

110% MIXING SOLUTIONS



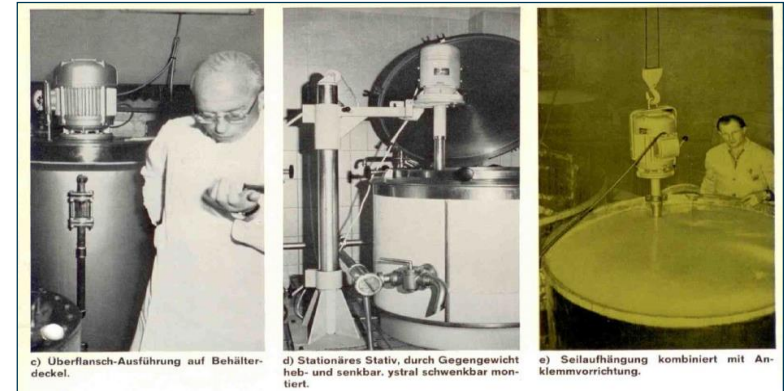
Technology YSTRAL Conti-TDS

Overview and operating principle

Technology YSTRAL Conti-TDS

Ystral

- 1959 ystral founded in Stuttgart
 - one machine = Jetstream Y Technology
 - one focus = dairy industry
- 1973 moved to Ballrechten-Dottingen
 - new Facilities - starting the new trial center
- 1998 Management David and Peter Manke
- 2005 MBO David Manke, Georg Manke, Peter Manke
- 2011 New modern assembly hall opened
- 2011 Established ystral asia pte ltd in Singapore
- 2013 Established ystral india pvt ltd in Bangalore



Technology YSTRAL Conti-TDS

Ystral company

- Modern production facilities
 - Assembly of large turn-key production systems
 - FAT can be conducted in-house
- Modern trial facility
 - Over 200 trials a year with customers
 - All combinations of equipment possible
 - Well equipped analytical laboratory
- Extensive range of “roaming” trial machines
 - Trials directly customer site
- 2018 – more than 260 employees





Products and Services



JetStream Mixers

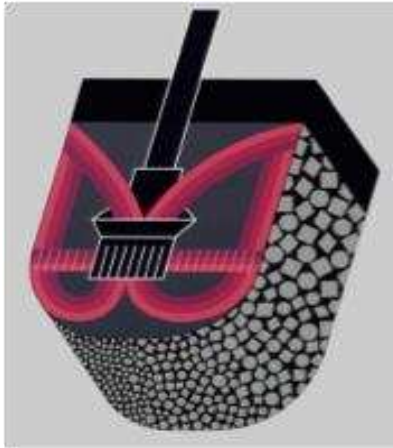
- ✓ Homogenous mixing
- ✓ Dissolving
- ✓ Suspending
- ✓ Cooling, heating
- ✓ Crystallisation



Batch Dispersers

- ✓ Dispersing
- ✓ Emulsifying
- ✓ Wet grinding
- ✓ Melting
- ✓ Extracting





Dispermix

- ✓ Mixing
- ✓ Dispersing
- ✓ Emulsifying
- ✓ Dissolving
- ✓ De-agglomeration



Batch-TDS Powder Induction Systems

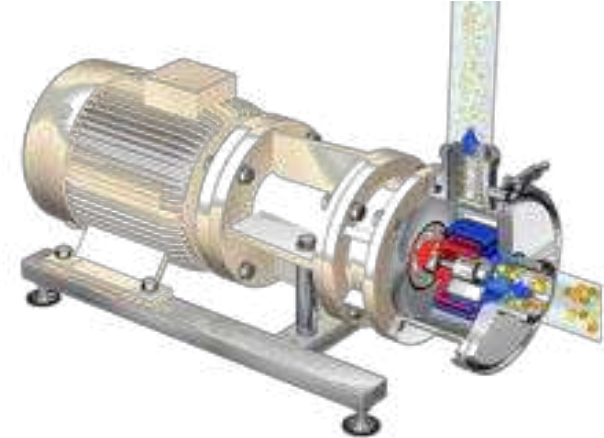
- ✓ Powder induction
- ✓ Wetting
- ✓ Mixing
- ✓ Blending
- ✓ Aeration
- ✓ Introduction of gas





In-Line Dispersers

- ✓ Dispersing
- ✓ Emulsifying
- ✓ Shearing
- ✓ Wet grinding
- ✓ Controlled reaction
- ✓ Saponification
- ✓ Homogenisation



Conti-TDS

- ✓ Powder induction
- ✓ Wetting
- ✓ Blending
- ✓ Dispersing
- ✓ Dissolving
- ✓ Emulsifying
- ✓ Reaction
- ✓ Aeration/deaeration
- ✓ Controlled introduction of gas



Process and Plant Design

- ✓ Process engineering
- ✓ Customer focused solutions
- ✓ Process machinery and components
- ✓ Turnkey systems in a modular concept
 - Liquid handling
 - Powder handling
 - Process monitoring and control
 - Process automation



Where are we active

Food industry :

dairy products, flavours and fragrances, edible oils, sweets, juices, baby food, ice cream etc.

Cosmetic industry :

creams and lotions, personal care, shampoo, etc.

Pharmaceutical industry :

active agent solutions, tablet coatings, additives, clinical nutrition, etc.

Chemical industry :

paints, lacquers, printing inks, adhesives, home care, agrochemicals, paper coatings etc.



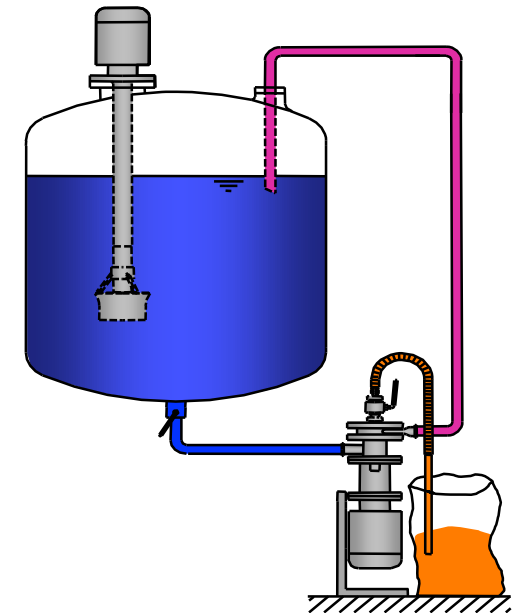


Technical Advantages of **YSTRAL Conti-TDS**

Technology YSTRAL Conti-TDS

Technical Advantages

- ✓ Shear gradient 50'000
1000 times higher
- ✓ Specific Power during dispersion 50 MW/m³
5000 times higher
- ✓ Specific Energy („Energy Density“) during dispersion :
1 to 5 MJ/m³
- ✓ Specific liquid surface during powder addition :
0,5 to 2 Million m²/min; 10 times more
- ✓ No vortex
- ✓ No additional air
- ✓ Less vapour
- ✓ No high viscosities required to create shear
- ✓ Variable batch sizes, viscosities, filling levels
- ✓ Reproducibility
- ✓ Better Safety



Limitations of „traditional“ production technology

- ✓ Manual – semi-automatic production processes
- ✓ Typical maximum batch sizes up to 10'000 litres
- ✓ Time consuming dosing of solids from sacks, big-bags or silos
- ✓ **Uncontrollable** wetting, dispersing and homogenisation process
- ✓ **Large amount of air** brought into the product
- ✓ **Small production window** when processing various viscosities
- ✓ Out-dated stirrer technology for mixing, let-down and adjustment



„Limitless“ production possibilities using YSTRAL technology

- ✓ Full automated production processes
- ✓ Variable production quantities **not restricted** by the „tank“ size
- ✓ **Enforced dispersion** and wetting with YSTRAL Conti-TDS
- ✓ **Flexibility** to increase production capacities
- ✓ **Flexibility** to change application and restructure as markets change
- ✓ Mixing **without bringing in air**
- ✓ **Large production window** when processing various viscosities
- ✓ JetStream mixing technology for let-down and **‘perfect’ homogeneity** in the shortest time

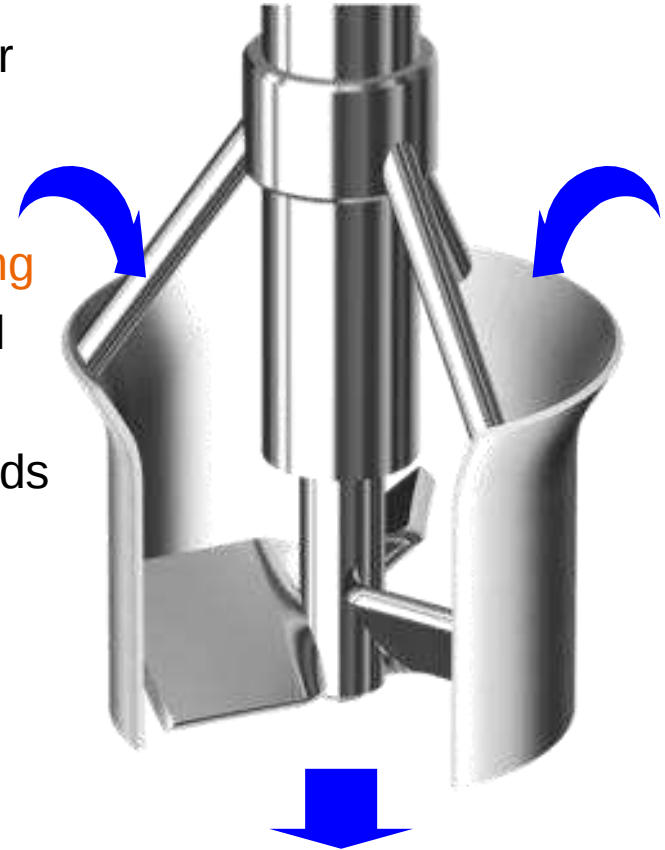




Working principle of **YSTRAL Jet stream mixer**

YSTRAL Jetstream Mixer

- ✓ Fast rotating rotor creates a liquid stream in a stator
- ✓ Liquid stream is directed towards the bottom of the vessel
- ✓ No rotation of the liquid in the vessel - **vertical mixing**
- ✓ Liquid stream is divided on the bottom of the vessel and directed upwards
- ✓ On the surface the liquid stream is redirected towards the rotor/stator system
- ✓ The whole contents of the vessel is in motion
- ✓ **No induction of air**
- ✓ **No sedimentation of heavy powders**
- ✓ Rotating parts covered (safety!)



Micro Mixing

- ✓ In the mixing head, turbulent, fast, effective

Macro Mixing

- ✓ In the whole vessel
- ✓ Homogenous
- ✓ Laminar
- ✓ Everywhere



- ✓ JetStream mixer creates a ‘perfect’ homogeneous MIX
- ✓ Stirrers can ONLY make “SUSPENSIONS” according to the one (1) second rule or 90% homogeneity criteria
- ✓ No vortex formation
- ✓ No induction of air
- ✓ No baffles required in the tank (easier cleaning)
- ✓ Suitable for all vessel designs and sizes



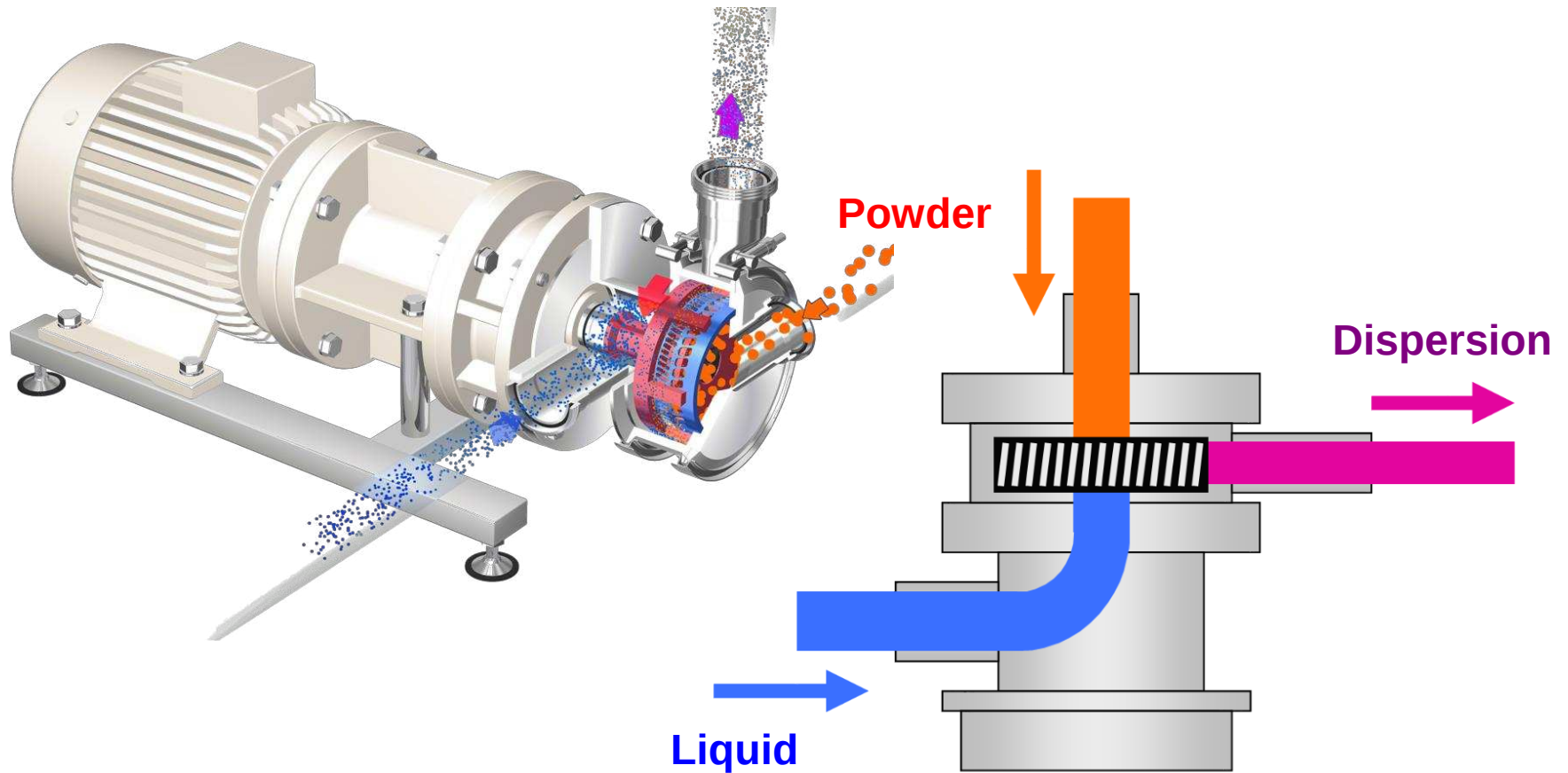
Working principle of **YSTRAL Conti-TDS**

YSTRAL Conti-TDS



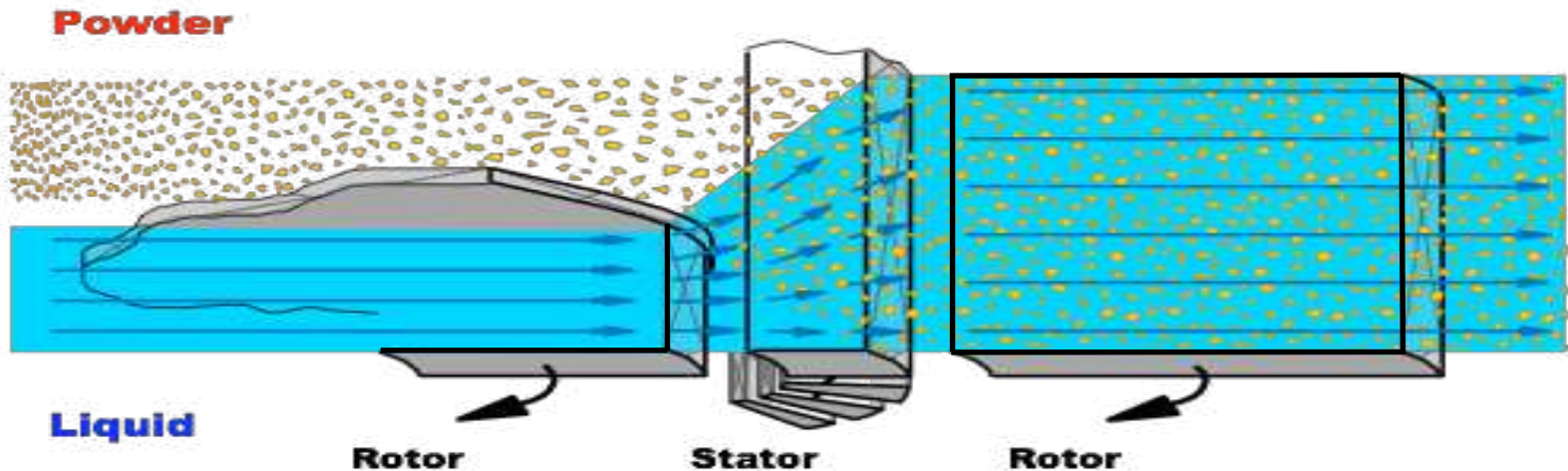
Technology YSTRAL Conti-TDS

YSTRAL Conti-TDS



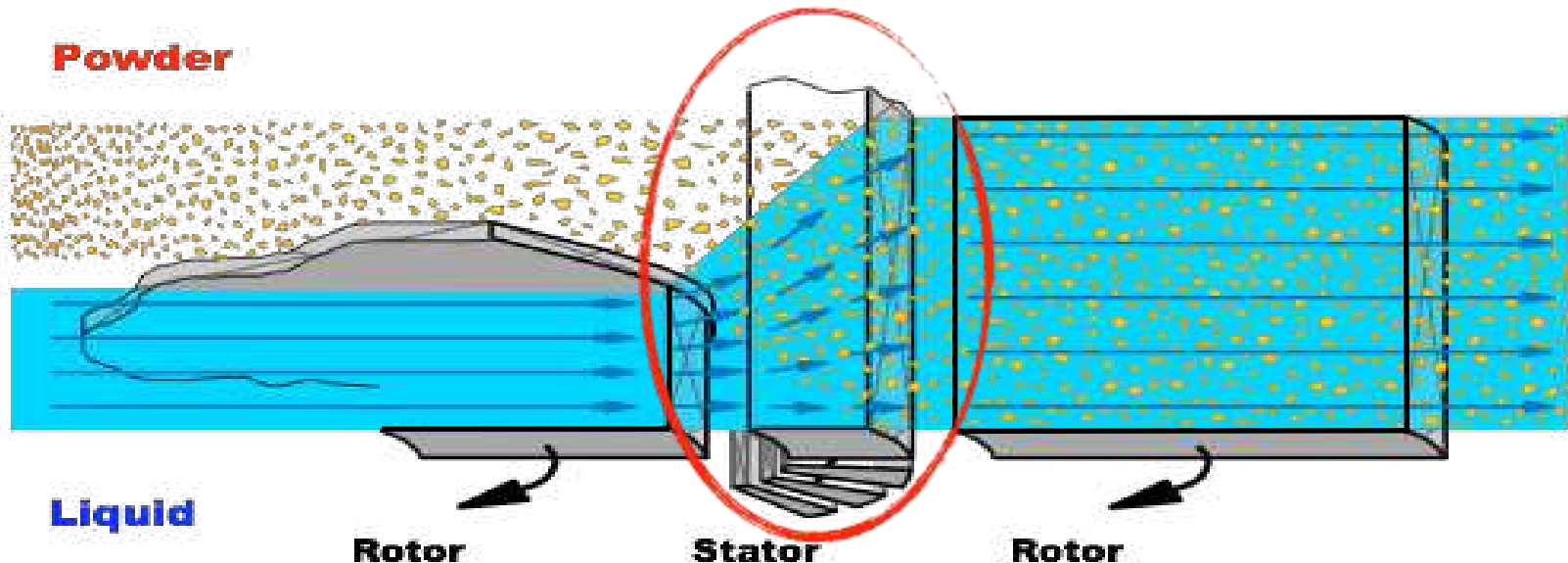
Working principle

- ✓ Basic principle is similar to a centrifugal pump
- ✓ Inner rotor and outer rotor have **different pumping capacities**
- ✓ The different pumping capacities **create a vacuum** (up to 95%)
- ✓ A stator is located between inner rotor and outer rotor
- ✓ **Powder and Liquid are separated** by the disc-shape rotor until they meet in the wetting and dispersing zone



Wetting/Dispersing zone

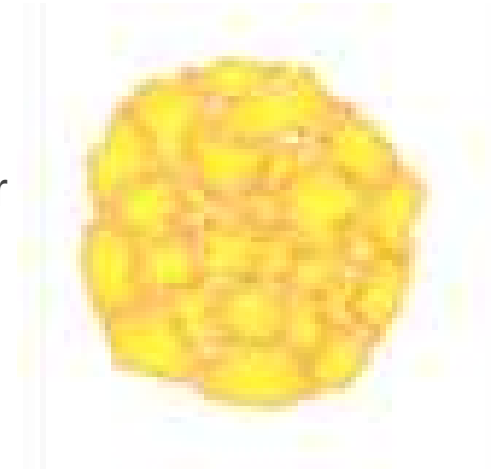
- ✓ Extremely high-frequency dispersing under vacuum
- ✓ Maximum vacuum, maximum distance between particles
- ✓ Specific surface of the **liquid is enlarged up to 2'000'000 times**
- ✓ Complete wetting and dispersing
- ✓ Maximum shear gradient up to **60'000 s⁻¹**. (HSD = 50 s⁻¹ and a stirrer = 20 s⁻¹)



How does it work in detail?

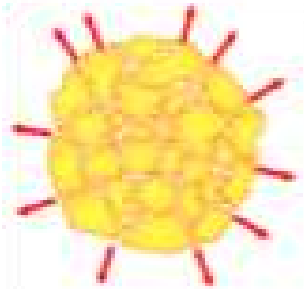
Before induction

- ✓ Powder is a “dispersion” of solid and air
- ✓ Powders contain agglomerates
- ✓ The pores and gaps inside agglomerates are filled with air



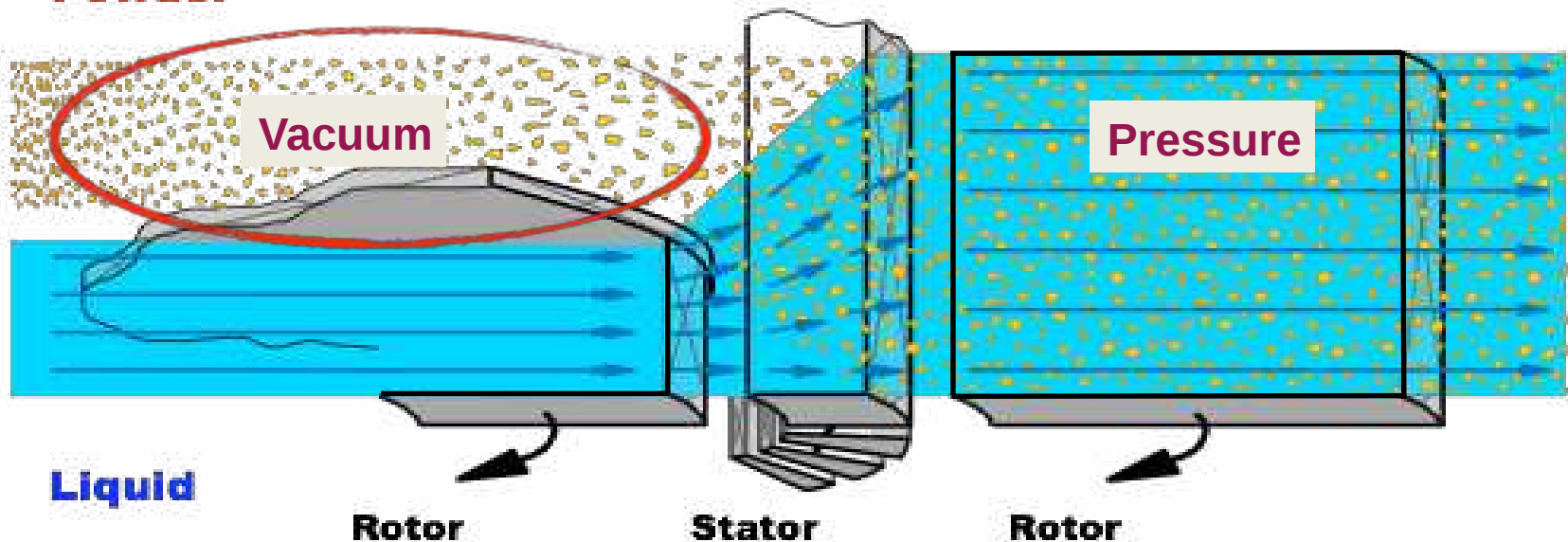
- ✓ Agglomerates have to be **completely destroyed** without unacceptable influence on the basic material
- ✓ Agglomerates need to be ‘wetted’ BOTH inside and outside for a “perfect” dispersion

Step 1 – Powder Induction

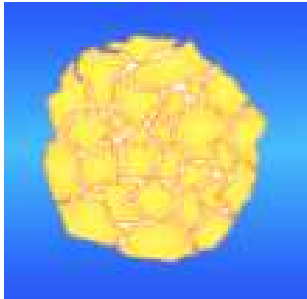


Powder

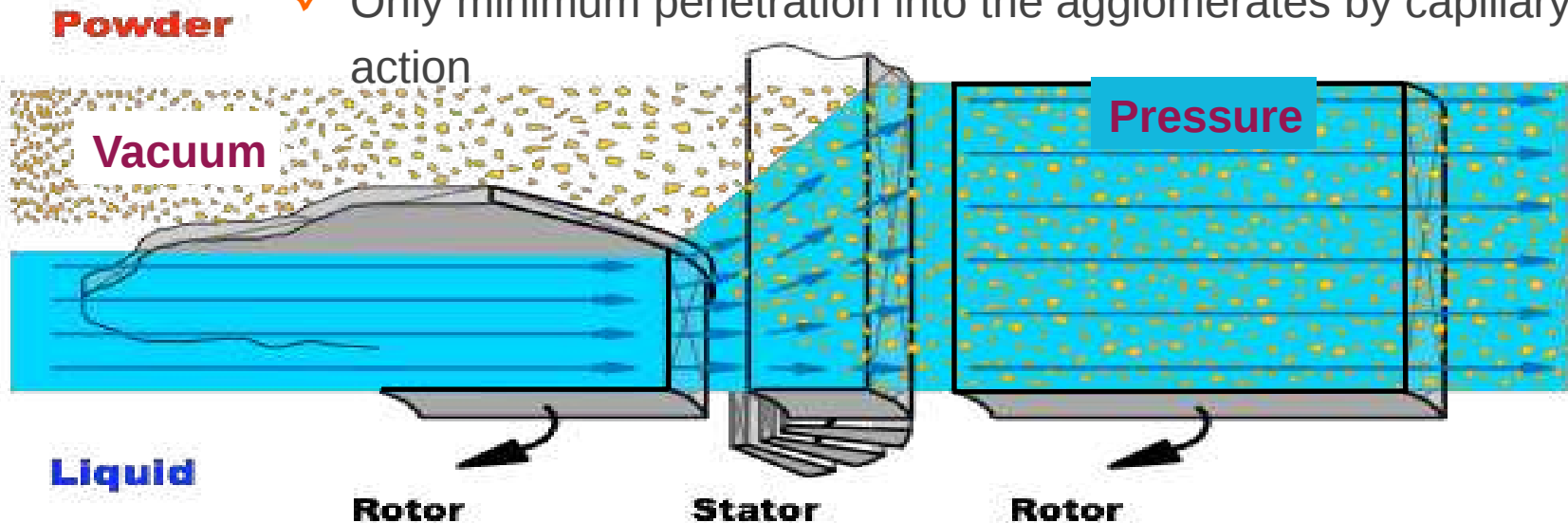
- ✓ Powder enters into the wetting chamber
- ✓ Vacuum increases
- ✓ Volume of air increases 20 times under full vacuum
- ✓ Distance between particles increases - open powder surface
- ✓ Speed of particles increases - powder is fluidised
- ✓ Air expands, also inside the agglomerates



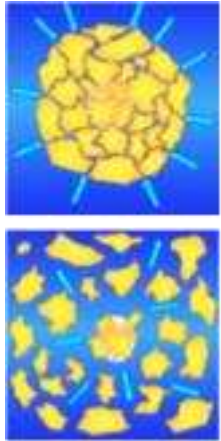
Step 2 – Wetting and dispersing



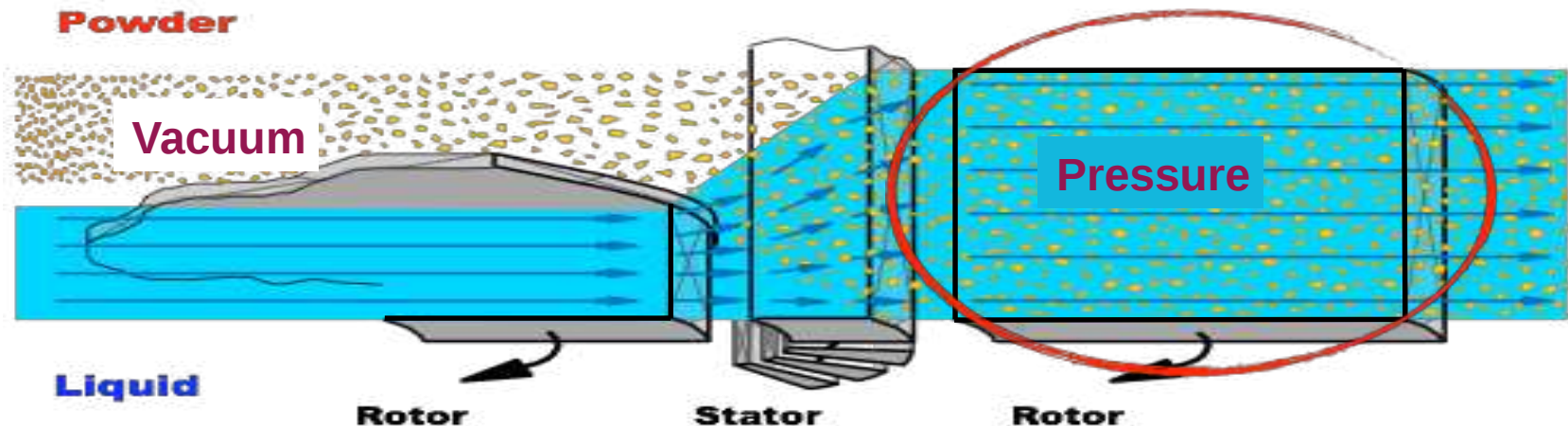
- ✓ Liquid surface is enlarged by shear and turbulence
- ✓ Powder is wet and dispersed into the liquid
- ✓ Wetting under maximum vacuum
- ✓ Agglomerates **completely enveloped** with liquid
- ✓ Wetting and dispersing under maximum vacuum
- ✓ Dispersing under maximum shear between rotor and stator
- ✓ Only minimum penetration into the agglomerates by capillary action



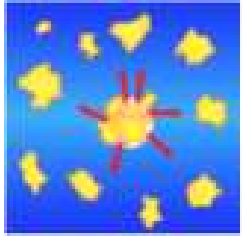
Step 3 – Exit from wetting chamber



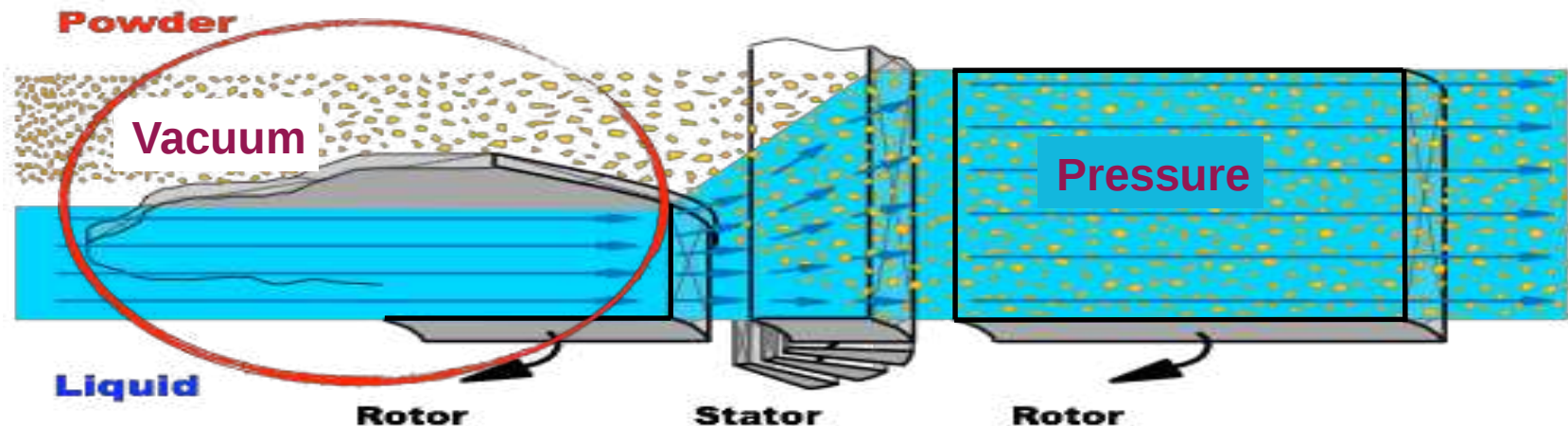
- ✓ Dispersion leaves the dispersing zone and returns back to the vessel
- ✓ Maximum pressure
- ✓ Air is compressed to the minimum volume
- ✓ Air bubbles coagulate and can freely rise out in the process vessel
- ✓ Compression of air inside the agglomerate
- ✓ Liquid is inducted into the pores and penetrates the agglomerate
- ✓ Wetting of inner surface and break-up of agglomerates



Step 4 – Subsequent passages (Recirculation)



- ✓ Dispersion is recirculated from the vessel back towards the dispersing zone
- ✓ Some smaller agglomerates may have remained containing 'rests' of air
- ✓ Second passage into the vacuum zone, now on the liquid side
- ✓ Air expands again to a maximum



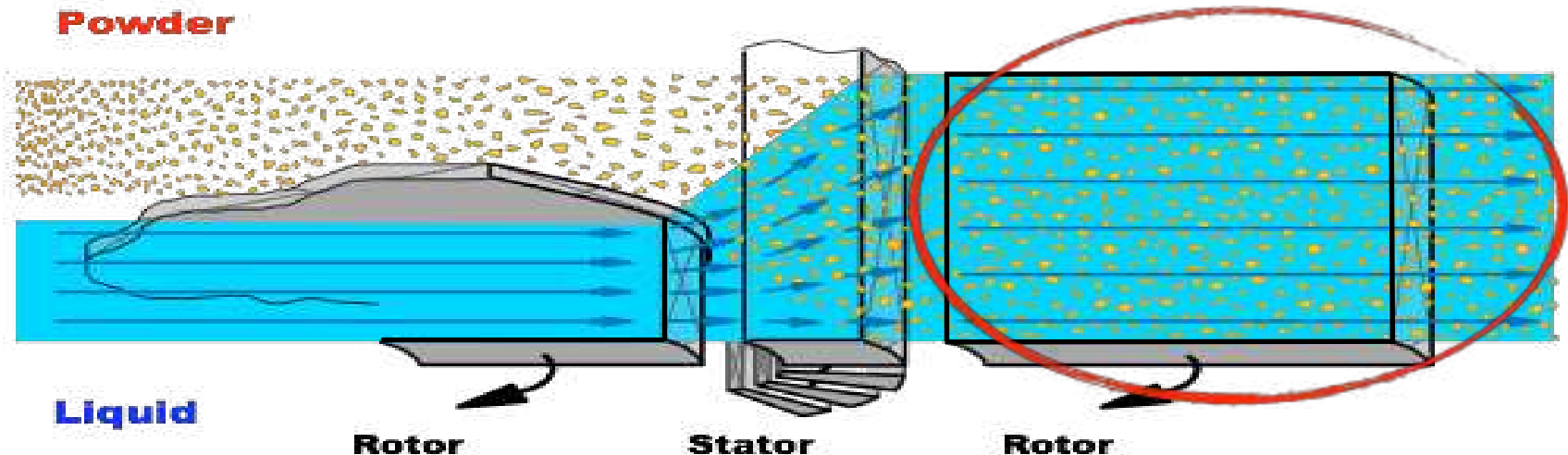
- ✓ Dispersion reaches the dispersing zone in recirculation
- ✓ Powder is wetted and dispersed into the recirculated dispersion
- ✓ Again dispersing under **maximum vacuum**
- ✓ Again dispersing under **maximum shear** between rotor and stator
- ✓ **Air is divided from the particle** because of the shear forces



Step 6 – Exit from wetting chamber (recirculation)



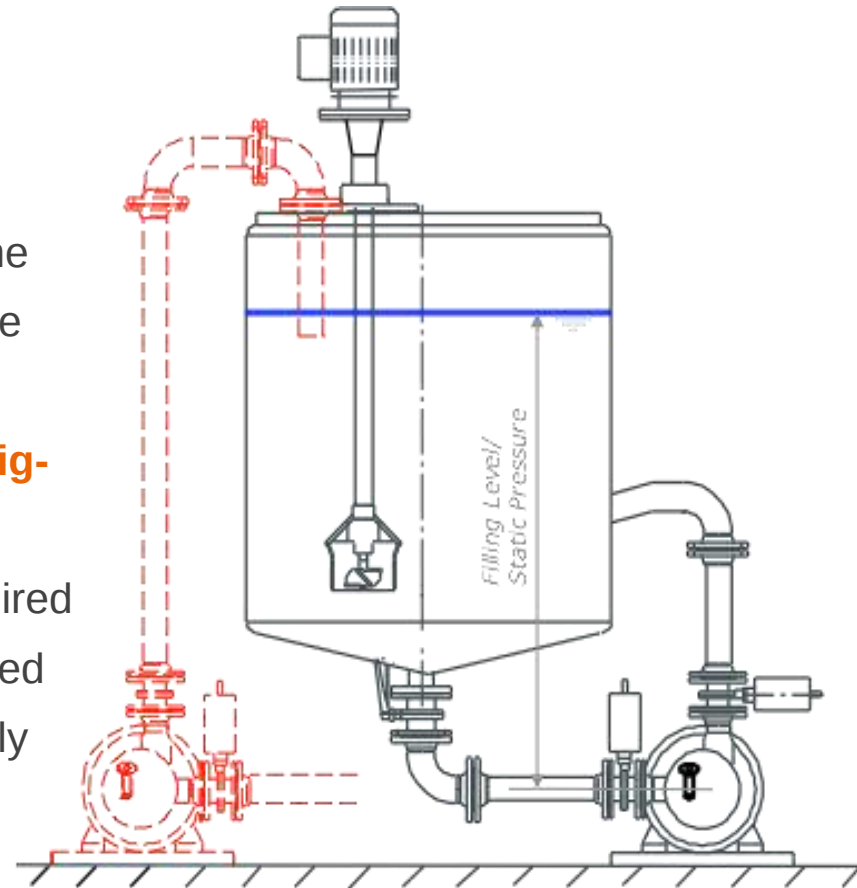
- ✓ Dispersion leaves the dispersing zone and is pumped back to the vessel
- ✓ Again maximum pressure
- ✓ **Wetting of inner surface** and break-up of agglomerates
- ✓ The remaining **air coagulates and leaves the dispersion**



Equipment Focus of **YSTRAL Conti-TDS**

Equipment Focus – YSTRAL Conti-TDS

- ✓ Installation **outside** the vessel
- ✓ Connections via pipes or hoses
- ✓ Liquid is circulated at high flow (90'000 ltrs/hr)
- ✓ A **vacuum is produced inside** the dispersing zone
- ✓ Dust- and loss- free induction and dispersing of the powder
- ✓ Induction from **sack, hopper, drum, container, big-bags silo or silo truck**
- ✓ After induction, additional dispersing until the required particle size, homogeneity or consistency is reached
- ✓ All energy of the machine is applied in the relatively small dispersing and wetting zone - **high "energy density"**
- ✓ Machine may be used to **pump the finished product** to the next processing step



Equipment Focus – YSTRAL Conti-TDS

	<i>PiloTec</i>	<i>Conti-TDS-2</i>	<i>Conti-TDS-3</i>	<i>Conti-TDS-4</i>	<i>Conti-TDS-5</i>	<i>Conti-TDS-6</i>	<i>Conti-TDS-8</i>
Power in kW	3 - 5,5	7,5 - 11	11 - 30	37 - 90	37 bis 90	110-150	200-250
Max. speed in rpm	8000	6000	3600	3600	3600	3600	3600
Induction rate in kg/min							
- from paper bag	1	1 - 4	2 bis 20	3 bis 50	4 bis 50	4 bis 50	4 bis 50
- from BigBag, container hopper or silo	1 - 6	4 - 12	6 bis 200	10 bis 400	10 bis 500	10 bis 500	bis 1000
maximum viscosity in mPas							
- normal operaton	2000	2000	4000	4000	6000	8000	8000
- with additional pump		10000	50000	100000	100000	100000	100000
Inlet pressure in bar	0,05 - 0,1	0,05 bis 0,2	0,1 bis 0,4	0,1 bis 0,6	0,1 bis 0,9	0,1 bis 0,9	0,1 bis 0,9
max. counter pressure in bar							
- during powder induction	0	0	0	1	1		
- dispersion, pumping	5	2,5 (4,0)	3,0 (4,5)	3,5 (5,0)	5 (8,0)	(...) = at maximum speed)	
Pumping rate in m³/h							
- maximum (water)	10	16	48	84	90		
- during powder induction	3-6	6-10	20-30	30-50	30-50		
working temperature	max. 70°C for water as a basic liquid for liquid with higher boiling point please ask the manufacturer						

	minimum inlet pressure	maximum outlet pressure	filling level above Conti-TDS at density 1 kg/dm³	Minimum Pipe Diameter according to the Viscosity	
				under 4000 mPas	above 4000 mPas *
Conti-TDS-2	0,05 bar (1 psi)	0,2 bar (3 psi)	0,5 bis 2m (2-6 ft)	40 mm / 1½"	50 mm / 2"
Conti-TDS-3	0,1 bar (1,5 psi)	0,4 bar (6 psi)	1 bis 4m (3-12 ft)	65 mm / 2½"	80 mm / 3"
Conti-TDS-4	0,1 bar (1,5 psi)	0,6 bar (9 psi)	1 bis 6m (3-20 ft)	80 mm / 3"	100 mm / 4"
Conti-TDS-5	0,1 bar (1,5 psi)	0,9 bar (13 psi)	1 bis 9m (3-30 ft)	100 mm / 4"(!)	100 mm / 4"

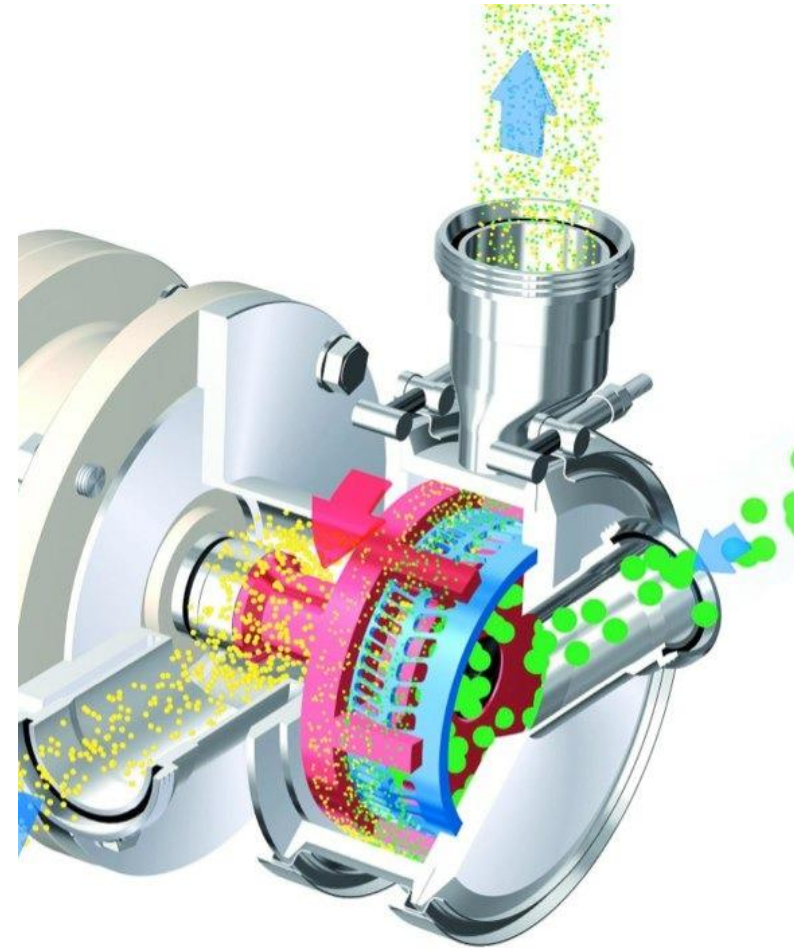
* if required with additional pump in the outlet

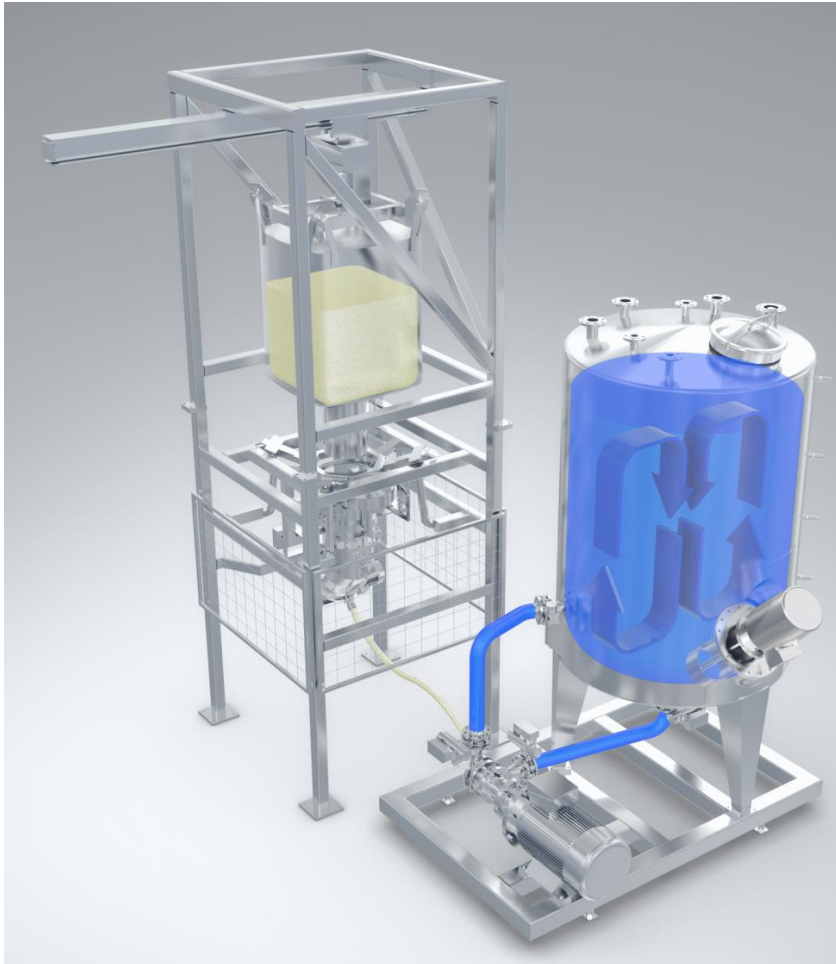
Equipment Focus – YSTRAL Conti-TDS-5

- ✓ Shear speed 25 m/sec
- ✓ Distance rotor-stator 500 μm
- ✓ Shear gradient 50,000 sec^{-1} (~60'000 sec^{-1})
 - a stirrer is 20 sec^{-1}
 - a dissolver is 50 sec^{-1}
- ✓ Maximum pumping capacity for water 90 m^3/h
- ✓ Usual pumping capacity during induction 30 to 50 m^3/h

Typical Induction rate :

- Milk powder 100 – 200 kg/min
- Dextrose 80 – 150 kg/min
- Starch 80 – 150 kg/min
- Hydrocolloid 20 – 50 kg/min

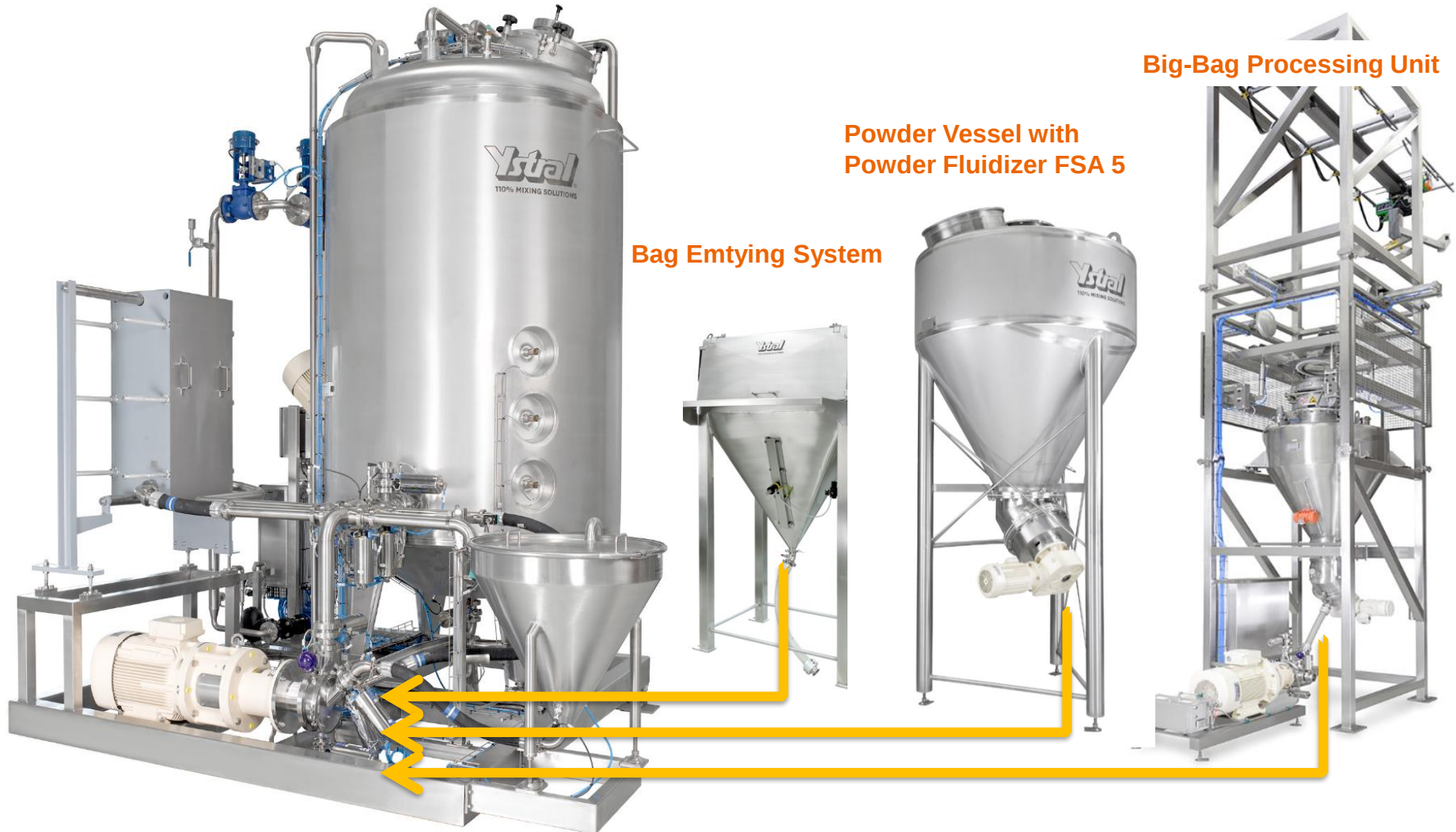




- A „basic“ set-up:
- Conti TDS
 - One tank with mixer
 - One powder dosing system

Technology YSTRAL Conti-TDS

Example: Single Tank Skidded-Unit with Powder Handling Modules





General Advantages

General Advantages

- ✓ Higher quality
better particle size distribution, better color strength, less air incorporation since the system works without vortex
- ✓ Higher Flexibility
variable batch sizes, viscosities, filling levels etc.
- ✓ All viscosity ranges – not only in high viscosities like the dissolver
the dispersion of finest powders in highest viscosities as typically in a dissolver is not required and makes no sense
- ✓ Production of Dispersions, intermediates or direct production of the final product
- ✓ Much higher level of safety
no powder handling at open tanks and with rotating dissolver discs



Summary

Summary – YSTRAL Conti-TDS

- ✓ **Dust- and loss-free operation**, no powder transportation, no refilling, no dust exhaust systems, no filter systems
- ✓ **Direct induction** from bags, big-bag, drum, silo or powder container
- ✓ Immediate and complete wetting directly into the liquid stream
- ✓ **No crusts at the wall** of the vessel or the mixing shaft
- ✓ High pumping capacity results in **high number of circulations**
- ✓ **Higher degree of dispersion** compared to conventional mixing principles
- ✓ The possibility to induct powders into high concentrated or high viscosity dispersions and to wet them completely
- ✓ Universal usability and adaptation
 - to several vessels
 - into **existing processing systems**
 - with casters for operation in different working areas

Summary – YSTRAL Conti-TDS

- ✓ Powder **induction without opening the vessel** or the system
- ✓ Function **independent from vessel size and filling level** in the vessel
- ✓ Possibility to induct powder directly into a liquid stream (e.g. when filling a vessel)
- ✓ After powder induction, the **same machine is used to disperse** the product to the required particle size, homogeneity and consistency
- ✓ **Transfer of the product to a storage tank** with the same machine
- ✓ Hygienic design
- ✓ Easy to clean
- ✓ **CIP-cleaning without disassembling**

Summary – YSTRAL Conti-TDS

- ✓ More than 120 different powder inlets and tools for individual tasks
- ✓ Customer specific accessories
- ✓ Customer specific execution of the machine
- ✓ Extensive periphery (container, big-bag-stations, vessels, fluidisers etc.)

Some examples of installations performed by YSTRAL



Some examples of installations performed by YSTRAL



Some examples of installations performed by YSTRAL



Some examples of installations performed by YSTRAL



Technology YSTRAL Conti-TDS

Some examples of installations performed by YSTRAL



Double Tank Skidded-Unit with Powder Handling Modules

Some examples of installations performed by YSTRAL



Double Tank Skidded-Unit with Powder Handling Modules

110% MIXING SOLUTIONS



We are looking forward to a good co-operation

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