Introducing LÖDIGE PROCESS TECHNOLOGY

Gebrüder Lödige Maschinenbau GmbH

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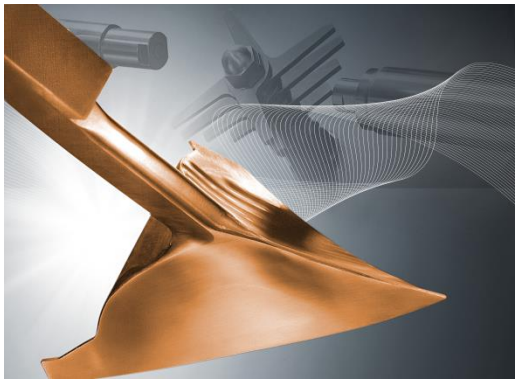
Company History

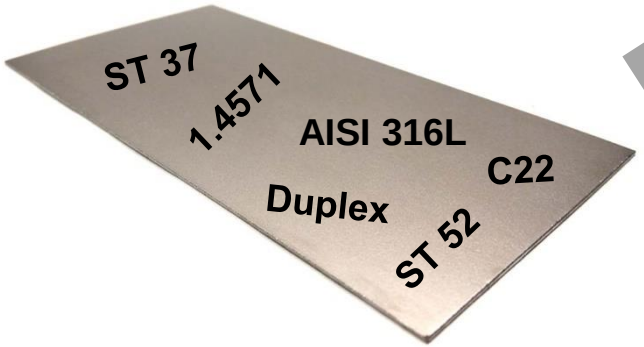


- 1938 Foundation of Lödige in Paderborn / Germany
- 1949 Invention of the Ploughshare® Mixer
- 1970 Start of production of vertical high shear mixers
- 1980 Start of production of coaters
- 1985 Papenmeier becomes part of the Lödige Group
- 2003 Drais - Div. Mixing & Reaction - incorporated
- 2012 New pharma test center
- Family owned company for 3 generations

Gebrüder Lödige Maschinenbau GmbH

Workshop - Capabilities

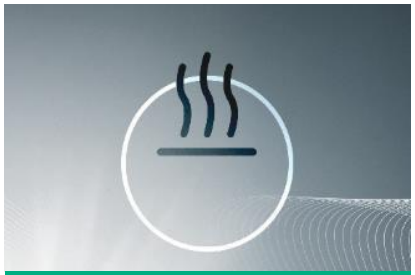
- Very high in-house production depth, from metal sheet to fully tailored machine
- Manufacturing from scratch on ensures highest made in Germany quality and fully machine customization
- Apprenticeship workshop for ongoing training of new qualified staff



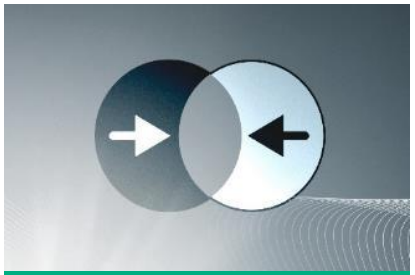
What we do?

Range of applications

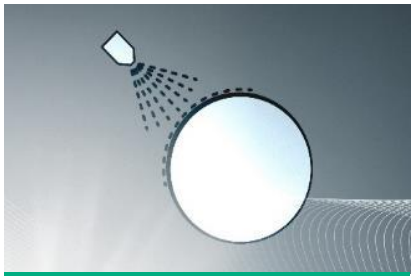
MIXING



DRYING



REACTING

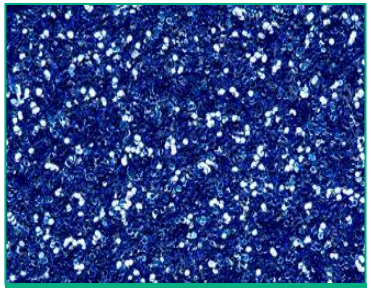


COATING

GRANULATING

Range of products

BULK SOLIDS



GRANULES

POWDER

PASTE

DUSTS

SLUDGES

Range of industries

- Building materials
- Chemicals
- Raw materials / minerals
- Cosmetics
- Plastics
- Foodstuff
- Pharmaceuticals
- Neutraceuticals
- Environment
- … and many more

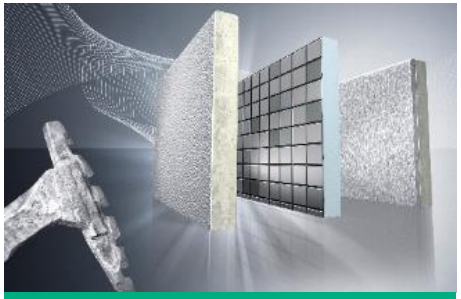
Core industries

PHARMACEUTICALS

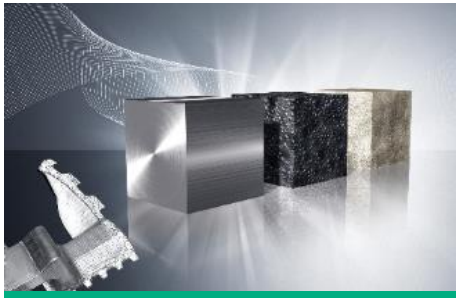
FOODSTUFF

ENVIRONMENT

CHEMISTRY

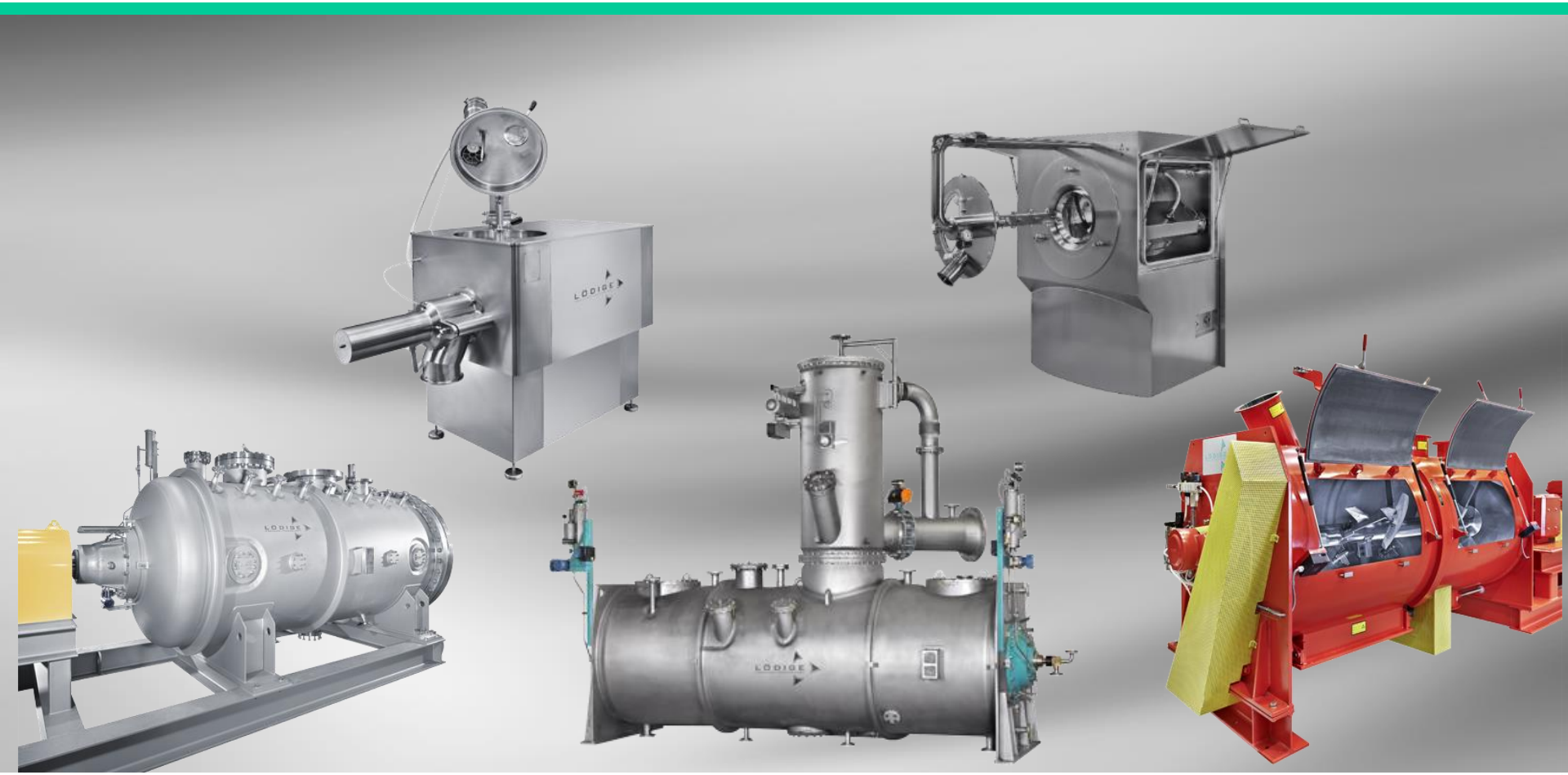


BUILDING MATERIAL



MINERALS / ORES

Big machine portfolio



30.000 systems supplied worldwide

Lödige product portfolio for pharmaceutical industry

Ploughshare Mixer FKM

Ploughshare®Mixer - History

- Invented in 1949 at Lödige
- Horizontal type of mixer with static drum and rotating plough type mixing elements
- Movement of ground by an agriculture plough was investigated and transferred into **product movement** of a mixing system

Ploughshare®Mixer - Function principle

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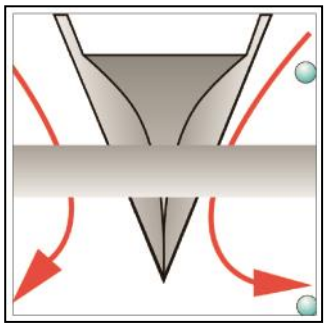
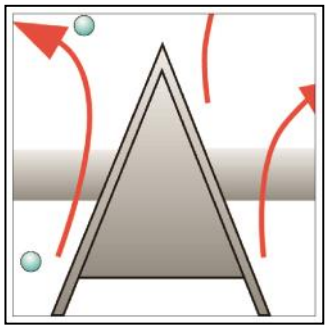
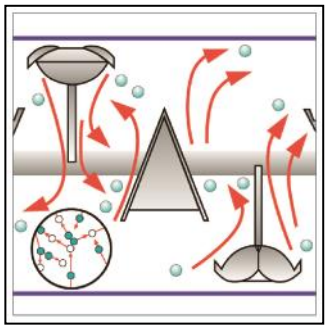
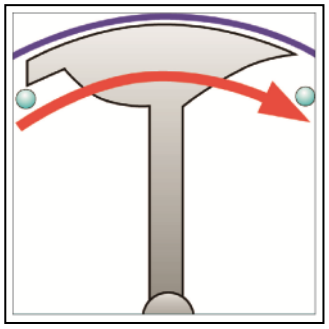
- Horizontal type of mixer with static drum and rotating plough type mixing elements
- Movement of ground by an agriculture plough was investigated and transferred into **product movement** of a mixing system

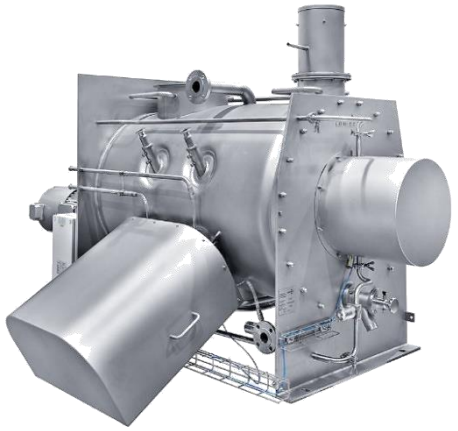





- Mixing principle is basing on a **mechanical generated fluid bed** which ensures rapid mixing and highest homogeneity

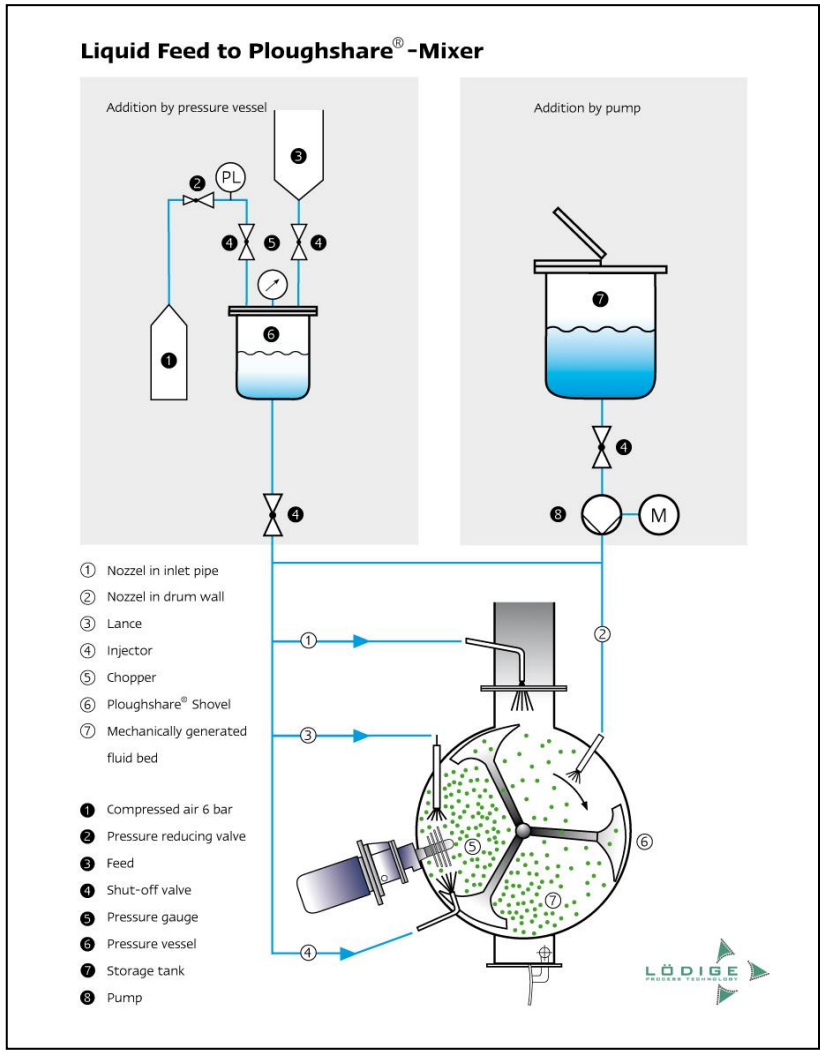
Ploughshare®Mixer - Function principle

Ploughshare®Mixer - FKM

- Long time established mixing technology, developed by Lödige
- Mixing ratios of 1:100.000 and higher
- Various possibilities for liquid addition / machines are suitable for high shear granulation as well
- Heating / cooling by temperature control jacket
- Choppers for particle size reduction
- Machines completely GMP-compliant
- WIP / CIP Systems available



Ploughshare®Mixer - Mixer and Granulator

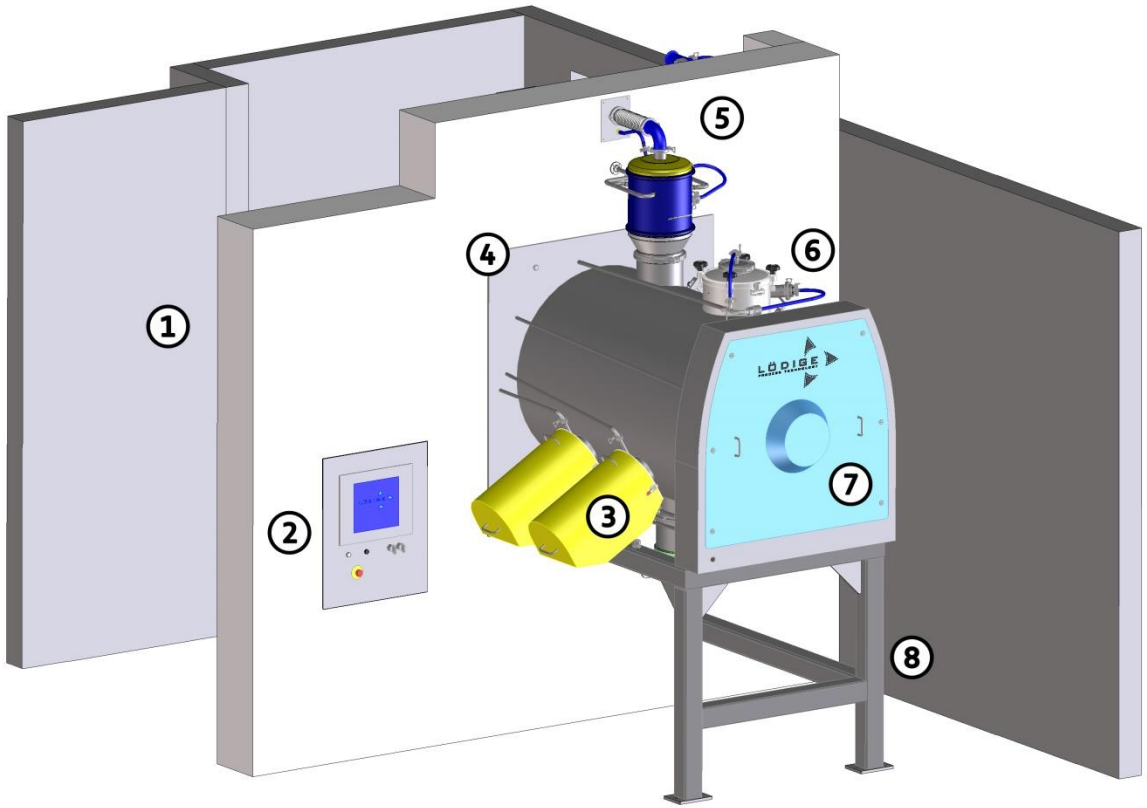


Various possibilities for liquid addition for addition of:

- ❑ granulation liquid
- ❑ fats
- ❑ colours
- ❑ flavors
- ❑ etc.

Ploughshare®Mixer - Installation Example

① Technical area
② Operator Panel
③ Chopper drives with stainless steel covers
④ Integration head end in pharma wall
⑤ Exhaust air filter
⑥ Feeding port
⑦ Enclosed head end
⑧ Support



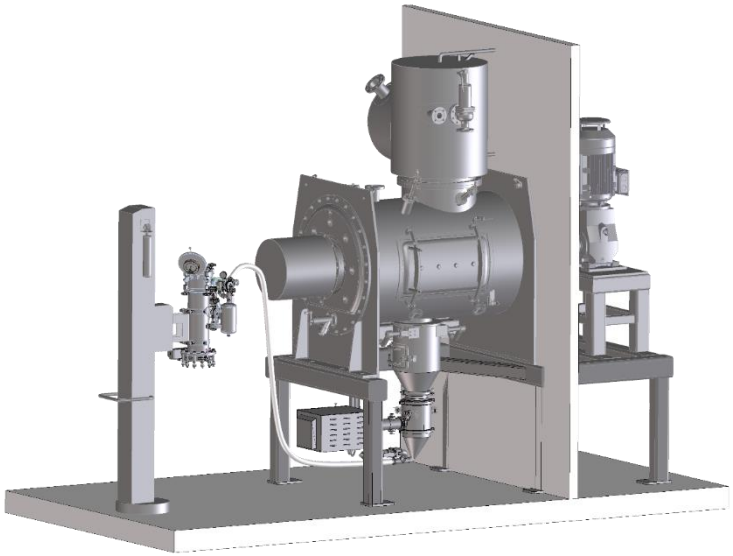
Ploughshare®Mixer - Laboratory machine

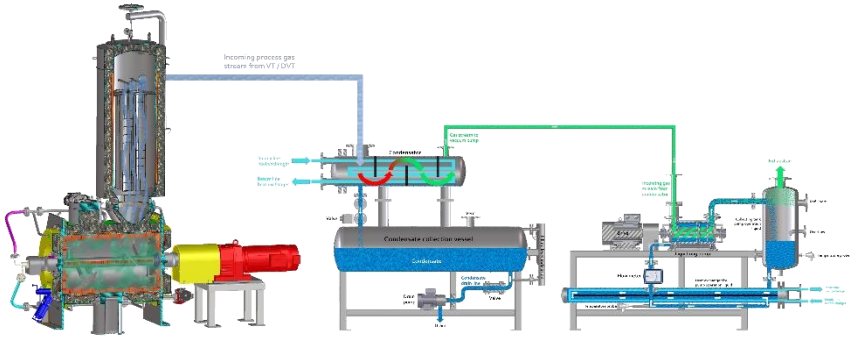
- Available as tabletop unit or with a mobile substructure on castors
- Machine is designed for pharmaceutical, food and cosmetic industries
- Interchangeable drums – 5, 10 and 20l volume
- Unit ready to be connected to media supply
- Double jacket, chopper, spray lid and many other options are available

Vacuum Shovel Dryer VT

Vacuum shovel dryer - VT

- Horizontal vacuum shovel dryer, basing on the Ploughshare mixer principle
- Very often used as Single-Pot Systems for various process steps in one machine:
  - Mixing
  - Liquid addition
  - Granulation
  - Heating / Cooling
  - Chemical reactions
  - Vacuum drying
  - Particle size reduction / Milling
- Supply of complete production systems including vacuum units and further peripheral equipment





Vacuum shovel dryer - Tailored machines

- In general all Lödige vacuum shovel dryers are tailored in terms of
  - Materials (AISI 316L, Duplex, Hastelloy, etc.)
  - Heating capabilities (warm water, steam, molten salt, electricity, etc.)
  - Mixing elements (shape of shovels, heating capabilities, etc.)
  - Drive power
  - Filter design (filter surface, filter material, cleaning system, etc.)
  - Pressure design (vacuum level, overpressure, seals, doors, etc.)
  - Peripheral equipment (vacuum systems, TCUs, etc.
  - Controls
- Trials are mandatory required to define technical design details

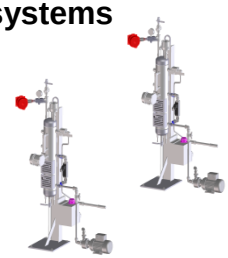
Vacuum shovel dryer - Installation example

Technical area

Production area

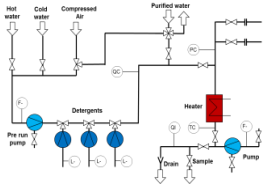
Vacuum systems

Lubricant supply systems



Temperature control units

WIP-Systems



Controls

Pneumatics

Vacuum shovel dryer - Laboratory machine

VT 20

- compact mobile unit
- only media supply necessary
- single side supported mixing elements
- easily accessible internals due to retractable machine housing
- mechanical seal with integrated pump
- sight glass for monitoring the processes
- pneumatically cleaned filter

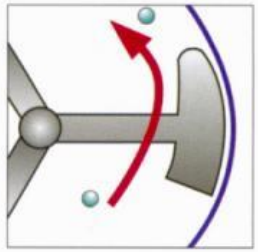
High Shear Mixer MGT

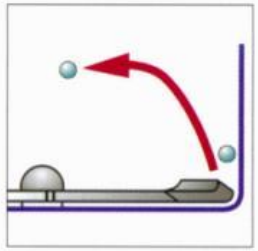
High Shear Mixer - MGT

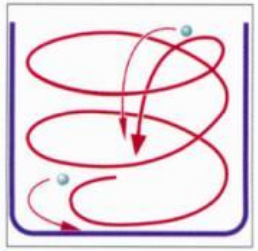
- High shear mixer for mixing and granulation of tablet masses and processing of cosmetic products
- Vertical cylindrical mixing vessel with bottom driven mixing elements and chopper
- Full stainless steel cladding in hygienic design
- Integrated sieve mill for granule size calibration
- More than 400 delivered units

High Shear Mixer - MGT

- Mixing vessel with straight walls
- Bottom driven impeller with special geometry
- Chopper with multiple blades in „one piece“ design
- Air purged seals at impeller and chopper

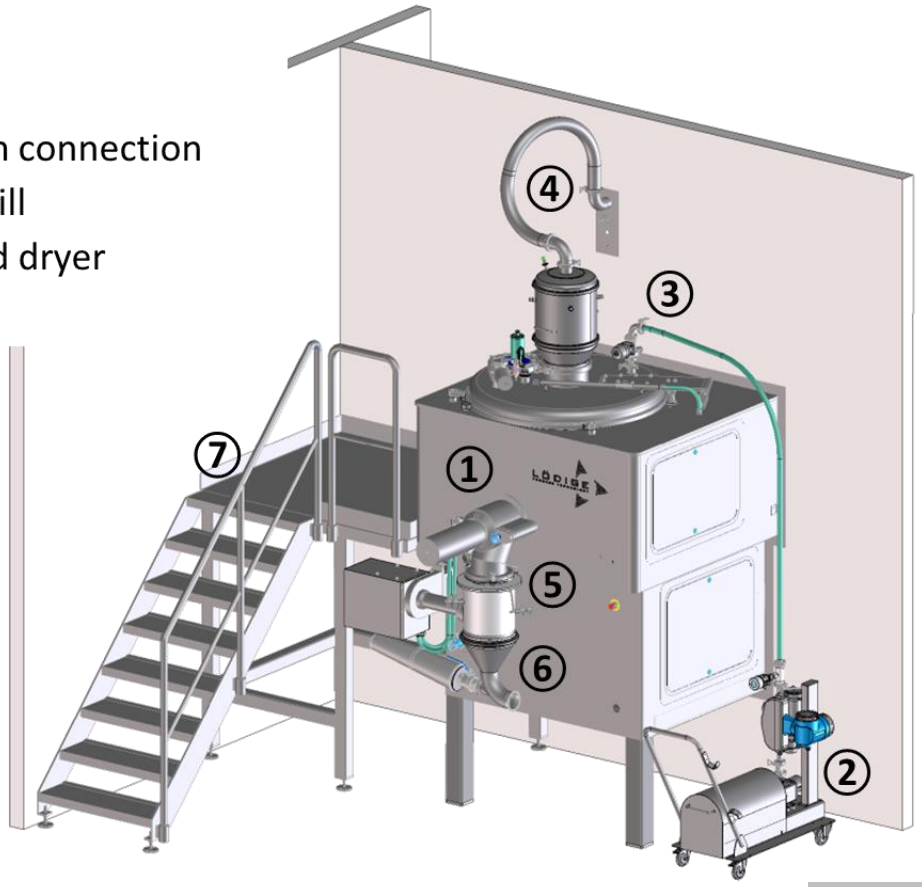






High Shear Mixer - Installation example

① MGT housing
② pump station
③ liquid addition
④ aspiration / vacuum connection
⑤ discharge / sieve mill
⑥ transfer to fluid bed dryer
⑦ operator platform



High Shear Mixer - Laboratory machine

- Table top unit ready for connection to media supply (electricity and compressed air)
- Integrated PLC controls with touch panel
- Interchangeable vessels in 1, 5, 10 and 15 l volume
- Chopper available for 5, 10 and 15l volume
- Many further options available on request

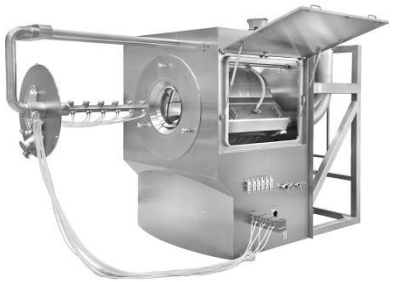
Coater LC

Lödige Coater LC

Lödige LC Series with

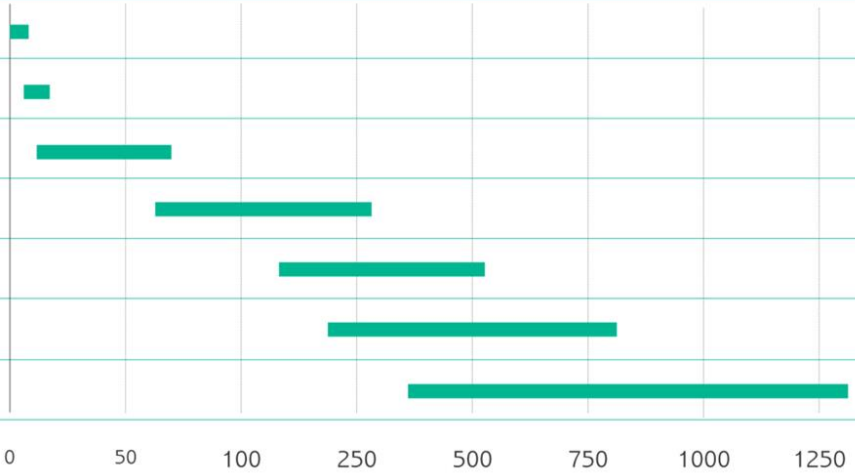
- new drum geometry
- modified air inlet system
- optimized nozzles distances and maximized number of nozzles and therefore speeded coating processes
- 25 % - 100% filling degree
- simplified design and therefore less costs by reduced maintenance

Coater sizes



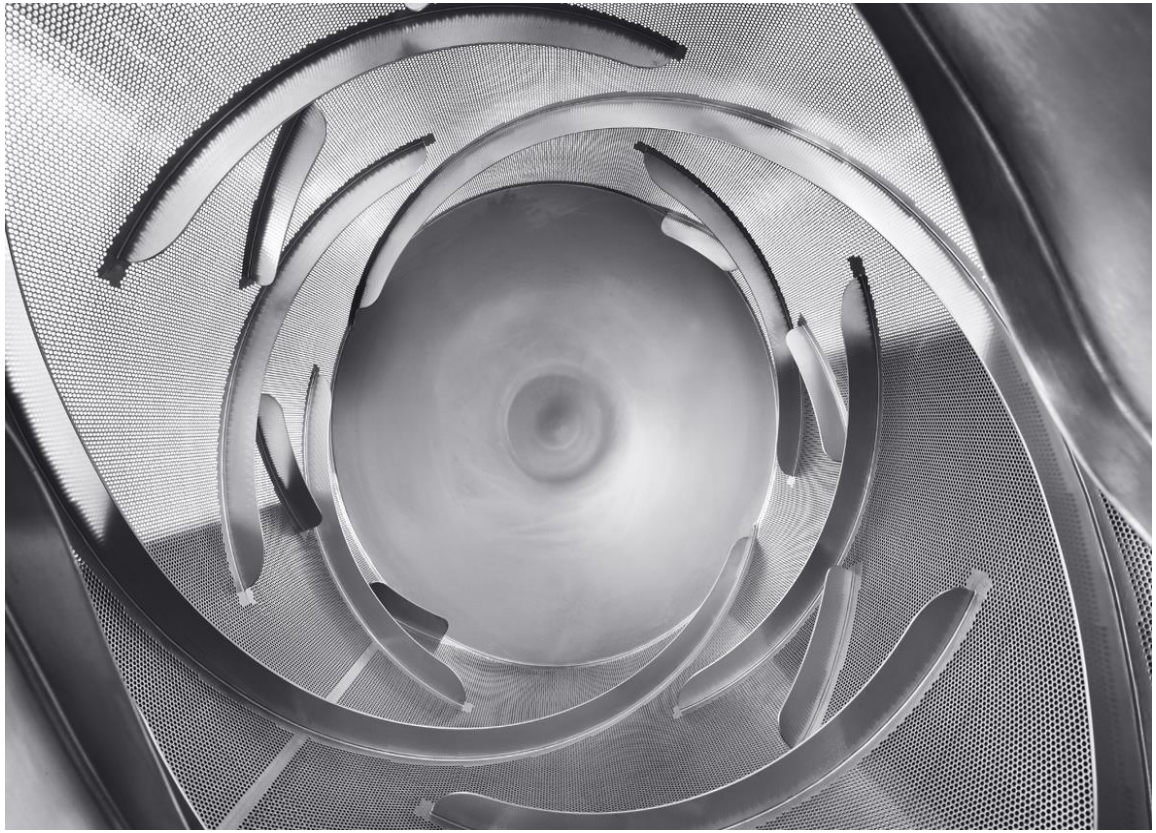
LC Sizes

Type	Batch size in kg*	Min. – Max. working volume in l
LC Lab	0,45 – 5,3	0,6 – 6
LC 50	5 – 20	6,5 – 26
LC 70	15 – 55	17,5 – 70
LC 100	50 – 200	65 – 260
LC 130	90 – 400	130 – 520
LC 150	150 – 600	200 – 800
LC 180	240 – 1000	320 – 1300



*(at a product density of 0.75 kg/l)

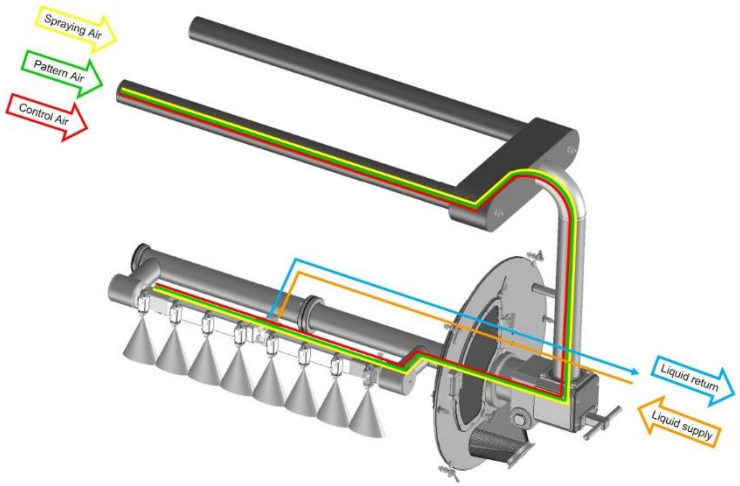
Lödige Coater LC – Pan



Pan design:

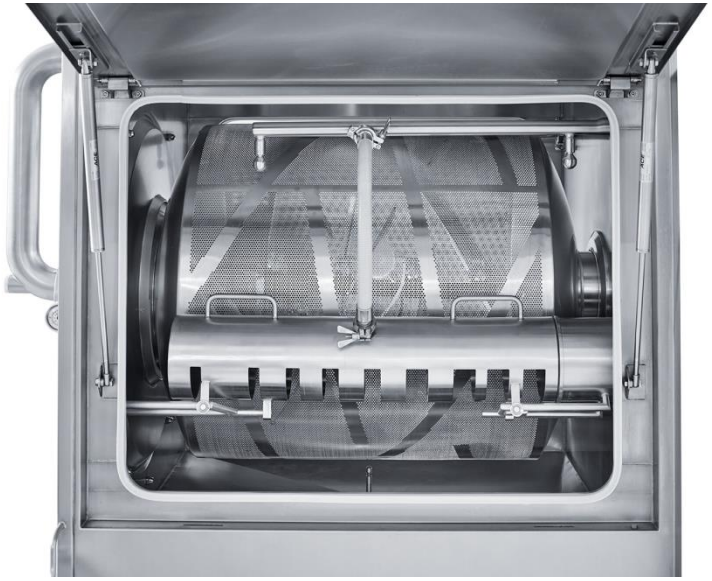
- Fully perforated pan
- Welded mixing elements
- Welded area without perforation
- Open area of perforation approximately 40%
- Special design of mixing elements for sugar coating

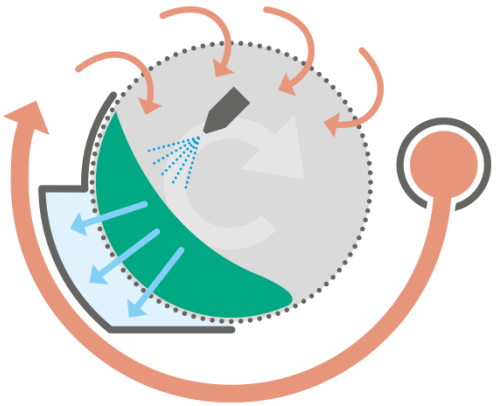
Lödige Coater LC – Spray arm



- Optimized PCA spray boom (in cooperation with Schlick) available in titanium or plastic
- Spray, control and pattern air are elaborated as boreholes which are integrated into the arm
- Distance to table bed adjustable from outside without disturbing the coating process (manual or fully automatic)
- Liquid supply is elaborated as manifold with boreholes in the spray arm as well

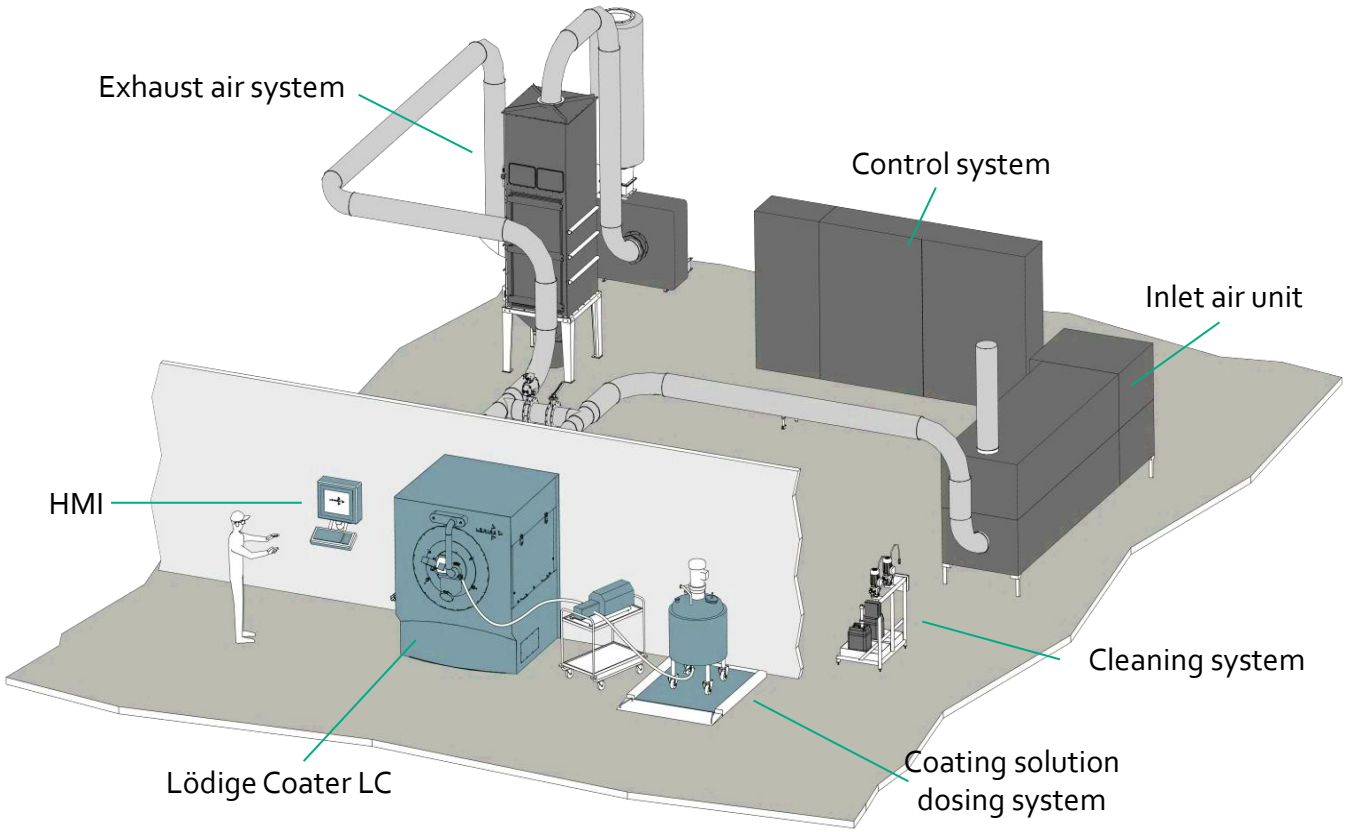
Lödige Coater LC – Inlet air distribution





- Pollution of drum and spraying system is reduced to a minimum which leads to longer runtimes and less cleaning efforts
- Fully even temperature distribution in the drum
- Higher coating performance due to minimized losses in spray drying
- Particularly suitable for high spray rates and suspensions with high solid content

Lödige Coater LC – Complete systems



Lödige Coater LC – Typical Installation

Lödige Coater LC – Installation example

Lödige Coater LC – New lab coater

- System made of Corian
- Same design and features like a production scale machine in terms of:
  - drum design
  - baffle design
  - air distribution
  - spray boom

  ensures all advantages and a reliable scale up
- Focus on easy handling

Coater LC light series

Lödige Coater LC light series

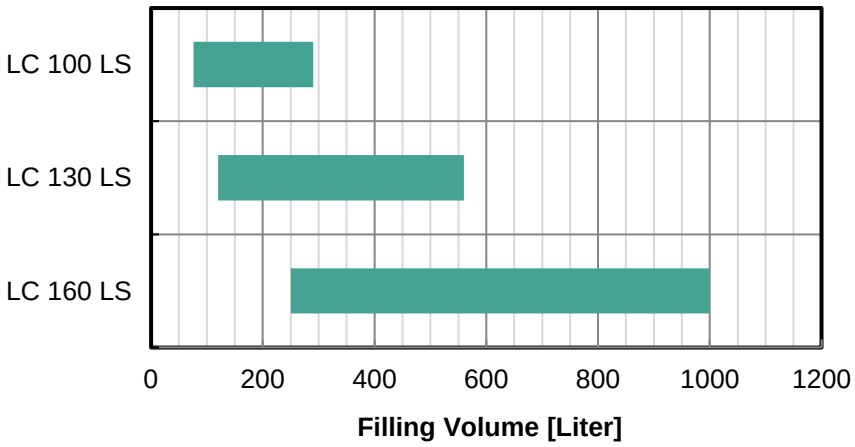
- Standardized cost effective machine which contains all latest developments from the LC series

- Cost savings by:
  - Simplified housing design
  - Less engineering efforts by standardized design and limited number of options
  - Standard control system
  - Standard documentation

- Machine is 100% manufactured in Germany

Lödige Coater LC light series

- Available in sizes:
  - LC 100 light series
  - LC 130 light series
  - LC 160 light series



Lödige Coater LC light series

- Basic design always includes:
  - Optimized drum geometry and mixing elements
  - New optimized air distribution
  - Spray boom with internal manifold liquid supply
  - Liquid addition system with pump and mass flow meter
  - WIP-System
  - Control system
  - All product contact parts in AISI 316L with Ra < 0,8 µm / outside AISI 304 with RA < 1,6 µm
- Machine available for film coating only!

Lödige Coater LC light series

- Available options:
  - Freeze protection
  - Dehumidification
  - H13 Filtration

  → Inlet air unit
  - H13 Filtration
  - Silencer

  → Exhaust air unit
  - Product temperature probe
  - Solvent based film coating
  - Qualification documentation
  - Services

  → Coater

- Further options are not available due to standardization

Thanks for your attention!