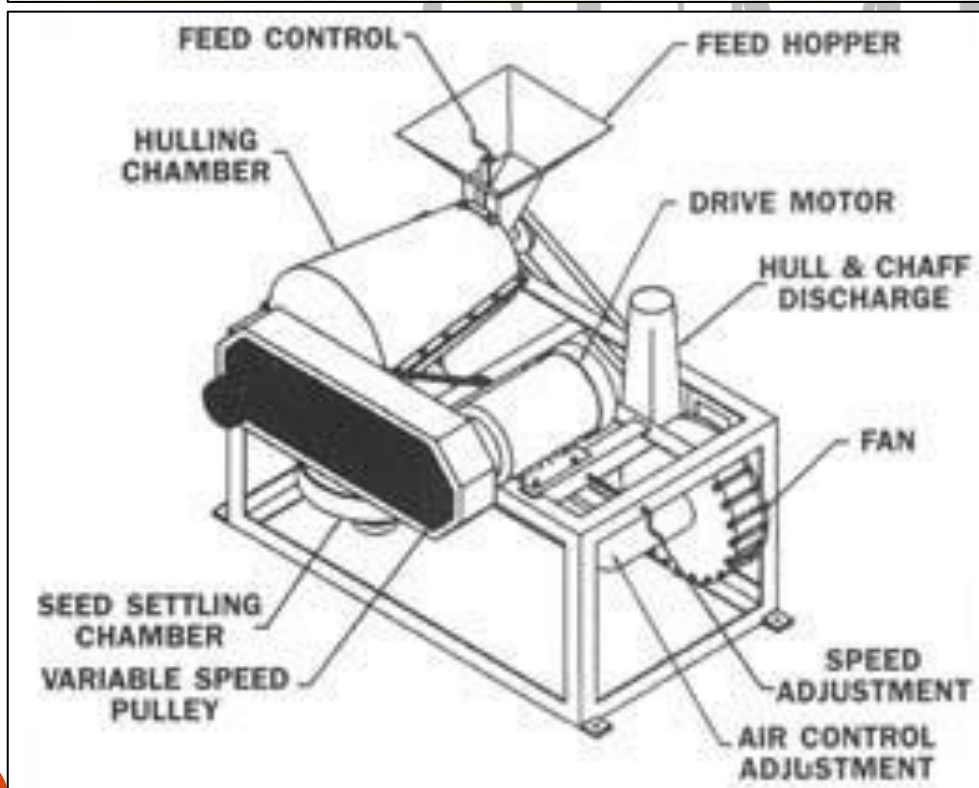
Wild oat (*Avena fatua*)



- Seeds with awns, hairs or other chaffy appendages reduce flowability in cleaning equipment
- It removes these unwanted appendages with rotary and beating arms



Pre-Cleaning Operation: Huller-Scarifier



- Removes **hulls** or **Pods** and scarifies hard seeds in sunflower, pumpkin, groundnut and water melon seed
- Throws seed against sandpaper or rubber concaves
- Harsh process with potential for seed damage

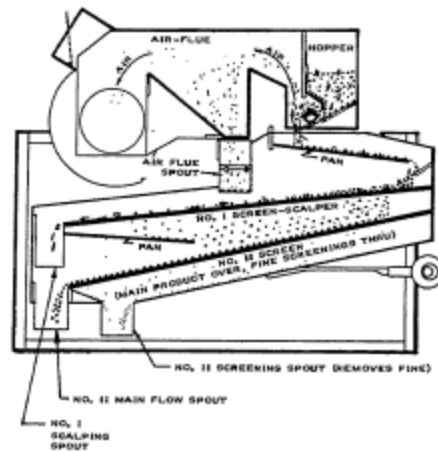
Products after Pre-Cleaning:



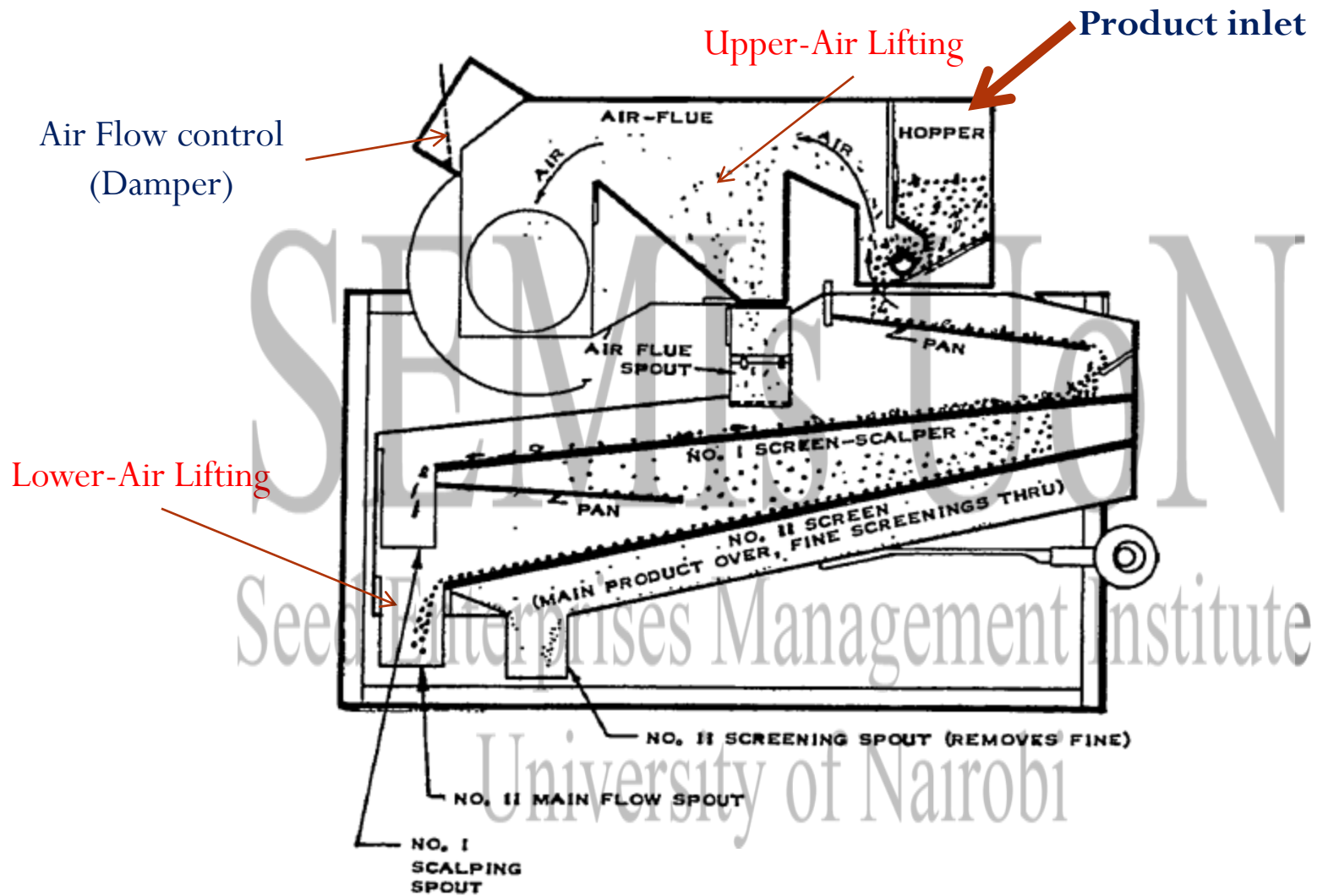
- Seeds need to be precisely cleaned for improving quality and make it legal to sale as 'seed' - Germination, purity, health, and vigor
- Air-Screen Separator is the most common machine in the seed processing operation
- It combines the principles of screen and air separation. This combination of principles separates the over/under size and fine/light debris from the seed

Air-Screen Cleaning

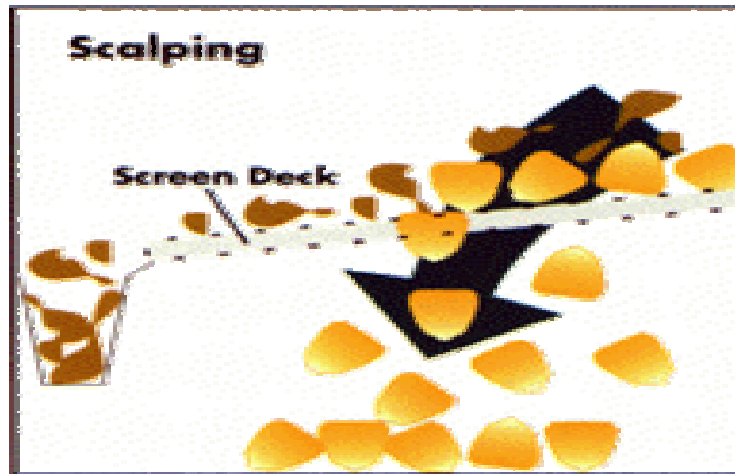
- Basic machine in most seed processing plants
- Combines air separation with sieve operations
- Based on differences in size and weight of seeds
- Three cleaning elements:
 - Aspiration: Removal of light material from the seeds
 - Scalping: Removal of oversize material from seeds
 - Sifting: Removal of undersize material from seeds



Air-Screen Cleaning - AIR



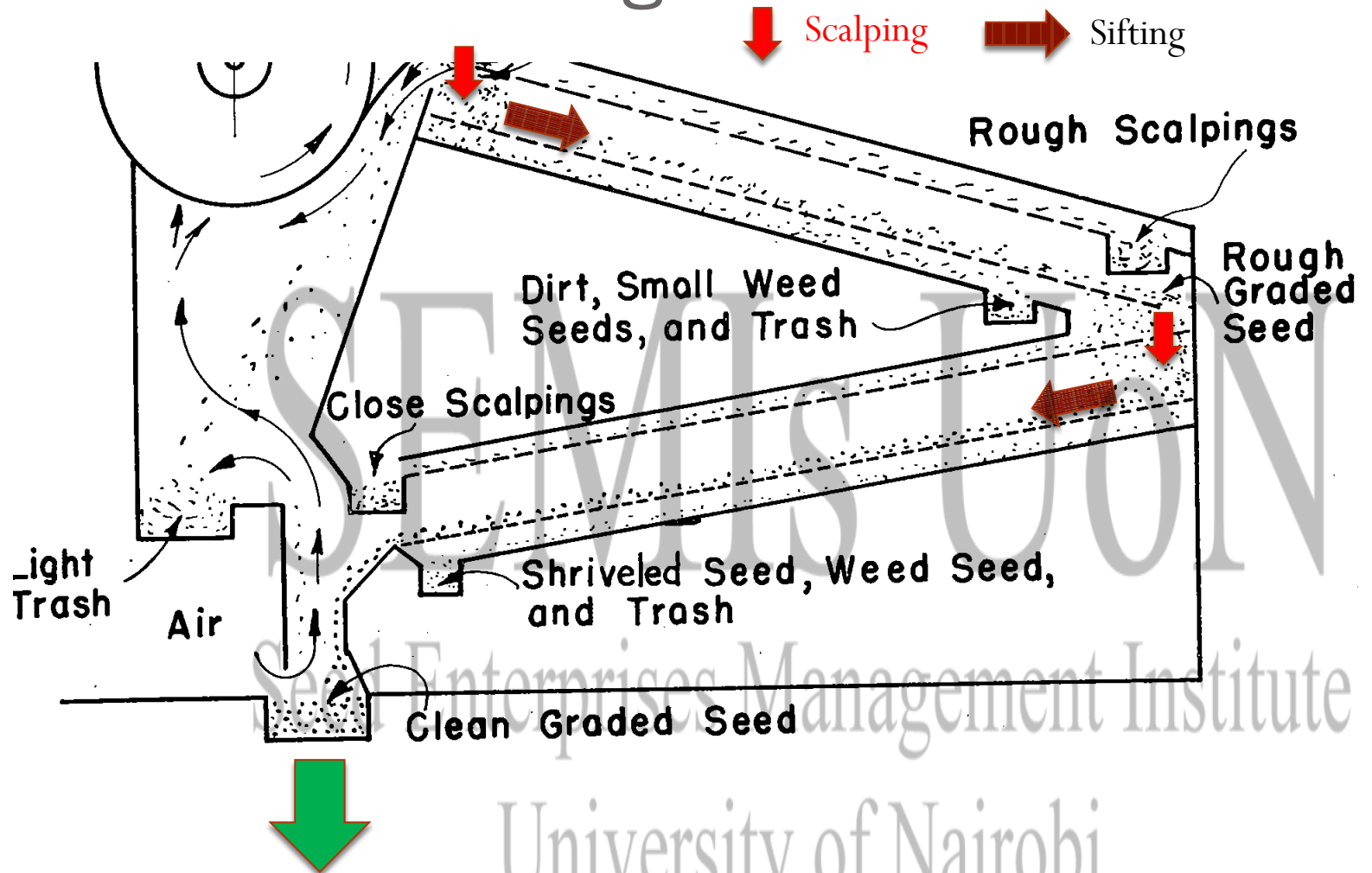
Air-Screen Cleaning - SCREENING



- **Scalping:** Good seeds are dropped through screen openings, larger material carried over screen
- **Sifting:** Good seeds ride over screens while small seeds drop through screen and moved to separate spout by shoe bottom

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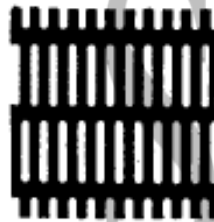
Air-Screen Cleaning – Clean seed flow



Air-Screen Cleaning – Screen Selection

- Shape:

OBLONG HOLES

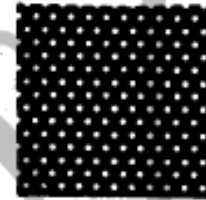


$3/64 \times 5/16$

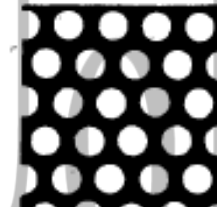


$8 \times 3/4$

ROUND HOLES



$1/25$



$10/64$

TRIANGLE HOLES



$9/64$ or $5\frac{1}{2}$ V

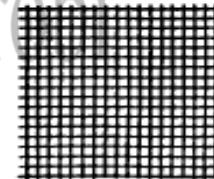


$11/64$ or $6\frac{1}{2}$ V

WIRE MESH



3×14



18×18

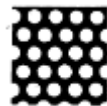
Air-Screen Cleaning – Screen Selection

- Size:

PERFORATED METAL SHEET										WIRE CLOTH			
ROUND HOLES			OBLONG HOLES		TRI-ANGLES	OBLONG CROSS SLOT	ROUND HOLE HALF SIZES	OBLONG HALF SIZES	SQUARE OPENINGS	OBLONG OPENINGS			
Fractions	64ths		Fractions	64ths	64ths	Finished Screens Made Only in "9" and "8" Model Widths. Sheet Sizes 26" x 61 1/4" and 26" x 63 1/4"			3x3	2x8	4x8 1/2	6x14	
1/25	5 1/2	24	1/24 x 1/2	5 x 3/4	5	6 x 3/4	6 1/2	8 1/2 x 3/4	5x5	2x9	4x15	6x15	
1/24	6	25	1/22 x 1/2	5 1/2 x 3/4	8	7 x 3/4	7 1/2	9 1/2 x 3/4	7x7	2x10	4x16	6x16	
1/23	7	26	1/22 x 1/2 Diag.	6 x 3/4	9	8 x 3/4	8 1/2	10 1/2 x 3/4	8x8	2x11	4x18	6x18	
1/22	8	27	3/64 x 5/16	6 1/2 x 3/4	10	9 x 3/4	9 1/2	11 1/2 x 3/4	9x9	2x12	4x19	6x19	
1/21	9	28	1/20 x 1/2	7 x 3/4	11	10 x 3/4	10 1/2	12 1/2 x 3/4	10x10	3x14	4x20	6x20	
1/20	10	29	1/18 x 1/2	8 x 3/4-D		11 x 3/4	11 1/2	13 1/2 x 3/4	12x12	3x16	4x22	6x21	
1/19	11	30	1/18 x 3/4	9 x 3/4		12 x 3/4	12 1/2	14 1/2 x 3/4	14x14	3x16 SP.	4x24	6x22	
1/18	12	31	1/16 x 1/2-A	10 x 3/4-E		13 x 3/4	13 1/2		15x15	3x18	4x24 SP.	6x23	
1/17	13	32	1/16 x 3/4	11 x 3/4-F		14 x 3/4	14 1/2		16x16	3x20	4x26	6x24	
1/16	14	34	1/15 x 1/2	12 x 3/4-G		15 x 3/4	15 1/2		17x17	3x21	4x28	6x25	
1/15	15	36	1/14 x 1/2-B	13 x 3/4-H		16 x 3/4	16 1/2		18x18		4x30	6x26	
1/14	16	38	1/14 x 3/4	14 x 3/4-I		18 x 3/4	17 1/2		20x20		4x32	6x28	
1/13	17	40	1/13 x 1/2	15 x 3/4-J		10 1/2 x 3/4	18 1/2		24x24		4x34	6x30	
1/12	18	42	1/12 x 1/2-C	16 x 3/4-K		11 1/2 x 3/4	19 1/2		26x26		4x36	6x32	
	19	44		17 x 3/4		12 1/2 x 3/4	20 1/2		28x28			6x34	
	20	48		18 x 3/4			21 1/2		30x30			6x36	
	21	56		19 x 3/4			22 1/2		32x32			6x38	
	22	64		20 x 3/4					34x34			6x40	
	23	72		21 x 3/4					36x36			6x42	
									38x38			6x50	
									40x40			6x60	
												18x20	
												20x22	



1/25



10/64



3/64 x 5/16



8 x 3/4



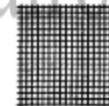
9/64 or 5/16



11/64 or 6/16



3 x 14



18 x 18

Air-Screen Cleaning – Screen Selection

- Screen must be selected according to the shape of the crop seed being cleaned -
 - **Round seeds:** A round-hole top screen and a slotted bottom screen are generally used to clean round-shaped seeds. The round-hole top screen prevents straw, trash, pods and other large and long material (*bolts/nuts, tools*) from dropping through while the slotted bottom screen drops broken seeds and weed seeds thinner than the round crop seeds.
 - **Oblong seeds:** An oblong top screen and an oblong bottom screen are generally used to clean long seeds. (how?)
 - **Lens-shaped seeds:** An oblong top screen and a round-hole bottom screen are generally used to clean lens-shaped seeds.

Air-Screen Cleaning - Adjustments

- **Rate of feed:** Although the feed gate on a feed hopper is adjustable for large changes of rate of feed, the basic adjustment is made by increasing or decreasing the speed of the feed roll
- **Screen knockers and tappers:** An adjustable knocker or tappers that slightly tap the screens which vibrates screens so that seeds will pass through close and small openings, and will jar loose long weed seeds that wedge so tightly in the perforations that the brushes can't remove them
- **Upper and lower air suction:** The suction is regulated by an adjustable damper in the air passage
- **Variable screen shake:** This permit the operator to adjust the screen vibration speed from slow to very rapid
- **Screen pitch:** Common range in pitch adjustment is from 4 to 20 degrees

Air-Screen Cleaning - Installation

- It should be installed properly on and securely fastened to a firm foundation.
- Proper air ducting from the cleaner is extremely important. Sharp turns, improper junctions, poor connections and poor collectors all contribute to poor air separations in a cleaner. Improper air exhaust also causes a very dirty, dusty plant
- A good system to manage good seeds and different discards – both air-lifting and screening products.
- Operator safety and friendly environment!
- Computerized Air-Screen Cleaner (Dr. Shyy's US patent)....

Dr. Shyy's US Patent on Automation of Air-Screen Cleaner - 1991

Air-Screen Cleaning

Questions?

