

Lindor *The gentle touch in mixing*

Mixing Day 2016

Delft  Solids Solutions

Van der Valk Hotel Den Haag - Nootdorp

April 5, 2016

Vandaag twee onderwerpen

1. “*Fit for purpose*” - Overview of solids mixers in the market

- Eight important solids mixers
- Every type has its own characteristics
- Each mixer is based on one of three basic mixing mechanism
- Selection should be based on product characteristics and process requirements
- Testing is a preferred approach to validate a mixer for a product and process

2. Gentle touch mixers for sensitive materials

- Lindor, the gentle touch in mixing for powders and granulate
- Gentle touch mixing is based on gravity flow
- Key characteristics: quickly homogenous, all particles always in motion, no breakage, no heat, hygienic
- Applications: fragile agglomerates, milk powder products, tea, breakfast cereals, ceramics, detergents, metal powders, etc.

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The Netherlands

www.lindor.nl

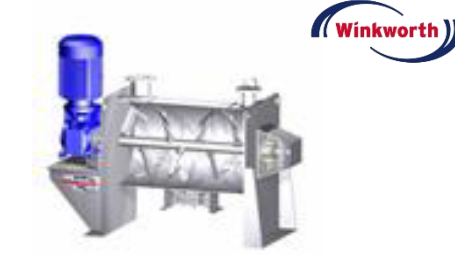
Tel: +31 (0)78 6550655
Enquiries: mixers@lindor.nl
Service & spare parts: service@lindor.nl

Eight powder mixers – each with their own characteristics



UT Mixer (Ribbon)

- Vertical fill & empty, incomplete
- Low cost, many suppliers
- Widely applied,
- Long mixing times
- High shear, high energy
- Difficult cleaning



RT Mixer (Ploughshear)

- Vertical fill & empty
- Very short mixing times
- High shear, high energy
- Partial emptying
- Difficult cleaning



TS Mixer (Paddle)

- Vertical fill & empty, fast but partial
- Very short mixing times
- Lower shear
- Cantilevered versions for easy cleaning



Gentle Touch Mixer (Lindor)

- Ahal, near complete fill & empty
- Short mixing times
- Very low shear & energy
- Retractable inlet & outlet versions for easy cleaning



Conical Mixer (Nauta)

- Vertical, complete fill & empty
- Long mixing times
- Lower shear



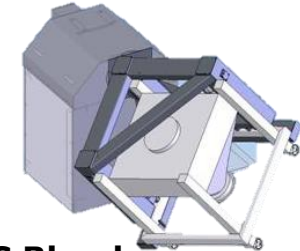
Vertical Ribbon (Ruberg)

- Vertical, partial fill & empty
- High cost, few suppliers
- Very short mixing times
- High shear, high energy
- Versions with easy cleaning



BC Blender (Bi-Conical)

- Vertical fill & empty
- Very long mixing times
- Low shear, low energy
- Complete emptying
- Easy cleaning

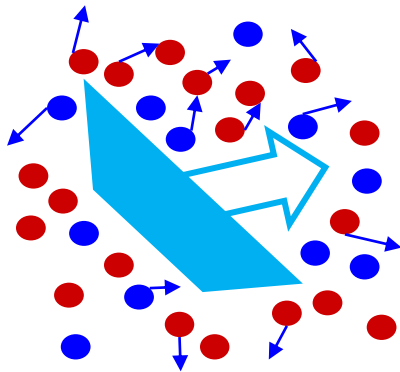


IBC Blender

- Vertical fill & empty
- Very long mixing times
- Low shear, low energy
- Complete emptying
- Easy cleaning
- Good isolation of batches

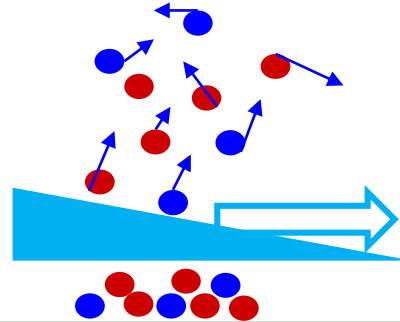
These eight types of mixers each have one of three basic mixing mechanisms

Forced Flow



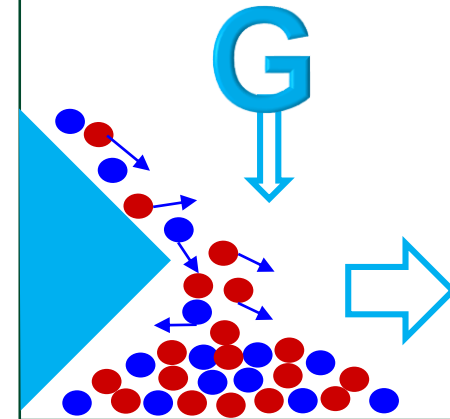
Particles are **PUSHED** by a tool like ribbon or blade which move some particles who move others.

Mechanical Fluidisation



Particles are **'WHIPPED'** in the air by a fast plough shear or paddle. These particles collide with others, creating a cloud.

Gravity Flow

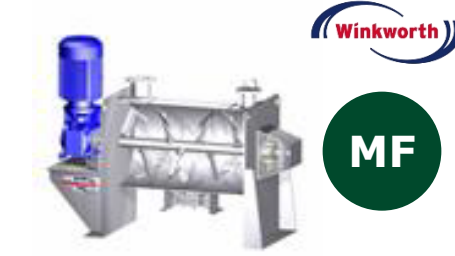


Particles are lifted and **DROPPING/SLIDING** on the rest, redistributing continuously. Each particle undergoes the same force (G).

Eight powder mixers – each with their own characteristics



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Eight powder mixers – each with their own characteristics

Illustrative



	Ribbon	Plough	Ruberg	Nauta	Paddle	Container	Biconical	Lindor
Homogen.								++
Mixing Speed								
Energy Consumpt.								
Cleaning Time								 1)
Product Breakage								very low
Even liquid application								++
Cost - level								

1): Ref. new Lindor 'Gull Wing' mixer with large swing doors and retractable inlet & outlet

Mixing for proof of concept, for optimisation and for validation



Dordrecht (NL) – Basingstoke (UK) – Mumbai (IN) – Osaka (JP) – Kuala Lumpur (MY)



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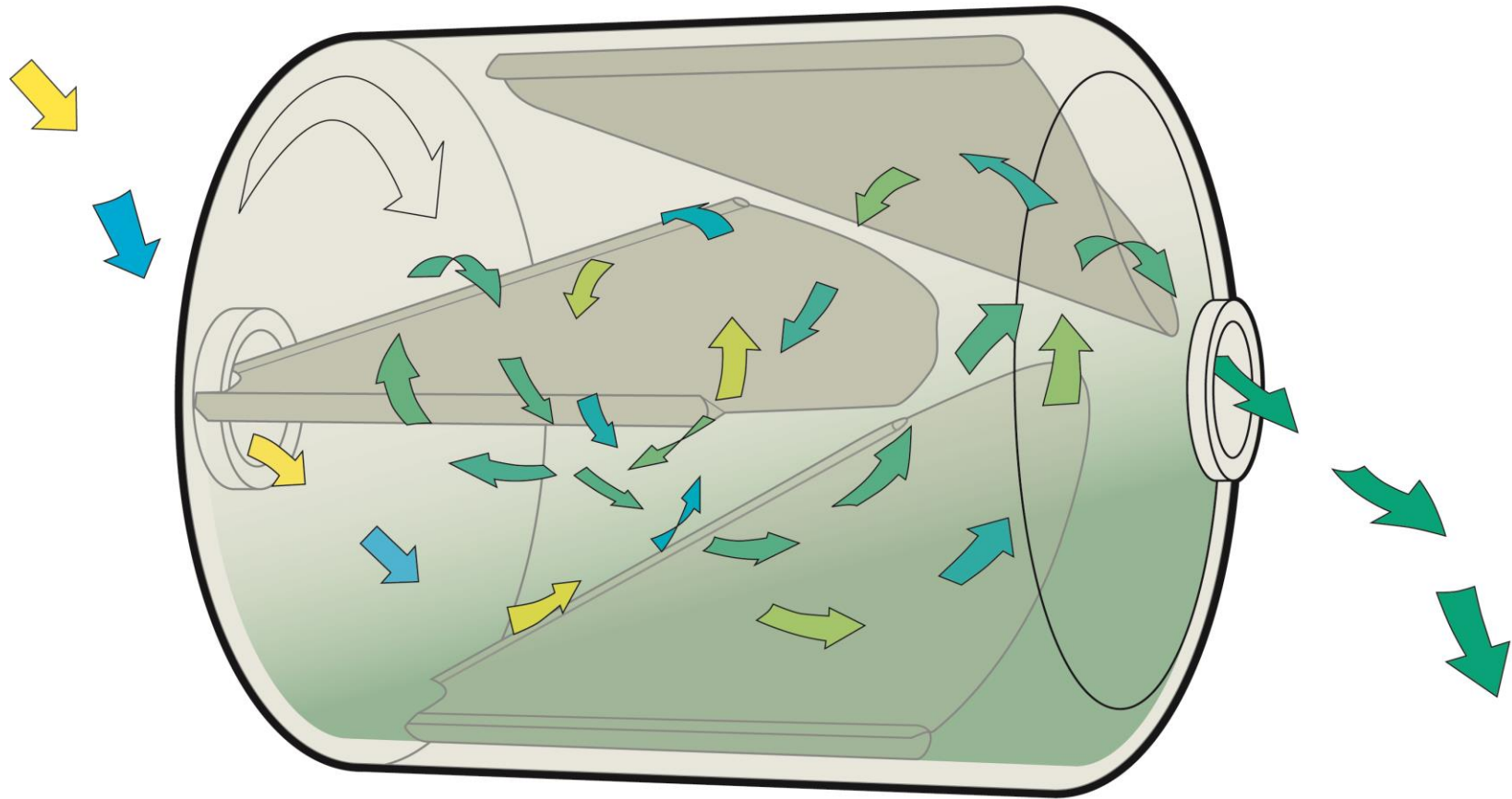
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Lindor, mixers voor gevoelige producten

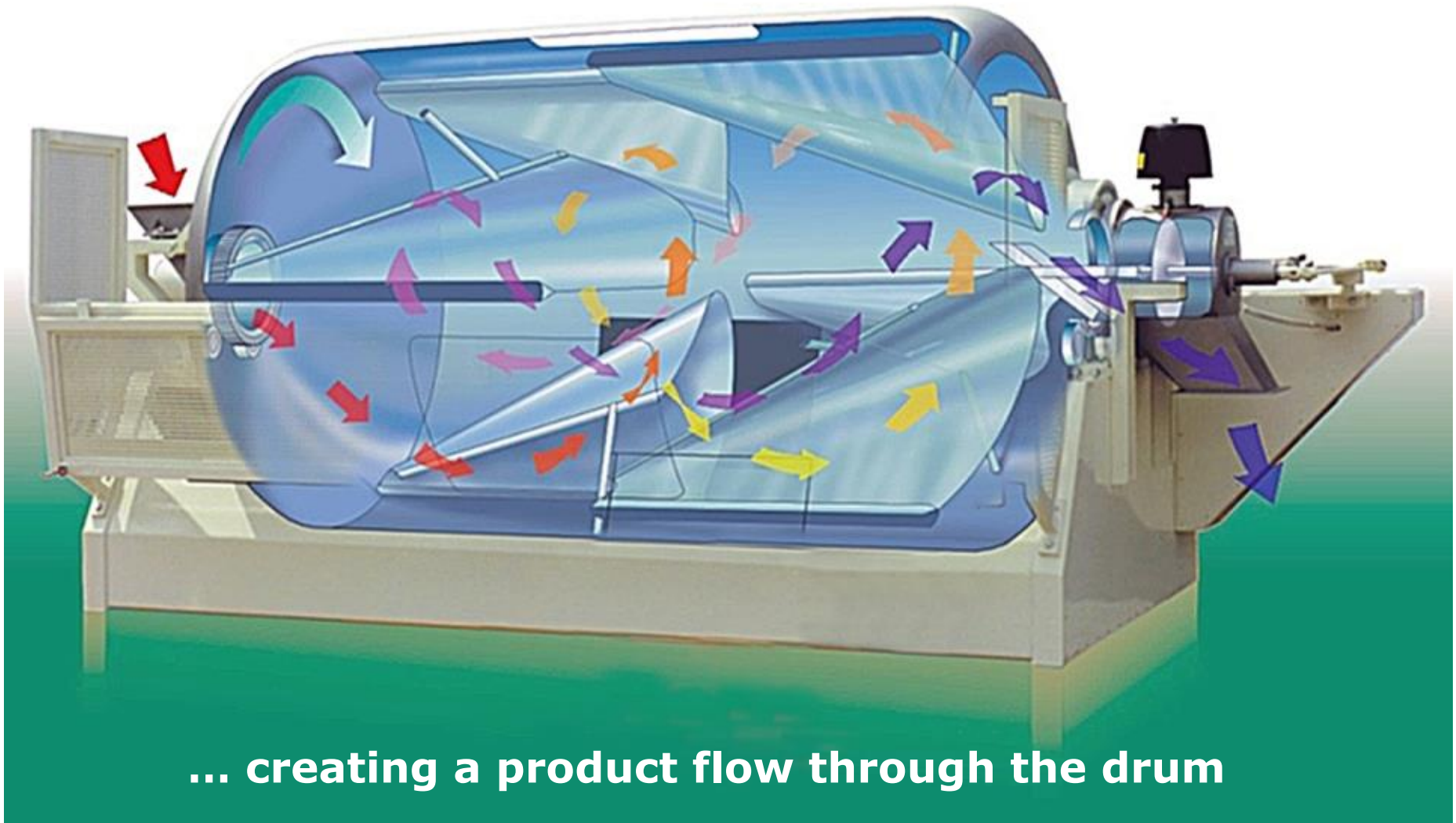


Lindor *The gentle touch in mixing*

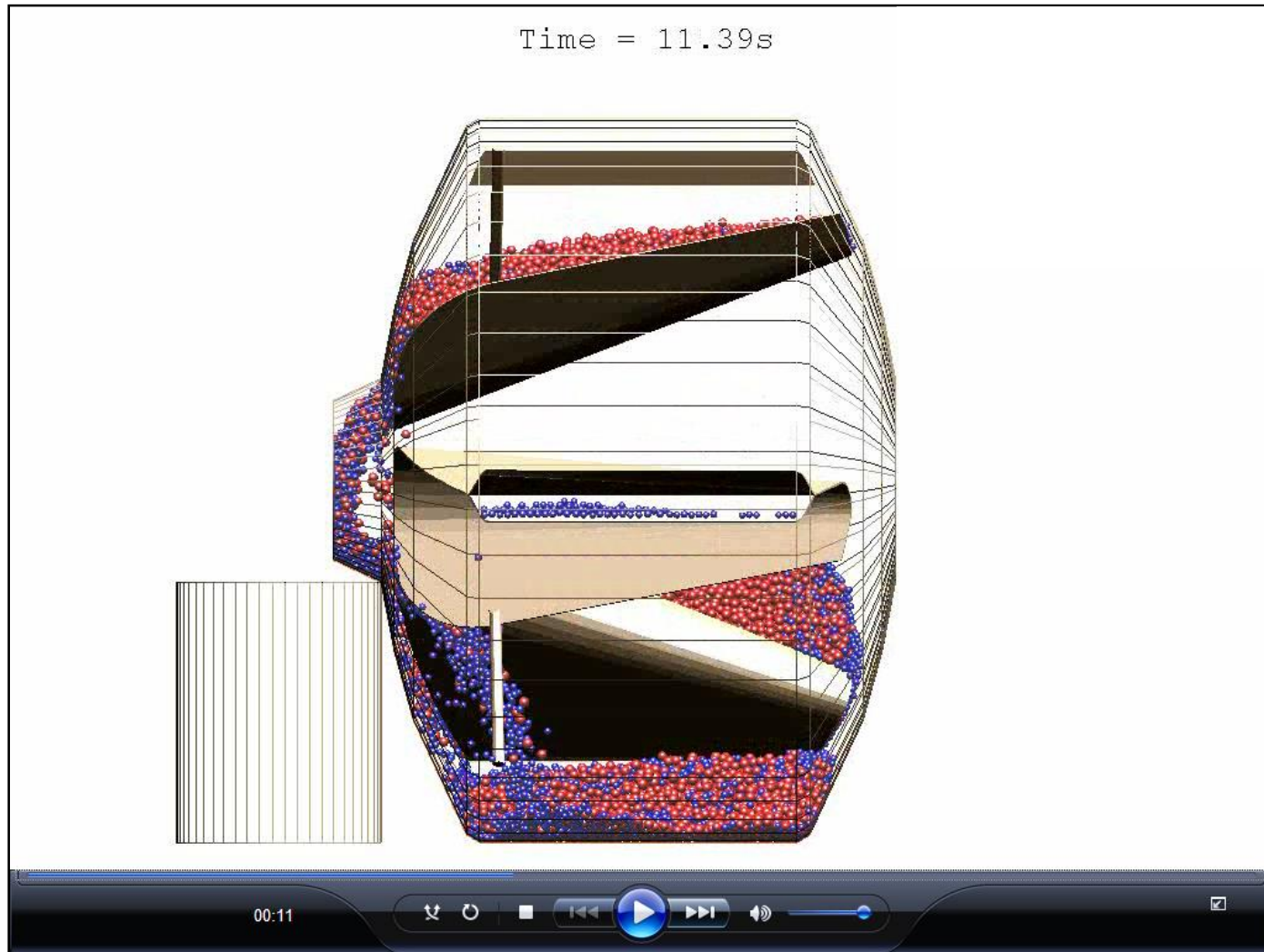
The concept of the Lindor mixer allows the product to be dispersed with no agitation, thus no damage



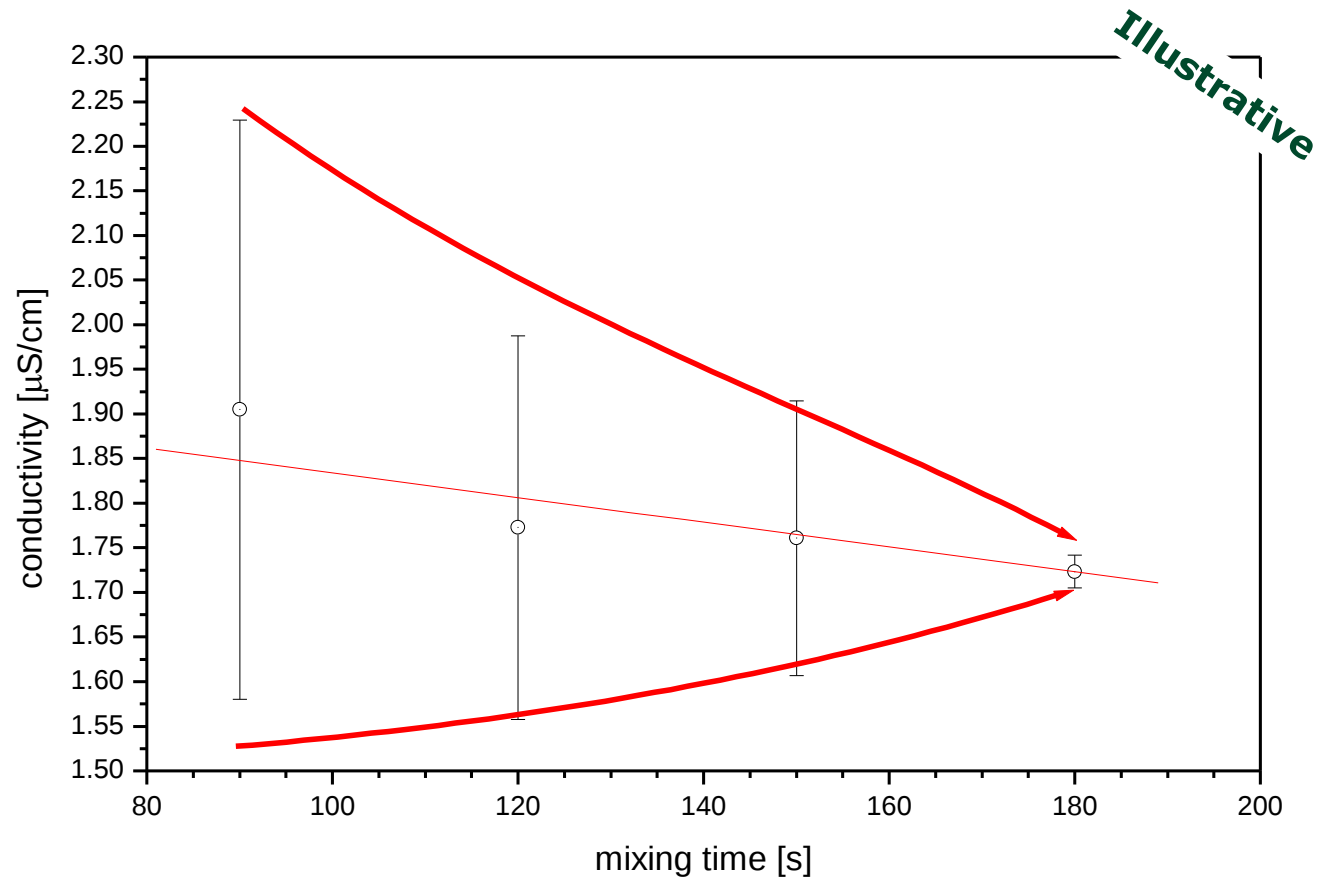
By slowly rotating drum with fixed scoops the product is lifted up and sliding down ...



A 3D simulation illustrates the flow of products



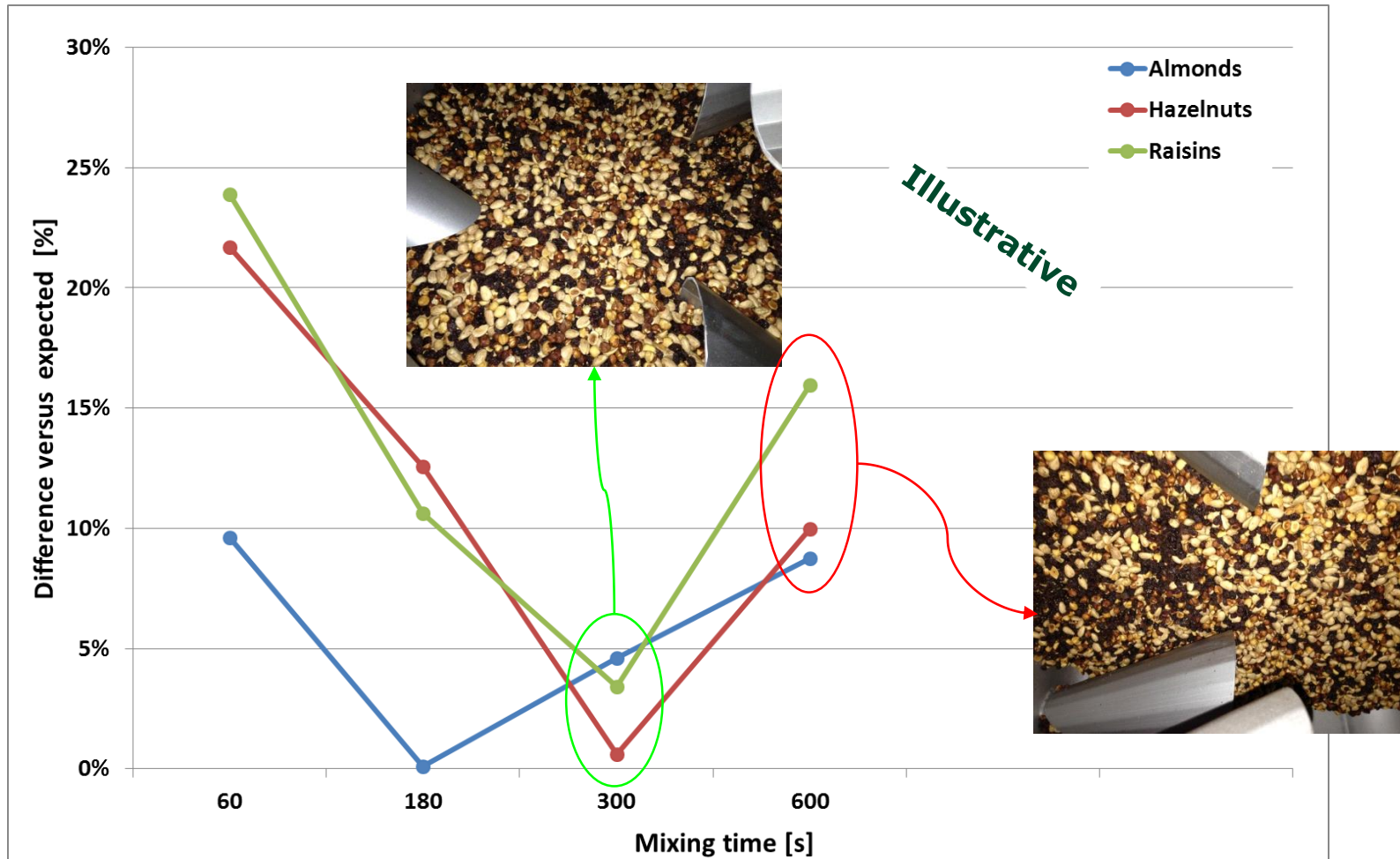
Homogeneous mixing in a short time...



Sample 200kg of product base (roller dried rice cereal) plus NaCl in Lindor L750

... But for some products, de-mixing after a longer mixing time!

Mixing of nuts and raisins



Low power usage – small motors

Illustrative

Bulk Density	Total Power Use (kW)			Installed Power based on SEW (kW)		
	0,3 kg/dm ³	0,5 kg/dm ³	0,7 kg/dm ³			
Type - size						
L500	0,2	0,4	0,5	2,2		
L750	0,4	0,6	0,8	2,2		
L1000	0,5	0,8	1,1	2,2		
L1500	0,7	1,2	1,7	2,2	3,0	
L2000	1,0	1,5	2,2	2,2	3,0	4,0
L3000	1,7	2,9	4,0	5,5	7,5	11,0
L4000	2,3	3,8	5,4	5,5	7,5	11,0
L5000	2,7	4,8	6,7	5,5	7,5	11,0
L6000*	2,9	4,9	6,8	2 x 5,5		
L7000*	3,4	5,7	8,0	2 x 2,5	2 x 7,5	
L8000*	3,9	6,5	9,1	2 x 5,5	2 x 7,5	
L10000*	4,9	8,1	11,4	2 x 5,5	2 x 7,5	2 x 11,0
L12000*	6,7	11,2	15,7	2 x 5,5	2 x 11,0	2 x 15,0
L14000*	7,9	13,1	18,3	2 x 11,0	2 x 15,0	

Used motordrives (SEW): 2,2 kW – 3,0 kW – 4,0 kW – 5,5 kW – 7,5 kW – 11,0 kW

*: 2 motordrives used per mixer

The typical characteristics of the Lindor Gentle Touch Mixer make it an excellent choice for fragile and precious products

Key Characteristics

- Excellent homogeneity
- No breakage – No heat
- Short mixing time (2 – 5 min.)
- Quick and easy to clean
- Self-emptying (typ. > 99,9%)
- Variable batch size (10% - 100%)
- Very low energy consumption
- Low maintenance
- Horizontal construction



And we also have a 10 liter lab mixer – Lindor L10



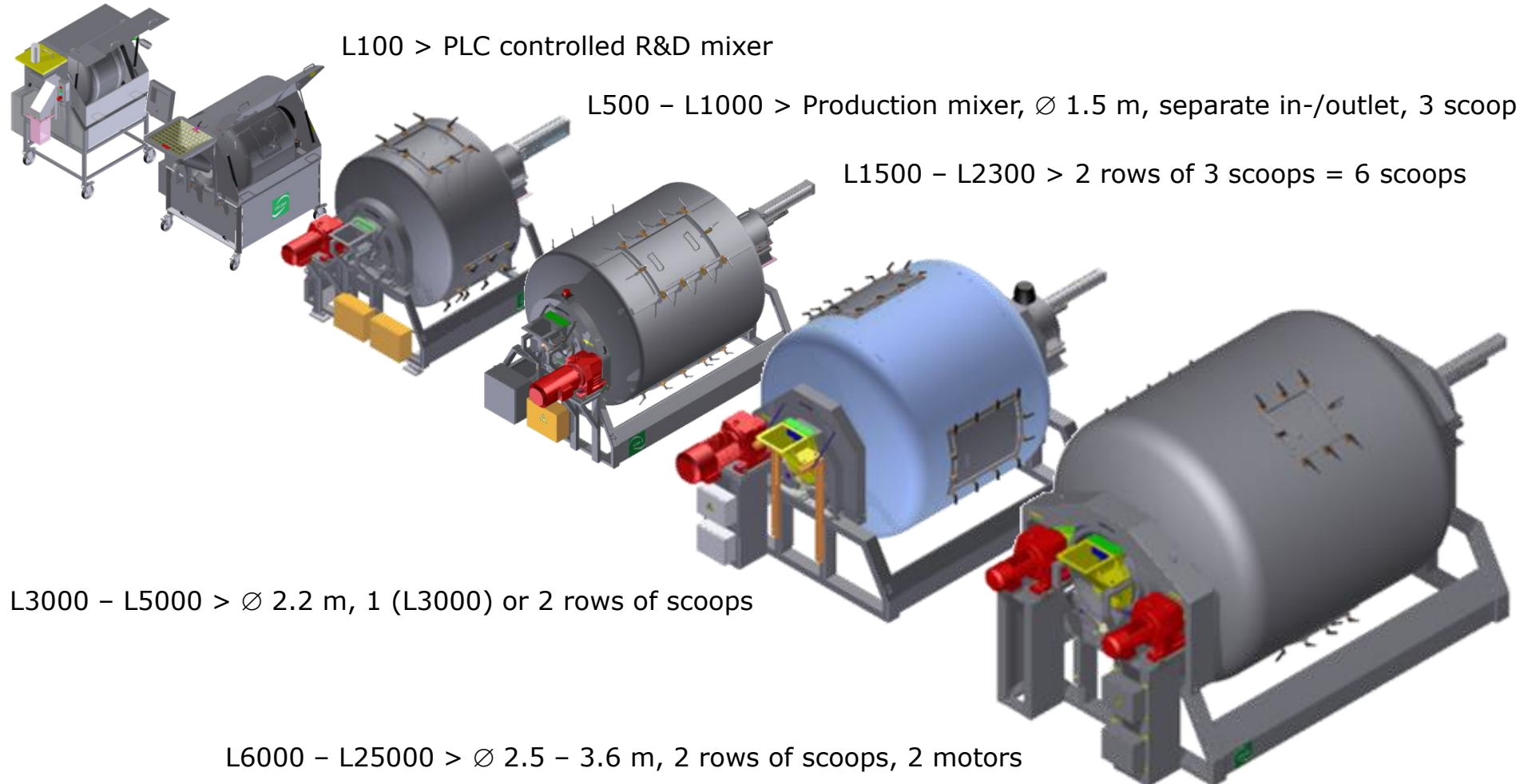
The small, medium and large size models vary in geometry and design

L70 & L200 > Manually operated pilot mixer

L100 > PLC controlled R&D mixer

L500 – L1000 > Production mixer, $\varnothing$ 1.5 m, separate in-/outlet, 3 scoops

L1500 – L2300 > 2 rows of 3 scoops = 6 scoops



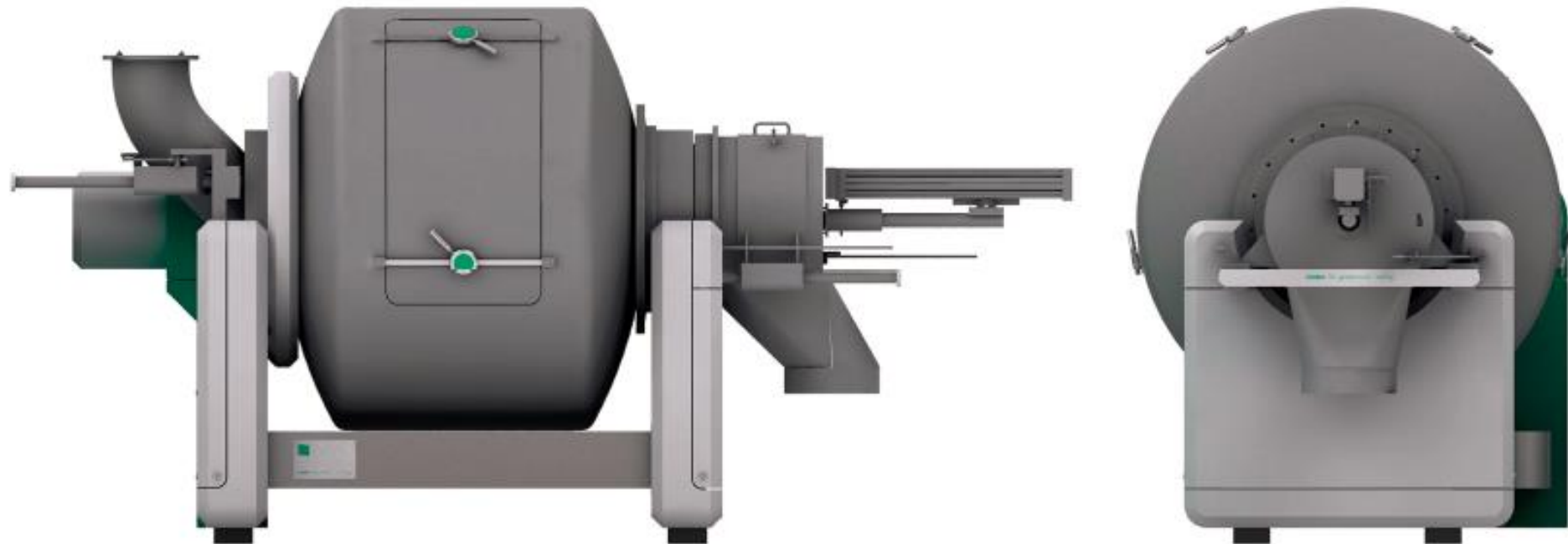
L3000 – L5000 > $\varnothing$ 2.2 m, 1 (L3000) or 2 rows of scoops

L6000 – L25000 > $\varnothing$ 2.5 – 3.6 m, 2 rows of scoops, 2 motors

Lindor L25000 – 25000 liters/ 15 ton batch size



New development – Lindor Gull Wing Mixer



New development – Gull Wing prototype at ANUGA



Selection of food companies and brands using Lindor ...



Selection of companies in fine chemicals using Lindor ...

 ALBEMARLE®



H.C.Starck 

Panasonic
ideas for life

KOBELCO
KOBELCO STEEL GROUP



FLUOR®



EVONIK
INDUSTRIES

DENSO

KÜTTNER

 **GS E&C**

أرامكو السعودية
Saudi Aramco 

 **TDK®**
EPCOS

TASNEE التمنية

 **Axens**
IFP Group Technologies

 **BASF**
The Chemical Company

SCHOTT

CeramTec
THE CERAMIC EXPERTS

POSCO
E&C

IFF International Flavors & Fragrances Inc.

 **Hanwha**

RECKITT
BENCKISER

Blending and flavouring tea

Reason for Lindor Mixer

- Homogeneous blend
- No breakage of leaves
- Quick mixing (2 – 3 minutes)
- Even distribution of liquids

Sizes installed (batch size)

- 25 kg – 5000 kg



Mixing infant formula & infant cereals

Reason for Lindor Mixer

- Homogeneity
- Powder quality – particle integrity
- Easy cleaning (with QSR)

Sizes installed

- 300 kg – 2000 kg



Mixing instant products

Reason for Lindor Mixer

- Powder quality
- Low maintenance
- Production capacity, short cycle times

Sizes installed

- 30 kg – 1000 kg



Mixing breakfast cereals

Reason for Lindor Mixer

- Homogeneous product
- No breakage of ingredients
- No segregation
- Short cycle times

Sizes installed

- 30 kg – 1000 kg



Mixing snacks

Reason for Lindor Mixer

- Homogeneous product
- No breakage of ingredients
- No segregation

Sizes installed

- From L500 – L1000



Blending, soaking and drying of polymers

Reason for Lindor Mixer

- Homogeneous blend
- Gentle action, no damage, no dust
- Even distribution of liquids
- Closed environment with N₂ blanket
- No ingress of foreign particles (< 1 ppm)
- Continuous mixing (some applications)

Sizes installed (batch size)

- 250 kg – 15000 kg



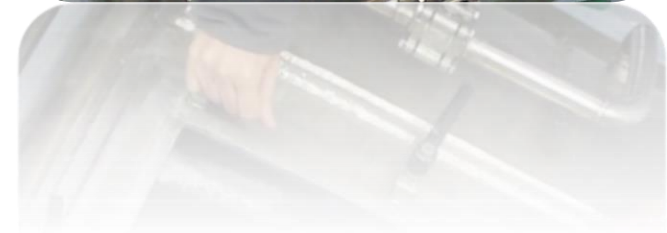
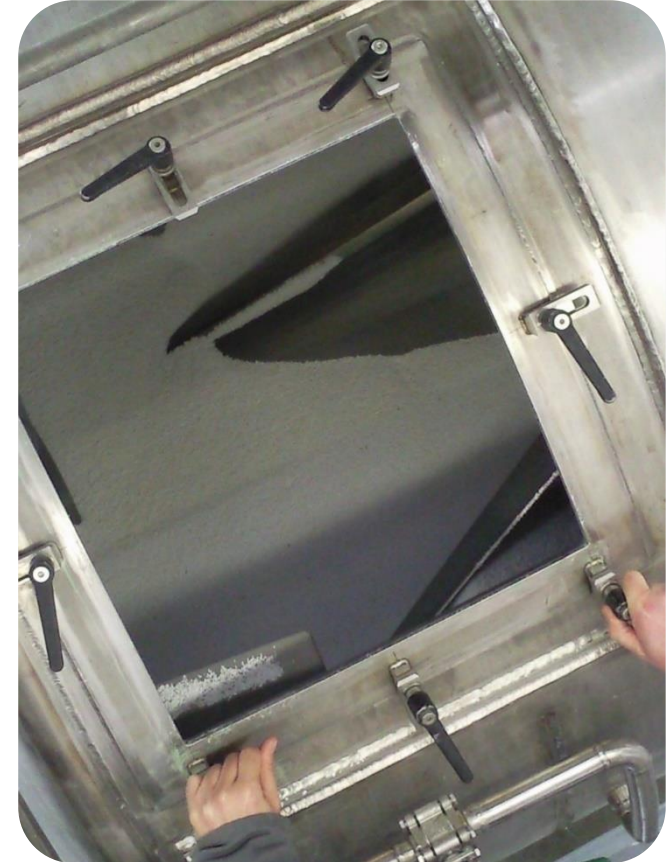
Impregnation, blending and drying of technical ceramics

Reason for Lindor Mixer

- Homogeneous blend
- Gentle action, no damage, no dust
- Even distribution of liquids
- Closed drying circuit)

Sizes installed (batch size)

- 500 kg – 2000 kg



Homogenization of battery powders

Reason for Lindor Mixer

- Homogeneous blend
- Gentle action, no damage,
- No risk of metal ingress in product

Sizes installed (batch size)

- 500 kg – 1000 kg



Lindor *The gentle touch in mixing*

Thank You