LÖDIGE
PROCESS TECHNOLOGY

SYSTEM SOLUTIONS FOR THE **FOOD INDUSTRY**

ALWAYS THE RIGHT MIX

FOOD INDUSTRY –
GUARANTEED HEALTHY AND SAFE NUTRITION

INNOVATION, EFFICIENCY AND QUALITY: TAILOR-MADE PROCESS DESIGN FOR A GROWING INDUSTRY

ALL IN ONE: COMBINED PROCESSING

Mixing is the classic process step in the production of foodstuffs – however, it is usually not the only step necessary for manufacture. The system solutions from LÖDIGE make it possible to easily integrate a wide variety of additional processing steps. Not only does this save labour-intensive processes such as premixing, but it also saves costs.

- Alkalising
- Fat intermixing
- Moistening / Wetting
- Conching
- Heating
- Homogenising
- Iodising
- Cooling
- Lecithinising
- Mixing granulation
- Pasteurising
- Fusion granulating
- Sterilising
- Drying
- Coating
- Compacting
- Fluidising

... and many more

Foodstuffs are the "resources for sustaining life"

As the old adage goes: "you are what you eat". And people, meaning consumers, are increasingly taking this adage to heart. Naturally, the quality criteria for the production, processing and distribution of foodstuffs is set at a respectively high level. Because the production of foodstuffs entails the targeted modification or transformation of raw materials from plant or animal origins into safe, healthy and delicious foodstuffs.

In Germany the food industry counts as one of the most important and dynamic sectors of the industry. Due to their quality and variety, the foodstuffs manufactured in this country are truly export hits – and that is not only within the EU, but worldwide.

In order to remain competitive despite rising standards and changing markets as well as customer habits, the efficiency of the processing methods used will become even more important in the industry in the future. All the more so since consumer expectations on product safety and quality are continually increasing. The potential for innovation lies predominantly in automation or the implementation of new technologies for substance conversion. The processing and mixing of various substances plays a major role here.

LÖDIGE provides the solution

LÖDIGE systems provide the mixing and processing precision required for optimum process design in the wide production range of the food industry. The systems operate efficiently, economically and with optimum solution concepts. LÖDIGE possesses decades of experience in the construction of mixers and processing systems. LÖDIGE systems are used around the world with great success by the leading companies in this challenging industry.

EHEDG EUROPEAN HYGIENIC ENGINEERING & DESIGN GROUP MEMBER

INTERNATIONAL QUALITY PRODUCTS
ARE MANUFACTURED USING LÖDIGE SYSTEMS

PROCESSING POWDERED SUBSTANCES

- Ice cream powder
- Aromas / Flavourings
- Oven-ready flours / Baking mixes with added fat and lecithin
- Flours
- Enzymes
- Vanilla sugar
- Potato chip ingredients

PROCESSING GRANULATED PRODUCTS

- Table salts
- Coffee and tea extracts
- Flavoured instant drinks
- Powdered milk / Powdered whey

PROCESSING FRAGILE SUBSTANCES

- Muesli / Cereals
- Instant soups
- Bouillon cubes
- Spice mixes with concentrates
- Tea blends
- Dried vegetables
- Frozen fruits and vegetables
- Tobacco

PROCESSING VISCOUS PRODUCTS

- Baby food
- Glazes
- Cheese / Processed cheese spreads
- Other emulsions and pastes

PROCESSING OF CHOCOLATE

- Chocolate pastes
- Filling pastes for waffles, etc.

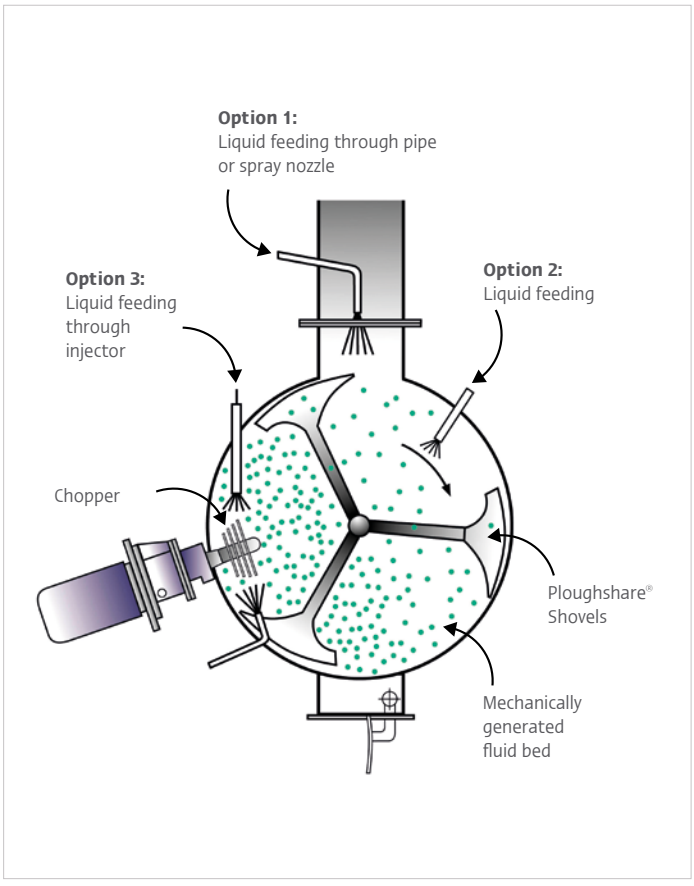
PROCESSING NUTRACEUTICALS

- Vitamin products
- Diet foods
- Muscle building products
- Dietary supplements
- Enzymes / Starter cultures
- Fizzy tablets
- Sports nutrition
- Weight loss drinks

TECHNOLOGY THAT SETS NEW STANDARDS: DISCONTINUOUS MIXING AND GRANULATION IN A HORIZONTAL SYSTEM

By inventing the Ploughshare® Mixer, LÖDIGE has revolutionised mixing and processing technology. When it comes to creating homogeneous coincidental mixes in the shortest time possible, it is the perfect choice – and has been since 1949. Numerous patented innovations based on this system are proof of the incredible potential of this technology.

The heart of the mixer is a special systematic arrangement of Ploughshare® Shovels on a horizontal shaft. They rotate in a horizontally fitted, cylindrical mixing vessel. The size, number, positioning, shape and circumferential speed of the elements are adapted to each other such that they cause a three-dimensional movement of the components during the mixing process. During this process, the mixture is continuously gripped by the mixing tools. In this way, dead space or low-movement zones are prevented. This guarantees quick, precise and reproducible mixing.



Some liquid addition possibilities in the LÖDIGE Ploughshare® Mixer following the principle of the mechanically generated fluid bed

Thanks to the special shape of the mixing elements, the product to be mixed is removed from the drum wall during the radial movement. The mixing and fluidisation process is perfect for particularly gentle product handling when fragile and heat-sensitive substances are concerned. Optionally there are also shovels similar to the ploughshare available for special requirements and component properties. With these, optimum results are achieved even for the most sensitive products.

Some mixing tasks – especially with combined processes – require additional support for the mixing effect of the mixing element. For this purpose, separately driven choppers rotating at high speed are installed. The resulting short mixing time combined with an optimally adapted drive power minimises the amount of energy used.

LÖDIGE Mixers are characterised by minimal maintenance and high availability. Their sophisticated design makes it possible: All interior components of the mixer are readily accessible and can be inspected and cleaned easily. Where particularly high hygiene standards are required, such as in the case of microbiologically critical mixing components, the mixers can optionally be outfitted with automated cleaning systems (WIP/CIP).

Large order: 18 machines are ready for acceptance

READY FOR ANYTHING: VERSATILE APPLICATIONS GUARANTEE INDIVIDUALISED PRODUCTION USE

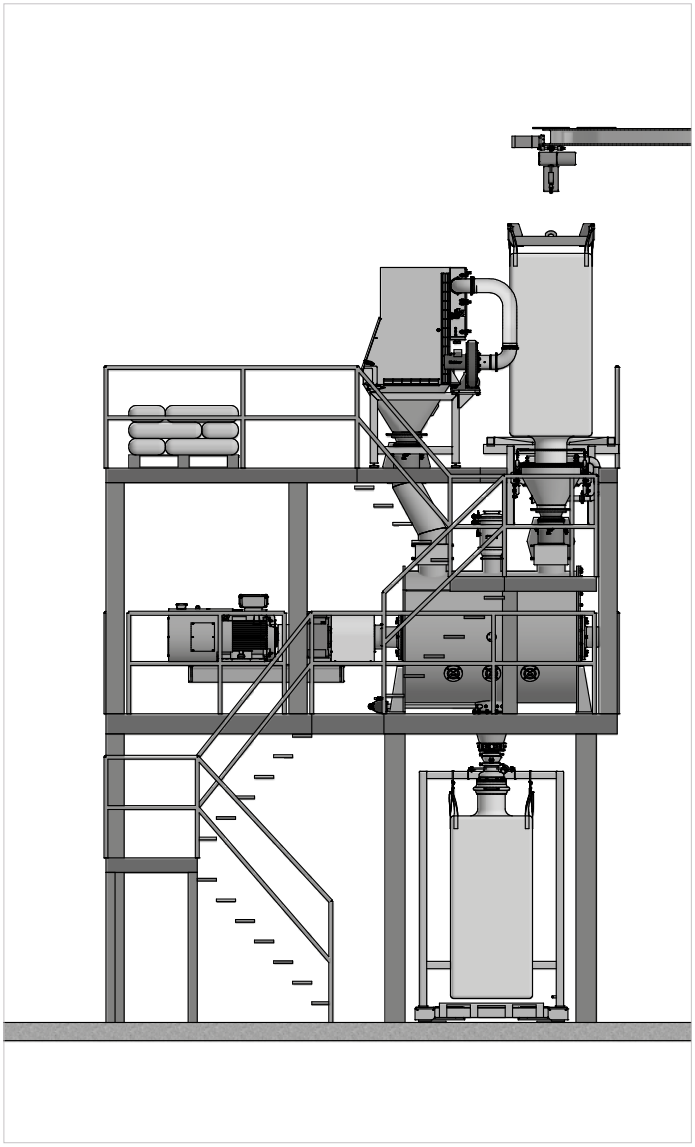
Due to its flexibility, the range of applications for the LÖDIGE Ploughshare® Mixer in the food industry is virtually unlimited. All work steps and product forms – from powdered mix with or without the addition of liquid, to pastes and to the whole area of liquids – can be realised with a single machine. Just another reason why the Ploughshare® Mixer represents an efficient, space- and cost-saving solution for small and medium-sized companies or contract manufacturers.

Process engineering solutions

Thanks to their wide range of process engineering options, LÖDIGE systems can be used for the most diverse products and production steps. In addition to the classic processing step of mixing, other processing steps required in the food industry can also be easily integrated into the system. Time-intensive steps such as, for instance, premixing can thus be omitted. LÖDIGE systems also prove their flexibility in terms of their dimensions: They are available both in production sizes and in sizes suitable for laboratory work.

Horizontal LÖDIGE Ploughshare® Mixer Type FKM 1200 DR

Welded mixing elements in hygienic design



Mixing plant with manual infeed, big bag feeding and filling

NON-STOP OPERATION: CONTINUOUS MIXING AND GRANULATING IN A HORIZONTAL SYSTEM

The Ploughshare® Mixer is also available for continuous operation. Equipped with tools that are specifically adapted to the particular task, it produces mixes of the highest quality. The high throughput rates achieved in continuous production can be varied based on retention time, filling level and component properties.

The continuous three-dimensional movement of the product components in the Ploughshare® Mixer ensures consistent separation of the particles in the fluidised bed. This makes it very easy to add fluids and coat the particles in a continuous process. The process can be performed with filling levels between 20 % and 50 % without any impact on the mixing quality.

The respective setting on the mixing tools can be used to perform constant re-mixing even during the retention times. This guarantees that the product keeps moving at all times until it is drained through the discharge opening for further processing. The retention times can be adapted to the specific requirements. The size of the discharge opening can be regulated using slides or an adjustable weir. This impacts the retention time significantly. This reliably compensates for any system-induced dosage fluctuations.

Mixing principle of the LÖDIGE Ploughshare® Mixer

LÖDIGE Ploughshare® Mixer for continuous operation Type KM 150 D

LÖDIGE Ploughshare® Mixer for continuous operation Type KM with slide in the discharge chute

A CLEAN SOLUTION: **THE HYGIENIC DESIGN OF LÖDIGE MIXING SYSTEMS**

LÖDIGE's comprehensive know-how is not limited to mixing solids, but also encompasses the requirements on the Ploughshare® Mixer when it comes to international hygiene standards. Compliance with relevant guidelines such as GMP (Good Manufacturing Practice) is a matter of course.

From the very design of the machine to the manufacture of hygiene-relevant products, the future cleaning capability of every machine must be taken into account – without compromising the functionality.

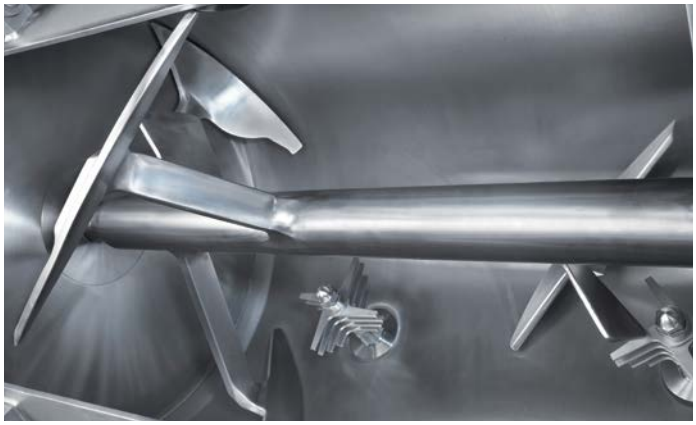
Several structural components play a key role in hygienic design: The mixing elements and choppers must be designed for easy cleaning and quick access. An oversized inspection door enables easy access to the entire inside of the mixing drum.

Generally, the best technical solution for shaft seals on mixing tool shafts and choppers is rinseable air gap seals or mechanical seals. All surfaces which come into contact with the product are made with a roughness grade of Ra < 0.8 µm.

In general, the surface roughness must be smaller than the particle size of the material adhering to the surfaces. This enables direct wetting of the residues with cleaning substances. Smoothed and polished surfaces are ideal for meeting hygienic requirements. The surface can also be electro-polished to further reduce roughness. The mixing elements are fully welded and thus have the same surface roughness as the drum wall.

During the production process the shaft seals are pressurised with compressed air prior to addition of the product. This prevents the product from falling into the gap between fixed and rotating parts of the seal. The volume flow rate is controlled and assessed via a flow meter. Air volume and pressure are always displayed for the operator on the control panel.

Horizotal LÖDIGE Ploughshare® Mixer Type FKM 1200 DR



Mixing tools welded onto the main shaft in hygienic design

Hygienic version of sealing service unit and control unit

WE KNOW EVERY TRICK IN THE BOOK:
AUTOMATED CLEANING PROCESSES

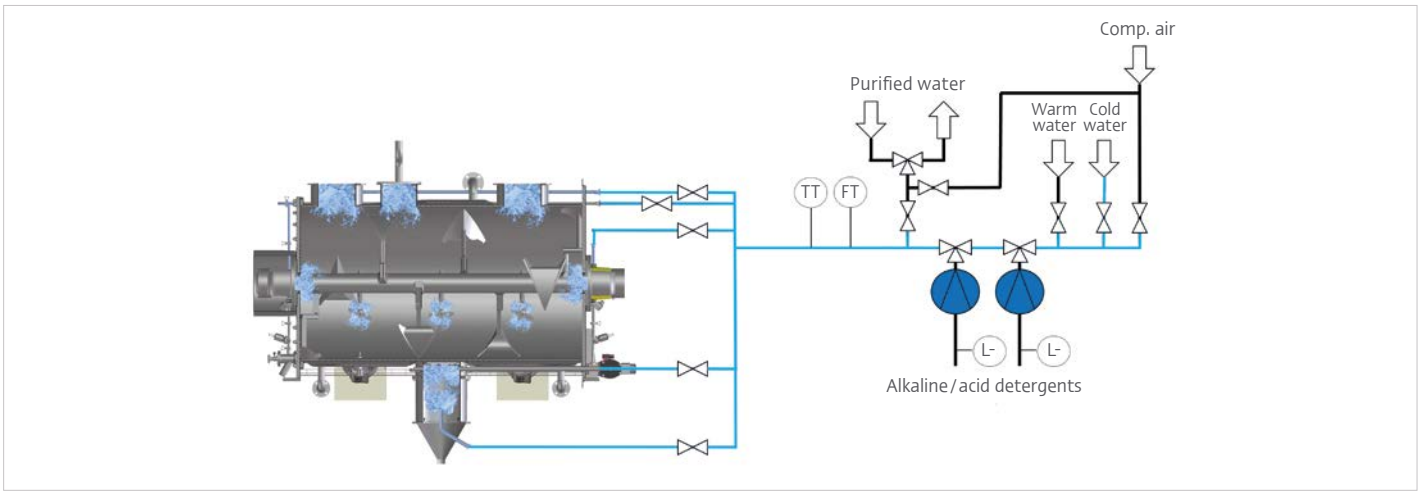
In addition to classic manual dry or wet cleaning, LÖDIGE also offers automated customer-individualised solutions for wet cleaning.

Washing in place (WIP) is by definition an automated form of cleaning, which, however, still requires several manual tasks.

Washing in place is comprised of the following basic steps: All shaft seals are pressurised with water and are thus equipped with drainage valves. The feeding and discharging nozzles are cleaned via rotary nozzles, which are installed on a removable washing adapter. During cleaning the mixing elements run forwards and backwards at intervals.

The ventilation filter must be cleaned separately. The opening is simultaneously closed with a washing adapter. A drain funnel can be docked on the discharge nozzle to drain off the wash water. Another option is to swivel the entire discharge nozzle to the side to enable separate cleaning of the discharge door.

After wet cleaning, all mixer parts, seals, pipes and valves that have been covered with water will be dried using conditioned compressed air.

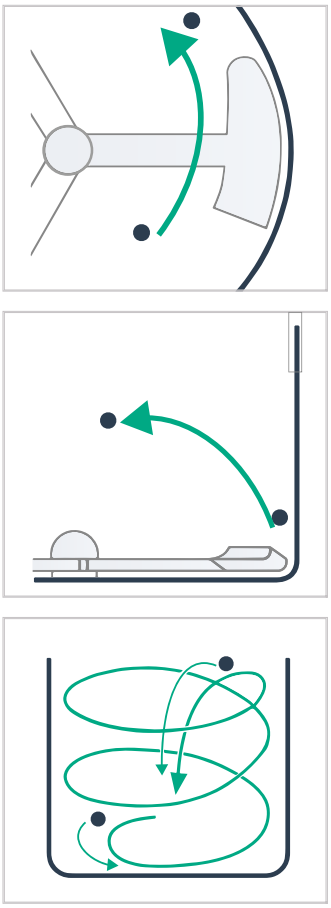


LÖDIGE Ploughshare® Mixer for batch operation with stainless steel pipework for WIP system

Cleaning nozzles for the WIP process

The covering above the bearing housing and motors creates an easy-to-clean surface

SHORT AND SWEET: **DISCONTINUOUS MIXING OF SOLIDS IN A VERTICAL SYSTEM**



Mixing principle of the LÖDIGE Mixing Granulator MGT

Our mixing granulators (MGT) are standardised systems which meet all requirements of WIP regulation design. They are very easy to clean and require very little maintenance.

A three-arm mixing tool rotates in a vertical, cylindrical mixing vessel close to the wall and to the bottom of the vessel. The special shape of this tool and its circumference speed are adapted to each other such that the product is brought to a vortex-like motion and simultaneously accelerated on the horizontal and vertical levels. This type of product movement causes quick and intense mixing, even of components with vastly different grain sizes, particle shapes, bulk weights and surface properties. In this way, high quality mixes are achieved in the shortest times.

If the characteristics of the product require it, a separately driven chopper is used to break up clumps, to distribute moisture evenly and to wet granulate. The granulation end point can be controlled systematically and is reproducible.

Liquid is added directly to the effective range of the chopper, either via gravimetric dosing or a pump. This ensures the best possible distribution. Here, the liquid can either run into the mixing area or be introduced via airless nozzle or air-assisted nozzle. In addition, a wet sieve can be optionally installed on the discharge to ensure a completely homogeneous distribution of the granulate size.

Mixing tool with tool lifting unit

MGT with downstream sieve mill

CLOSELY CONNECTED: **MIXING, DISPERSING AND EMULSIFYING IN A VERTICAL SYSTEM**

Wet Mixer Type NOHK preferably used for the production of baby food

The Wet Mixer NOHK is a vertical mixing system for discontinuous processes. The geometry of the conical mixing vessel, the arrangement and shape of the tools and their circumferential speed are adapted to each other, in such a way that this results in effective mixing of all components. Depending on the process engineering tasks, the individual mixing tools are custom combined to form one tool set for both material transport and for dispersion and deagglomeration processes. The installation height in the vessel has a wide range of adjustment. The product movement can also be specifically influenced via an adjustable deflector.

Soup pastes, baby food or special sauces: The areas of application for the Wet Mixer NOHK are diverse. The system provides perfect results for mixing and processing of these products – even highly viscous materials.

Adapted tool configurations ensure an effective mixing process

Mixing principle of the Wet Mixer NOHK

HIGHEST PERFORMANCE IN THE SMALLEST SPACE: **MIXING AND PROCESSING IN A CONTINUOUS RINGLAYER SYSTEM**

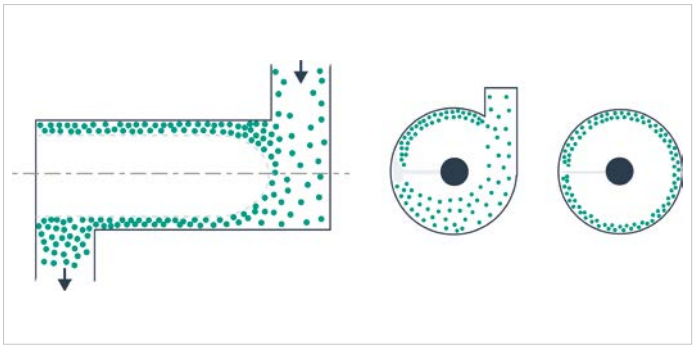
Whether tasks include mixing, moistening, granulating or compacting: the LÖDIGE Ringlayer Mixer model CoriMix® CM is perfect for a particularly wide range of applications. The result: Uniform product quality with a very high percentage of the specifically desired granulate size.

The secret to the CoriMix® CM: its high speed. The mixing tool moves the product at up to 40 m/s. The resulting centrifugal force pushes the product into a ring layer with a high shearing intensity in its profile. This intensity is the result of the significant speed difference between the rotating, specially shaped mixing tools and the mixer wall. The filling level and speed, geometry and mixing tool settings as well as the mixing vessel length and volume throughput affect the retention time of the components.

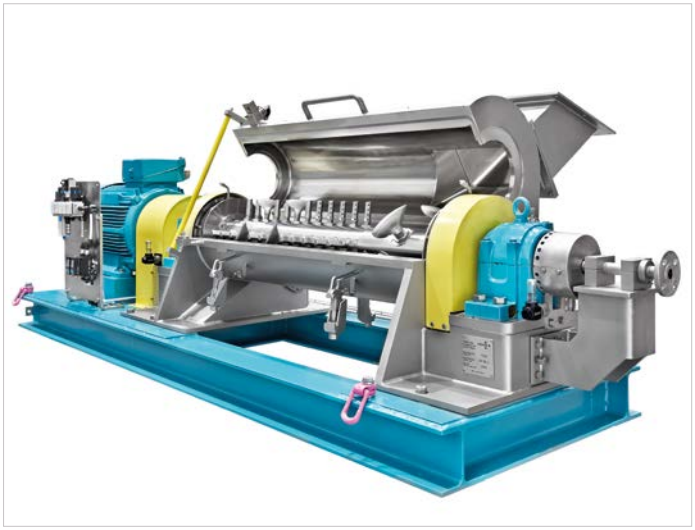
The system is extremely flexible: The mixing compartment can be divided into zones with different shearing intensities. This permits optimum adaptation to the individual characteristics of the products being mixed. Liquid components are guided directly into the ringlayer to ensure perfectly homogeneous distribution within the product. This also successfully prevents unwanted moistening of the mixing shaft and mixer wall. The cleaning process is also incredibly user-friendly: The drum of the CoriMix® systems can be opened along its entire length, making it easily accessible.

The very high throughputs of 20 kg/h up to 20 t/h combined with a compact machine design are the main advantages of the Ringlayer Mixer CoriMix®. Thus, the Ringlayer Mixer provides the highest performance even in the smallest production spaces.

Ringlayer Mixer CoriMix® Type CM 5 with extendable mixing unit as a hygienic solution



Ringlayer Mixer process



Ringlayer Mixer CoriMix® Type CM 80

EFFECTIVE HEAT TRANSFER:
THE DRUVATHERM® VACUUM SHOVEL DRYER

Precisely reproducible, uniform and operationally reliable: The LÖDIGE Shovel Dryers.

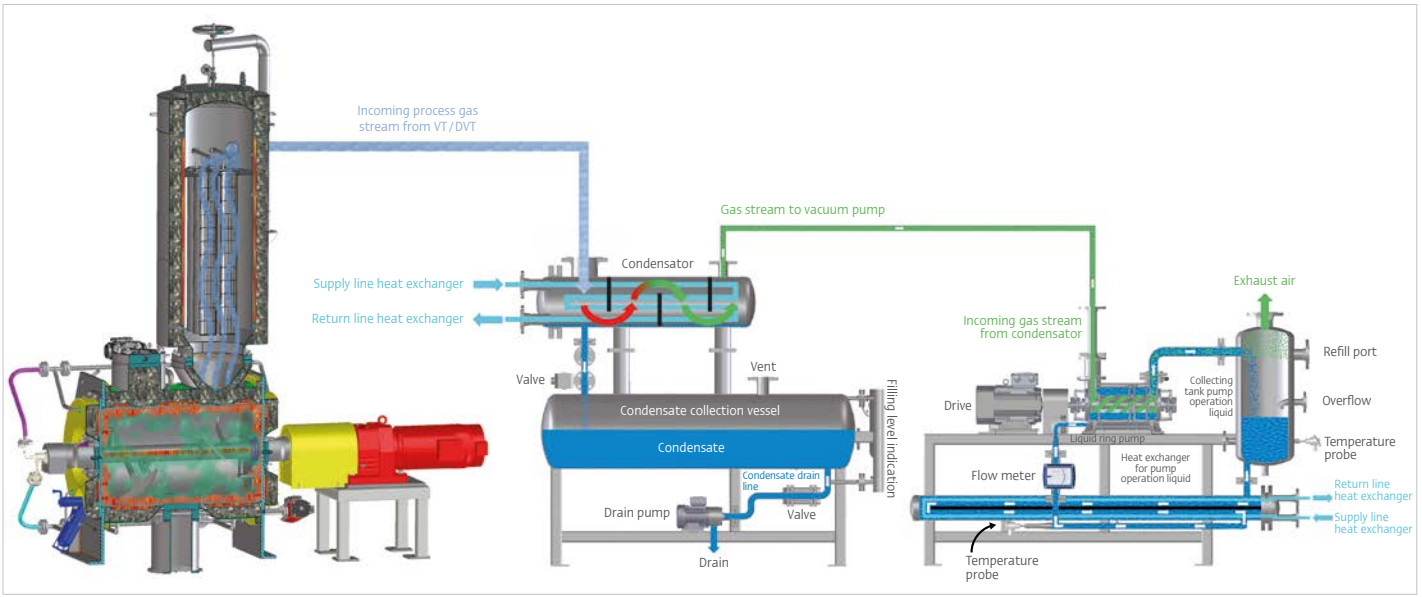
The mechanically generated fluidised bed creates large product surfaces. This leads to a higher frequency of contact between the individual particles and the drum wall. The result: a higher efficiency of heat exchange, which significantly reduces the process times. In addition, this intensive and homogeneous mixing inhibits the formation of temperature and moisture gradients within the respective product.

Moreover, the vacuum created in the system simultaneously enables drying at particularly low, and thus product-friendly, temperatures. During the process, a high temperature gradient is created between the product and the heating jacket, which ensures a very effective heat transfer. This guarantees a very high degree of process accuracy and enables the reproducible formulation of the product.

The design of the Shovel Dryer is – up to a total volume of 1200 litres – also possible with a shaft bearing at one end.

DRUVATHERM® Vacuum Shovel Dryer Type VT 3000 in hygienic version

DRUVATHERM® Vacuum Shovel Dryer type DVT 50 as the pilot plant for research and development



Principle of the DRUVATHERM® Vacuum Shovel Dryer

MACHINES FOR **RESEARCH, PRODUCT DEVELOPMENT AND SAMPLE PRODUCTION**

LÖDIGE Laboratory Ploughshare® Mixers operate according to the identical functional principle as the production machines and thus enable reliable scale-up to production size. The data on mixing quality, product behaviour and process engineering parameters is transferable. This enables production of even small batches with the same quality criteria.

Laboratory Ploughshare® Mixer with exchangeable drums

Laboratory Vacuum Dryer

Vertical Laboratory and Pilot Mixing Granulator

LÖDIGE Ploughshare® Mixer model L50 with feeding funnel

LÖDIGE TEST CENTRES

The LÖDIGE Test Centres are outfitted with cutting edge machinery for

- Mixing
- Kneading
- Dispersing
- Emulsifying
- Wet granulating
- Drying
- Heating/Cooling
- Coating

and thus guarantee tests under conditions which comply with all production and hygiene requirements.

In the LÖDIGE Test Centres the testing capacities comprise over 700 square metres with more than 30 machines available. A laboratory for physical analyses is also connected. Testing for cosmetic products is found in a separate area.

During tests we use, among others:

PLOUGHSHARE® MIXER FKM

PROCESS
- Mixing
- Granulating
- Moistening
- Adding fat

... and more

MACHINE SIZES
- L 5
- L 10
- L 20
- L 50
- FM 130

RINGLAYER MIXER CORIMIX® CM

PROCESS
- Mixing
- Granulating
- Densifying

MACHINE SIZES
- CM 5
- CM 10
- CM 20

MIXING GRANULATOR MGT

PROCESS
- Mixing
- Granulating
- Wet granulating
- Drying

MACHINE SIZES
- MGTL 5
- MGT 30
- MGT 70
- MGT 125

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LÖDIGE offers high-quality partial systems and service for process engineering applications in various industries in the fields of mixing, granulation, coating, drying, reaction and related processes. Our motivated employees and their expertise in processes, development and production are the key to our success and the success of our partners all over the world. Focusing on core industries and proximity to our customers through local presence is a crucial component of the positive development of our company.

LÖDIGE was founded in 1938 and is a family-run company in the third generation. With the invention of the Ploughshare® Mixer, LÖDIGE provided the industry with a mixing system that can handle a wide range of process applications. This machine is the basis for many innovations in the area of mixing and processing technology.

Industrial mixing and processing technology has been significantly influenced by LÖDIGE and will continue to be so in the future. A large number of patents and more than 35,000 machines and systems demonstrate our experience with customer-oriented system solutions. LÖDIGE operates with more than 500 employees worldwide and supports its customers with a network of subsidiaries, technical offices and agencies.

ALWAYS THE RIGHT MIX