

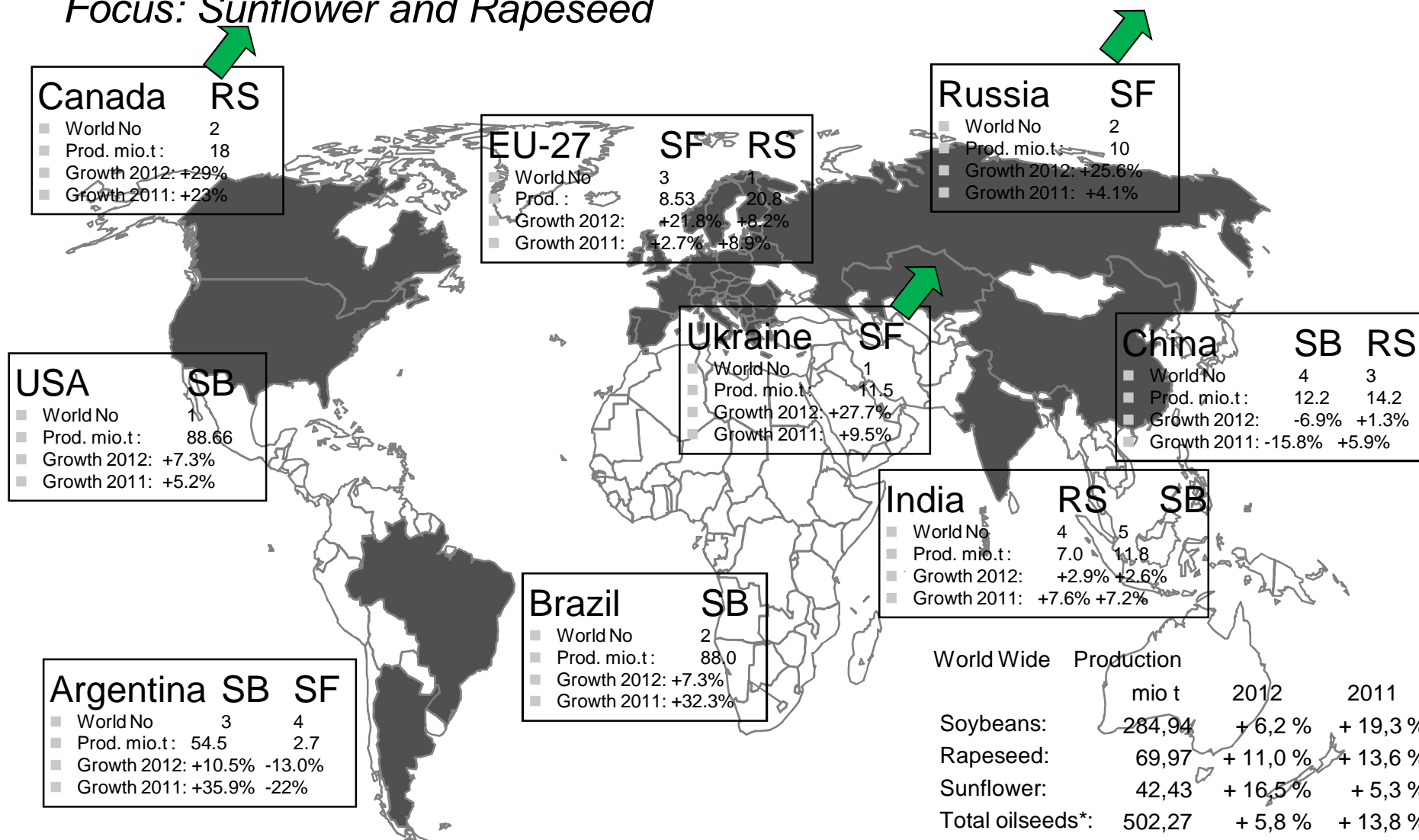
A vibrant field of sunflowers under a clear blue sky. The sunflowers are in various stages of bloom, with some fully open and others still budding. The foreground shows several large, detailed sunflowers, while the background is a vast field stretching towards the horizon.

Sunflower Dehulling

Bühler AG
2014

Oilseeds World Production 2013/2014.

Focus: Sunflower and Rapeseed



Source: [USDA](http://www.usda.gov)

*Includes: Soybeans, Rapeseed, Cottonseed, Sunflower, Peanut, Palm kernel, Copra

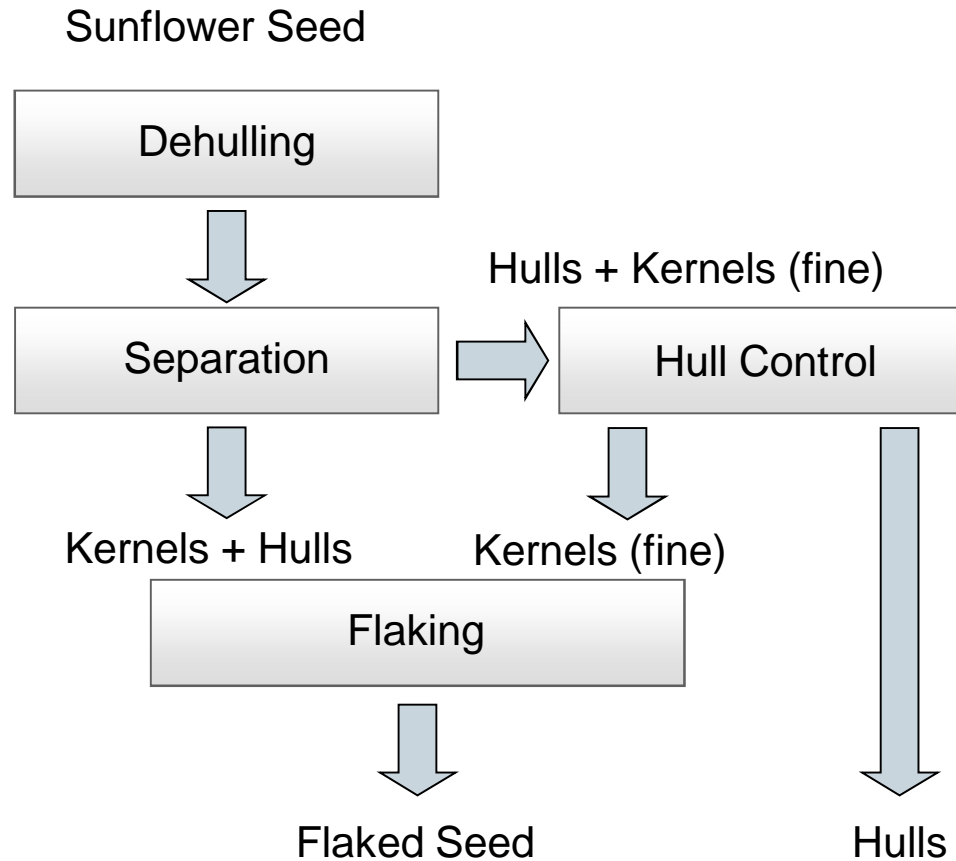


Sunflowerseed Production

Market Outlook

- Growth of sunflowerseed production in Europe and Eastern Europe
- Demand for high valuable products like animal feed and vegetable oil due to growth of world population and increase of living conditions
- Especially important:
 - High yields of oil (low oil residues and low oil losses)
 - High content of protein in meal
 - Digestibility of meal due to less fiber content

Sunflower Preparation Processes



- Dehulling
 - beating by impactors
- OR**
 - crushing by corrugated roller mills
- Separation
 - separation of hulls & kernels by oscillating sieves
 - aspiration of hulls by air
- Hull Control
 - sifting of hulls and kernels
- Flaking
 - flaking of kernels to open oil cells

Dehulling Key Preparation Technology

Corrugated Roller Mill



Capacities

Sunflower up to 260 - 320 t/24h

Vertical Impact Dehuller



Capacities

Sunflower up to 150 - 180 t/24h

Horizontal Impact Dehuller



Capacities

Sunflower up to 150 - 180 t/24h

** All capacities and performances values are depending on raw material specifications & conditions.*

Dehulling Corrugated Roller Mill



For high capacity multi-seed crushing

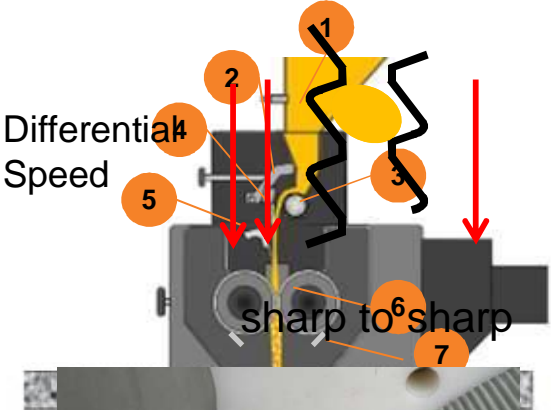
- Suitable for multi-seed processes
- High capacity
- Limited dehulling efficiency

The roller mill assures flexible processing of multiseeds.

Dehulling

Working Principles of Corrugated Roller Mill

- level controlled feeding device
- feeder allows consistent distribution over entire roll width
- permanent magnet removes ferrous particles in feed
- individual roll gap adjustment
- scraper knives cleans rolls from seed residues



1. In sensor
2. Product guide plate
3. Roller
4. Differential speed
5. Product guide plate and roll end sealing
6. Cracking rolls with pneumatic driven roll gap
7. Scraper knife

Dehulling

Vertical Impact Dehuller



For efficient multi-seed impact dehulling.

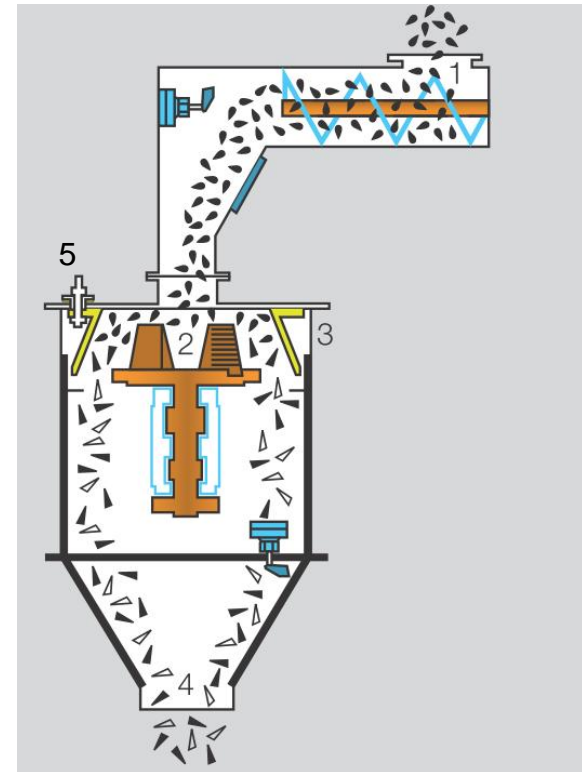
- Suitable for multi-seed dehulling
- Smooth dehulling for low fines content
- Quiet, clean and safe operation

The versatile dehuller adapts to your requirements.

Dehulling

Working Principle of Horizontal Impact Dehuller.

- Feeder screw for even feed
- Level indicator (top/bottom) avoids choking
- Permanent Magnet
- Grooved rotor for controlled, fines avoiding product impact
- Dehulling degree adjustment through adjustable impact cone (spacers)



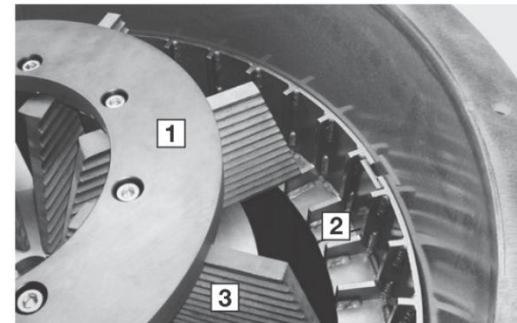
1. Product feed
2. Rotor
3. Impact cone
4. Outlet
5. Dehulling tuner

Dehulling

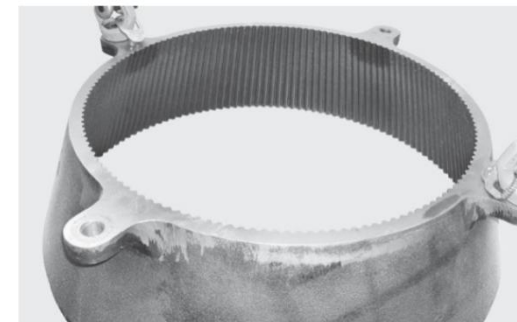
Especially Suited for Multi-Seed Oil Mills.

Main advantages:

- Applicable for dehulling of various oilseeds incl. sunflower, cotton seed, and soybeans
- High process safety due to screw feeder, magnet and level probes
- Continuously adjustable screw and rotor speed allow perfectly controlled process
- Alternative impact cone surface characteristic (smooth, fluted) for optimized dehulling
- Efficient especially with higher moisture content



1. Rotor
2. Wear plates
3. Impact paddles



Impact cone characteristics
Smooth: Sunflower
Fluted: Soy, cotton seed

Dehulling

Horizontal Impact Dehuller



For state-of-the-art sunflower dehulling.

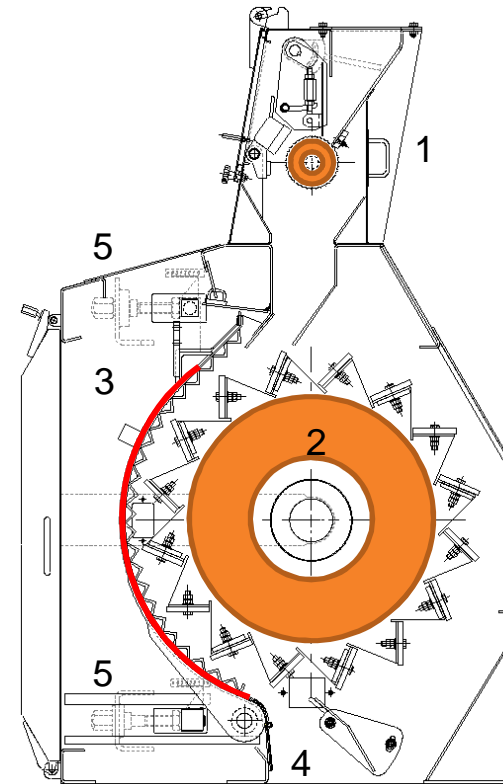
- Smooth dehulling for low fines
- Long machine lifetime
- Easy maintenance of key parts

Applied in the sunflower seed processing industry exclusively.

Dehulling

Working Principle of Horizontal Impact Dehuller.

- Feeder roll with integrated frequency converter
- Magnet
- Wear resistant and adjustable impact chest
- Only applicable for sunflower seeds



1. Product feed
2. Rotor
3. Impact chest
4. Outlet
5. Dehulling tuner

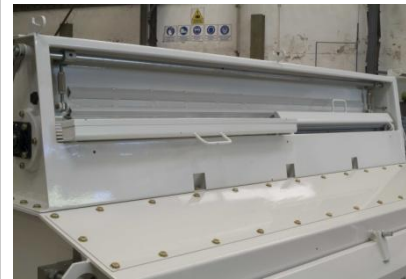
Dehulling

Simple Way of Dehulling.

Main advantages:

- Simple and fast adjustment of impact chest and thus excellent dehulling quality
- No aspiration required
- Simple and easy accessible and exchangeable wear parts
- Efficient especially with lower moisture content

Permanent magnets



Impact chest adjustment



Impact rotor



Impact chest

Dehulling System Comparison.

	Corrugated Roller Mill	Vertical Dehuller	Horizontal Dehuller
Dehulling Efficiency	+	++	++
Sunflower Suitability	+	++	++
Other oilseeds	++	+	N/A
End Product Quality	+	++	++
Integrated Safety Features	+	++	+
Aspiration	Yes	Yes	No
Throughput (t/h)	++	+	+
Efficiency (kWh/t)	++	0	+
Space requirement	0	++	+
Serviceability	++	+	++

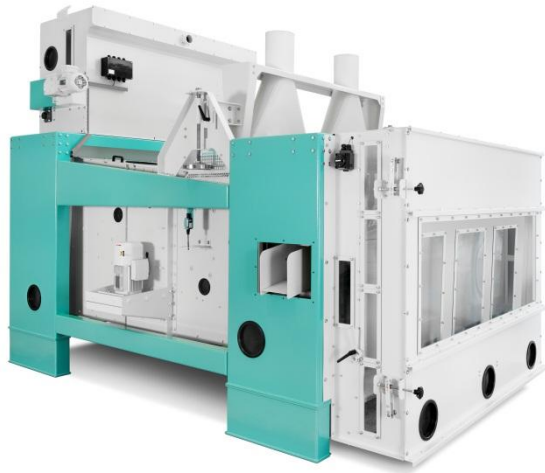
* ++ ... very good; + ... good; 0 ... acceptable; N/A ... not applicable

Dehulling

Technical Datas - Overview.

Impact Dehuller	Corrugated Roller Mill	Vertical Dehuller	Horizontal Dehuller
Dimensions (mm)			
Length	2.920	2.110	2.923
Width	1.900	550	2.003
Height	1.130	1.820	1.925
Rotor / Roll diameter (mm)	300	600	800
Rotor / Roll length (mm)	1.600	-	2.150
Aspiration needed (m³/min)	20	15	0
Motor power (kW)			
Feeder drive	0,75	0.37 (FC optional)	0.33
Main drive	18,5	15-22 (FC optional)	18
Weight (kg, net)	3.690	825	2'640
Beaters / Throw paddles / Rolls	2	8	16
Throughput (t/24h)			
Sunflower	260 – 320	150 - 180	150 - 180
Soybean	500 - 800	120 - 150	-
Cotton seed (max. 4% lint)	230 – 260	120 - 150	-

Separation Hull Separator



Efficient sifter for hull separation.

- Optimal separation of oilseed kernels from hulls
- High throughput capacities
- Easy operation and maintenance
- Designed especially for oilseed separation

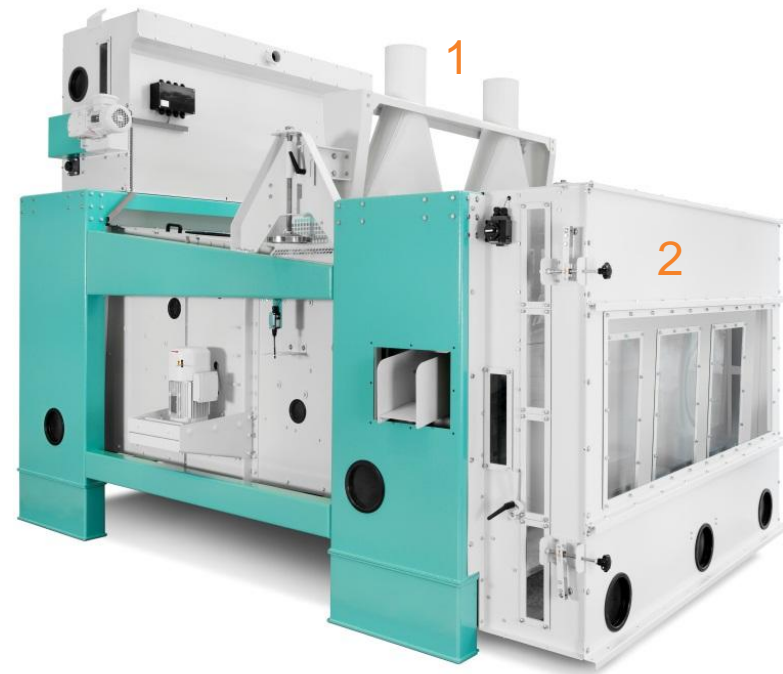
Applied in the oilseed processing industry for the dehulling of sunflower seeds and soya.

Separation

Key Preparation Technology

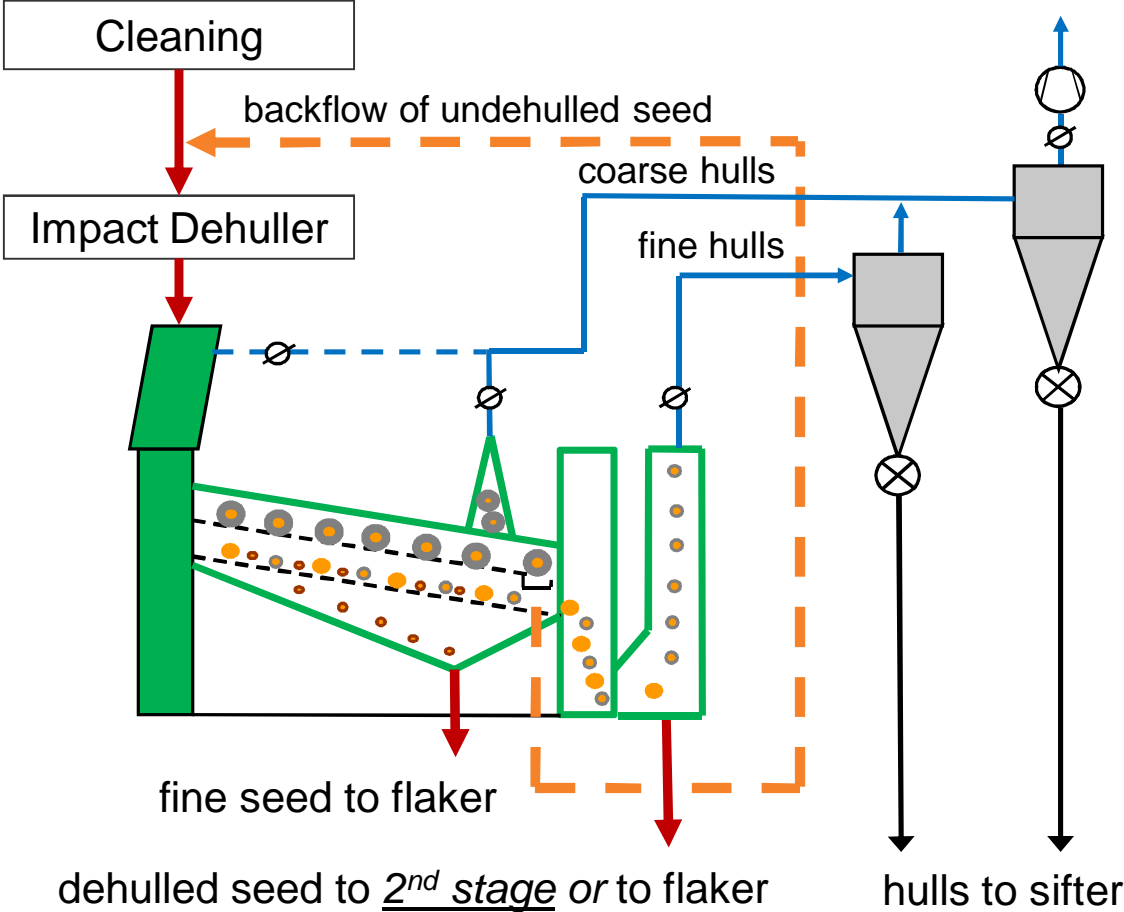
Hull Separator SMA 203-3 OL

- 1. Proven main hull aspiration system**
 - Easy adjustable, powerful suction nozzles
- 2. Proven post hull aspiration system**
 - Multi-tunable aspiration channel
 - Large control window for optimal setting



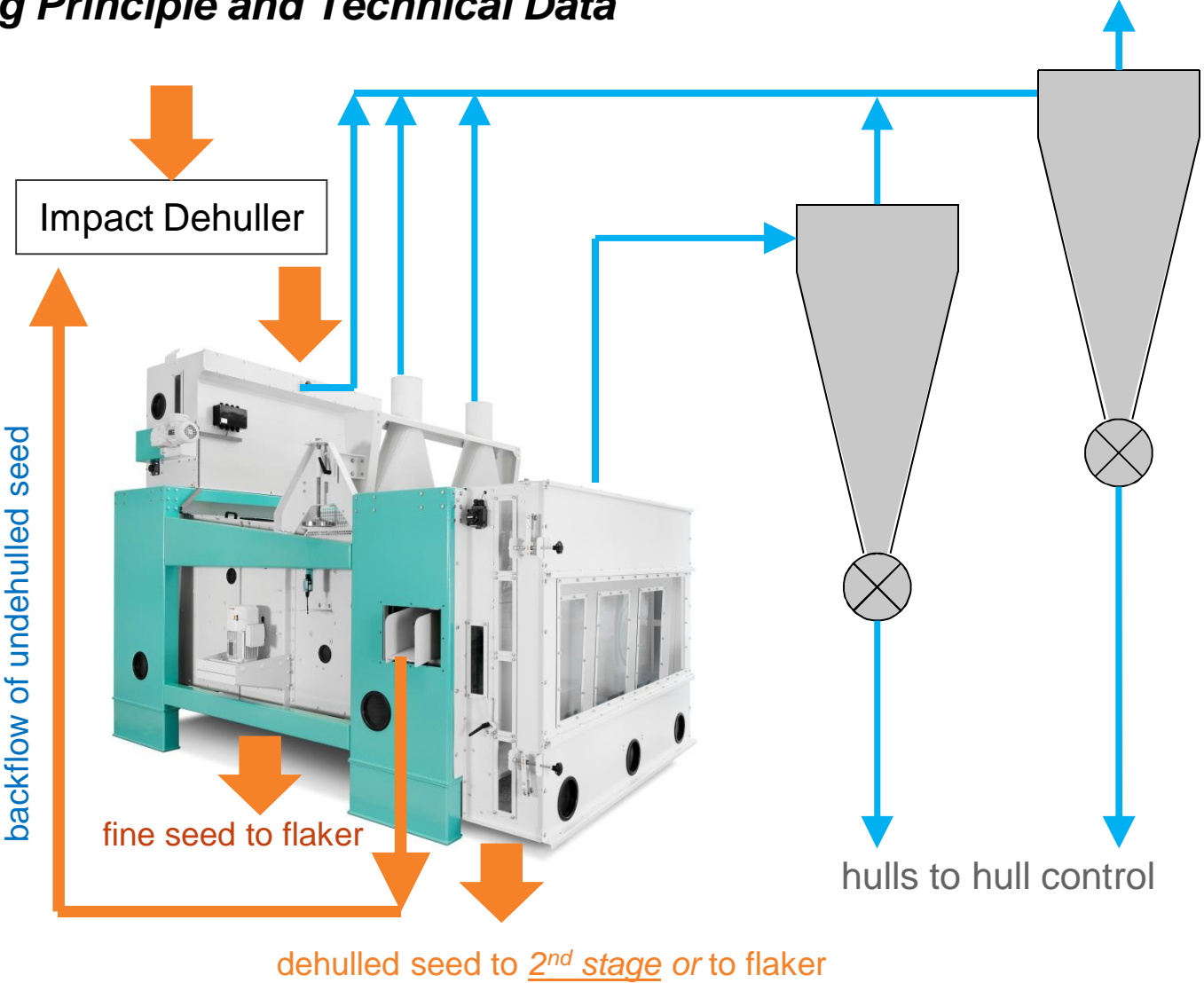
Separation

Working Principle and Technical Data



Separation

Working Principle and Technical Data



Sunflower Preparation Processes

Objective

- reduction of fiber content in meal by hull removal
- increase of final protein content
- highest oil yield

Different Dehulling Processes

2- stage Dehulling

Hull Removal from 26% to 10%

1- stage Dehulling

Hull Removal from 26% to 14 – 12 %

- Differentiation through the rest of hull content and amount of kernel loss by efficient hull controls

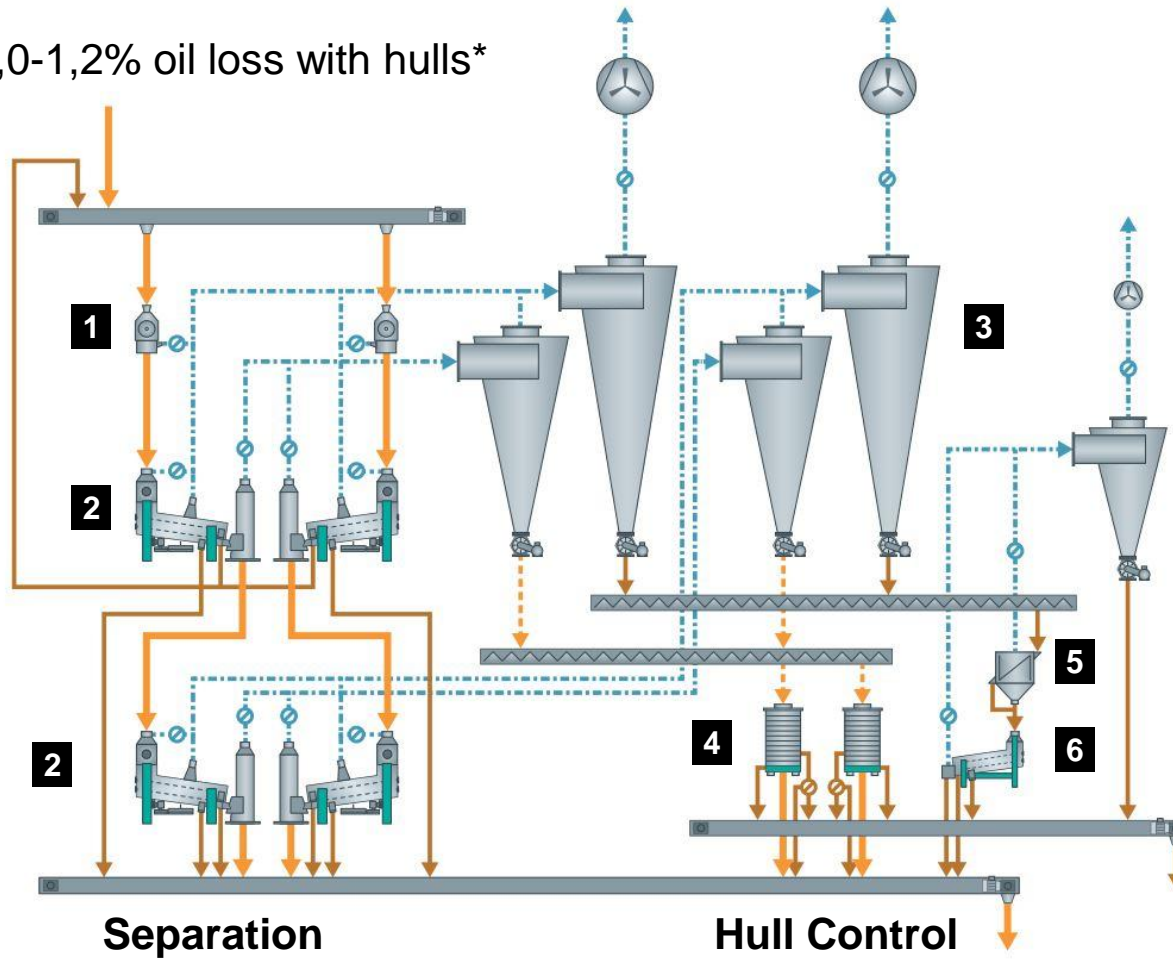
* additional 2,5-3 % botanical oil content in hulls

Sunflower Preparation Processes

2- stage Dehulling with Total Hull Control

10% rest hull

1,0-1,2% oil loss with hulls*



1. Dehuller
2. Separator
3. Filter/Cyclone
4. Hull Sifter
5. Hull Drum Sieve
6. Hull Separator

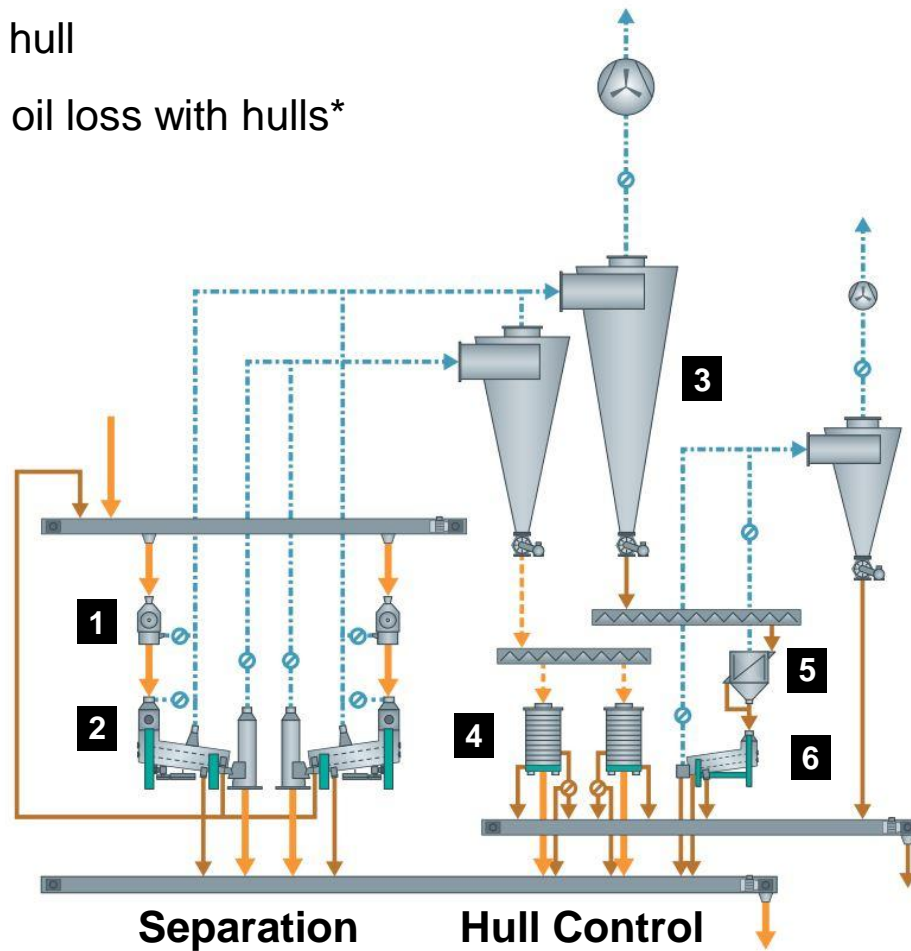
* additional 2,5-3 % botanical oil content in hulls

Sunflower Preparation Process.

1- stage Dehulling with Total Hull Control

12% rest hull

0,9-1,1% oil loss with hulls*



- dehulling results
- low kernel/ oil losses
- high investment

1. Dehuller
2. Separator
3. Filter/Cyclone
4. Hull Sifter
5. Hull Drum Sieve
6. Hull Separator

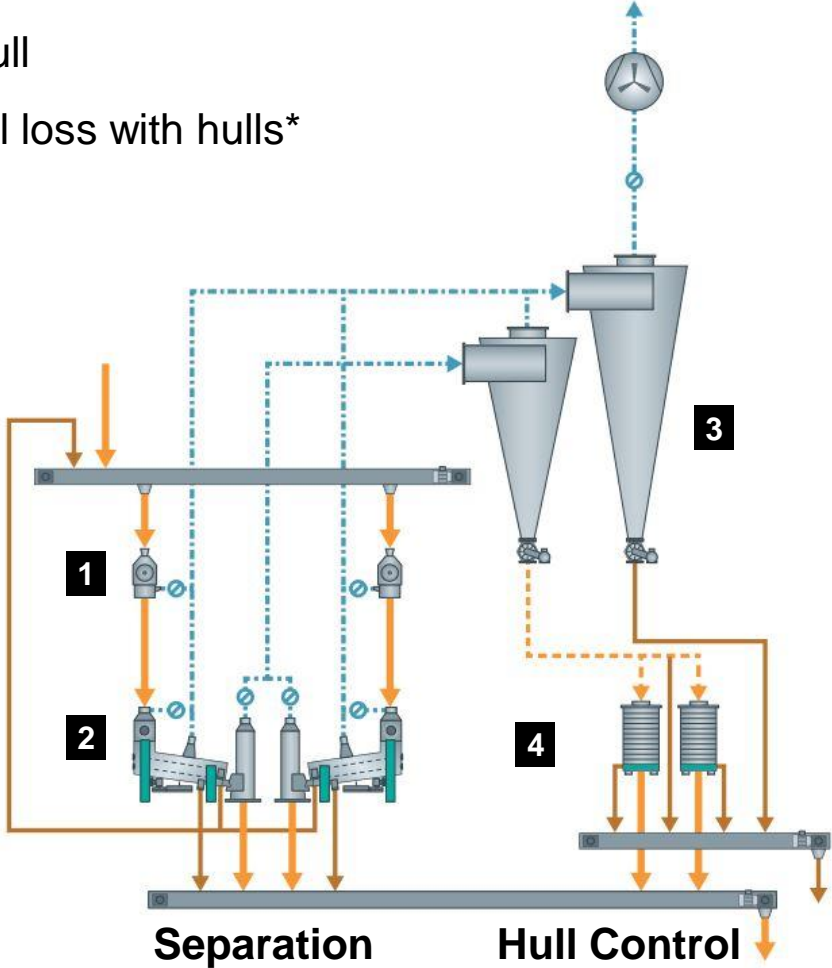
* additional 2,5-3 % botanical oil content in hulls

Sunflower Preparation Process.

1-stage Dehulling with Partial Hull Control

14% rest hull

1,0-1,2% oil loss with hulls*



- 1. Dehuller
- 2. Separator
- 3. Filter/Cyclone
- 4. Hull Sifter

* additional 2,5-3 % botanical oil content in hulls

Sunflower Preparation Process

Yields

SUNFLOWER INPUT SPECIFICATION

Moisture content	8,00 %	Protein content	18,00 % NS
Oil content	43,00 % NS	Hull content	26,00 % NS
Crude fiber content	17,50 % NS	Impurities	≤ 1,00 % NS

YIELDS AFTER DEHULLING

DEHULLING	2 stage	1 stage partial	1 stage total	no dehulling
Rest hull content in dehulled fraction	10 %	14 %	12 %	26 %
Capacity prior to dehulling	100 t/24h	100 t/24h	100 t/24h	100 t/24h
Capacity prior to expeller pressing	80 t/24h	84 t/24h	82 t/24h	100 t/24h
YIELD				
Total hulls removed	18 t/24h	14 t/24h	16 t/24h	0.0 t/24h
Additional oil loss*	0,21 %	0,16 %	0,17 %	0.0 %
Extraction meal	37 t/24h	41 t/24h	39 t/24h	56.2 t/24h
Protein content	44,5 %	41 %	42,5 %	31.4 %
Crude fiber content	19 %	23 %	22 %	29.3 %
Oil content	1,0 %	1,0 %	1,0 %	1,0 %
Expeller crude oil	34 t/24h	33 t/24h	33 t/24h	30 t/24h
Extraction crude oil	7 t/24h	8 t/24h	8 t/24h	11 t/24h

* based on seed input; all figures determined with Bühler Oil Balance calculation

Sunflower Preparation Process. Performance Figures

SUNFLOWER INPUT SPECIFICATION			
Moisture content	8,00 %	Protein content	18,00 % NS
Oil content	43,00 % NS	Hull content	26,00 % NS
Crude fiber content	17,50 % NS	Impurities	≤ 1,00 % NS
Dehulling Stages	2-stages	1-stage - partial	1-stage - total
Rest Hull Content	10 %	14 %	12 %
Protein Content	44,5 %	41%	42,5 %
Loss of Oil based on Hulls	1,2 – 1,0 %	1,2 – 1,0 %	0,9 – 1,1 %
Loss of Oil based on seed input	0,2 - 0,3 %	0,15 – 0,2 %	0,17 – 0,2 %

Flaking is Key in Achieving Low Rest Oil in Meal.

State of the art features

- Flake thickness adjustment during operations
- Easy access for regular maintenance
- Correct roll type and surface

Optimal Sunflower throughput

(at 0.4mm flake thickness, cold, 8% H₂O)

- capacities of approx. 400 t/24h



www.buhlergroup.com

Bühler's High Performance Flaking Mill OLFB.



Bühler's state-of-the-art flaking mill.

- High performance flaking mill
- Flake thickness adjustment during operations
- Compact and efficient
- Easy maintenance, safe operation