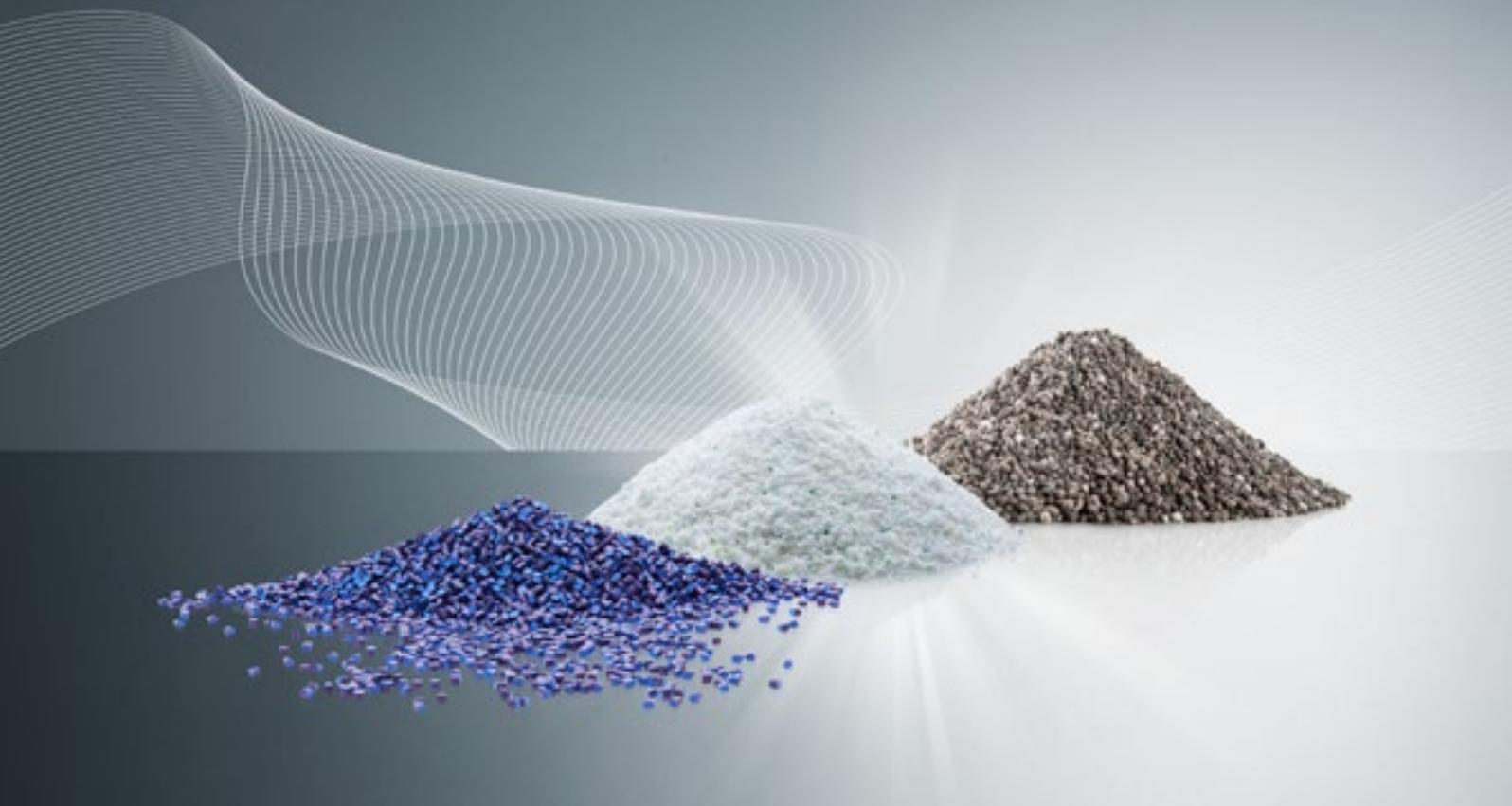




SYSTEM SOLUTIONS FOR THE PRODUCTION AND REFINEMENT OF CHEMICALS



ALWAYS THE RIGHT MIX

CHEMICAL INDUSTRY – INNOVATIVE PROCESS TECHNOLOGY FOR THE MAJOR CHALLENGES IN THIS INDUSTRY





QUALITY AND SYSTEM RELIABILITY FROM THE VERY BEGINNING

SOLUTIONS FROM LÖDIGE

- Mixing
- Granulating
- Homogenising
- Reacting
- Drying/cooling
- Coating
- Recycling
- Dedusting / Moistening



Production and refinement of chemicals of all kinds

Our modern life would be inconceivable without products from the chemical industry. The range of substances, solutions and processes that the chemical industry provides for the production and refinement of chemicals for other industries seems almost unlimited. Sectors such as the agricultural industry use refined chemical raw materials in pesticides and fertilisers or for seed refinement. The products are also needed in metallurgy, food production, the pharmaceutical and paper industries or in car manufacturing. It is therefore no surprise that the chemical industry is characterised by a fast pace and innovative strength. Every year, large sums are invested in researching and developing new materials and applications. In order to remain competitive in the face of changing market conditions and increasing demands on products, the efficiency of the processing methods used will become even more important in the future. Innovation potential lies above all in the use of novel technologies for material conversion. The processing and mixing of various substances plays a major role here.

Lödige provides the solution

Lödige accompanies industry developments for the production of inorganic or organic chemicals and mixes with future-oriented systems that create measurable user benefits through precise configuration. Our expertise goes beyond conventional processes such as mixing, moistening, reacting and homogenising in the production and refinement of chemical base materials. Based on our many years of experience and our comprehensive expertise, we develop optimal mixing and processing systems for special applications as well as for processes that are demanding in terms of process engineering. We support our customers in the implementation of new production lines by providing advice, constructive project work or tests in our technical centre in Paderborn.

Well-known producers rely on system solutions from Lödige for the manufacture of their quality products in mixing technology. We offer solutions from research and development to production.

MOST RELIABLE: MIXING, GRANULATING AND HOMOGENISING

Mixers, reactors and granulators are used in numerous process steps for the production and refinement of inorganic or organic chemicals. The machine technology we supply always complies with the specifications of the Machinery Directive. The topic of safety plays an essential role in explosion protection during production – particularly for mixes with organic components.

In Europe, for example, the ATEX regulations need to be observed and the machine technology must be equipped safely. By considering the entire production process with all its special features in close consultation with our customers, we always design the machine technology in such a way that it complies with the legal requirements.

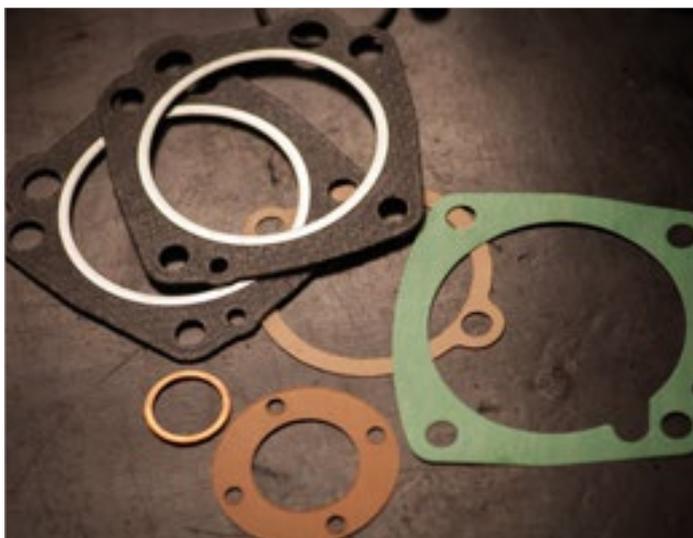
Fine chemicals and chemical raw materials



Cleaning agents, soaps, surfactants



Fibres and moulding compounds (for example for flat seals, insulating materials)



Friction materials





INDISPENSABLE HELPERS: **CHEMICALS FOR AGRICULTURAL APPLICATIONS**

Products from the chemical industry are omnipresent in modern agriculture. Whether in the production of animal feed, fertilisers or plant protection agents, such as: pesticides, herbicides, insecticides. Powerful process engineering from Lödige ensures economical and energy-efficient production with high throughput rates that meet all requirements in terms of safety and hygiene.

One example is the production of monocalcium phosphate (MCP) – an essential ingredient of feed and phosphate-containing fertilisers – which can be done in an „all-in-one“ process without further aggregates and process steps in a Lödige Ploughshare® Mixer for continuous operation. The MCP production process takes place in three phases: Mixing – Reacting – Granulating.

The high demands placed on hygiene in the production of pet food are comparable to those in food production. Lödige possesses decades of experience in the construction of corresponding mixers and processing systems. The choice of materials and adjustments to the design – such as welded mixing tools, cleaning systems and special motor covers – allow the specifications to be met in full.

Animal food



Fertilizers



Pesticides



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 solid 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.

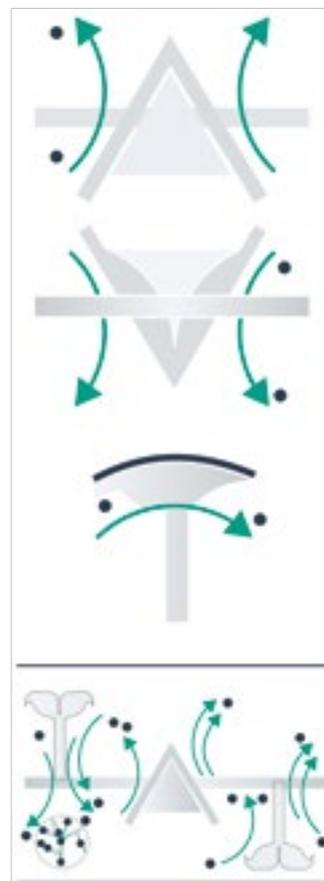
The central feature of the mixer is a special arrangement of Ploughshare® Shovels on a horizontal shaft. The shovels rotate in a cylindrical mixing drum, which is positioned horizontally. The size, number, position, shape and circumferential speed of the shovels are carefully coordinated to create a three-dimensional movement in the materials during the mixing process. This means that the materials are continuously mixed by the mixing tools to prevent dead spots or areas of low movement from forming. This guarantees quick, precise and reproducible mixing.

Thanks to the special shape of the mixing elements, the mixed product is removed from the drum wall during the radial movement. Crushing of the particles between the machine wall and the mixing tools is avoided. The mixing and fluidising

process is therefore predestined for carrying out mixing processes for components that differ greatly in terms of bulk density, particle sizes, rheological properties and mass proportions. Modified shovel shapes specially adapted to the properties of the mix, such as the „Becker Shovels“, support this effect.

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 together with the efficient use of drive power keeps the energy consumption to a minimum.

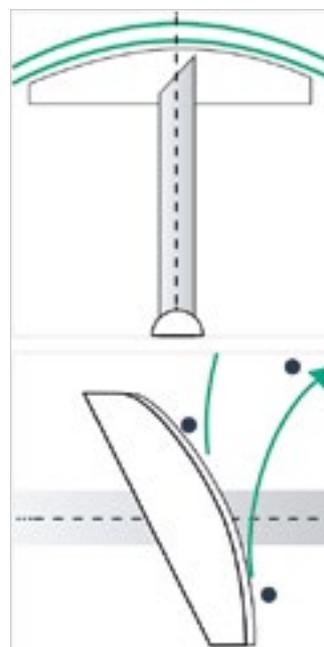
Lödige Ploughshare® Mixers are characterised by minimal maintenance and high availability. Their sophisticated design makes it possible: All product contact parts are readily accessible and can be inspected and cleaned easily.



Schematic representation of the fluid bed generated mechanically



Lödige Ploughshare® Mixer FKM 1200 D for batch operation



Becker Shovels



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 residence time, filling level and component properties.

The continuous three-dimensional movement of the product in the Ploughshare® Mixer ensures consistent separation of the particles in the fluid bed. This makes it very easy to add liquids 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 residence times. This guarantees that the mixture keeps moving at all times until it is drained through the discharge opening for further processing. The residence 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 residence time significantly. This reliably compensates for any system-induced dosage fluctuations.



Lödige Ploughshare® Mixer KM 600 DW for continuous operation



Lödige Ploughshare® Mixers for continuous operation can be optionally equipped with various equipment such as moistening devices



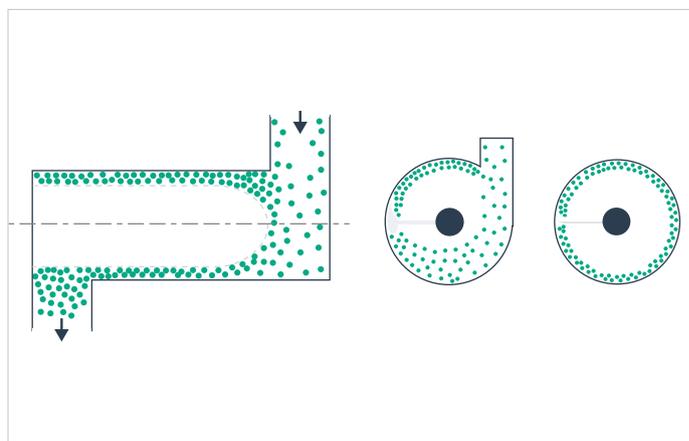
Lödige Ploughshare® Mixer KM D for continuous operation with externally adjustable weir

MAXIMUM SPEED: MIXING AND PROCESSING IN THE RINGLAYER MIXER

Be it mixing, moistening, granulation or compaction – the compact Lödige CoriMix® Ringlayer Mixer is perfect for a particularly wide range of applications. The operating principle of the Type CM CoriMix® is based on its high speed: The mixing tool moves the product at a peripheral speed of 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 rotation speed, geometry and mixing tool settings as well as the mixing drum length and volume throughput affect the residence time of the components.

At the same time, the system is highly variable: The mixing chamber can be divided into zones with different shearing intensities. This permits optimum adaptation to the individual characteristics of the products being mixed. The liquid components are fed directly into the ring layer. The finest droplets are created by means of high shear. The high shear enables quick incorporation of the liquid and an absolutely homogeneous distribution. 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.

Optional linings of the mixing vessel also allow processing of products that tend to stick or are abrasive. Special composite materials, wear resistant alloys and armoring provide the necessary wear protection. These welds effectively protect against abrasion that could occur on the tools from the high rotation speed of the mixer shaft.



Principle of the Ringlayer Mixer



Lödige Type CM CoriMix® Ringlayer Mixer



Liquid components can be added through the mixing tools in case of aqueous liquids



SUITABLE SIZE: MACHINES FOR PRODUCT DEVELOPMENT AND SMALL-SCALE PRODUCTION

Systems for product development

The functional principle of Lödige Laboratory Systems is identical to that of Lödige production machines. This enables product development under real, procedurally identical conditions to those in the production facilities. As a result, our customers receive a statement on the procedural feasibility of the task. A scale-up is reliable from mixer size FKM 130 onwards. A transfer of the parameters determined in the tests and the knowledge gained on the product behaviour and the technical data to the production scale is possible without restriction.

Systems for small-scale production

The specific criteria for mixing tasks with small production quantities or batch sizes are met by graded machine sizes and equipment for manual handling or semi-automatic operation. For special applications, the machines can also be equipped with automated supply and discharge systems. The advantages of this system design are particularly evident in variable applications, such as frequent product changes or the need for flexible process handling. Application-adapted machine technology ensures high system availability with reduced service intervals. The possibility of fast and comprehensive cleaning is guaranteed by the appropriate machine design.



Ploughshare® Mixer FKM 130 D for batch operation



Ploughshare® Mixers (Lab machine) with fixed container, sizes 5, 10, 20 l, optionally with mobile support



Ploughshare® Mixer FKM 450 for batch operation with bag chute and emptying station

LÖDIGE TURNKEY SOLUTIONS

Advice, machine, process and service – at Lödige everything comes from a single source. The individual, project-specific design and the precise adaptation to the task through a large selection of standard options and equipment variants are our strength – and thus the advantage for our customers in the chemical industry. Depending on the requirements, we realise projects of the most varied sizes for our customers – from the supply of system components and partial solutions to turnkey systems. Our complete solutions in the field of process systems include engineering, design, procurement of machine line parts and steel structures, piping and connecting pieces, including the associated control system. The customer receives a turnkey system. In addition, we also offer partial solutions with feeding modules and bagging. Whether for use in production or in the laboratory – Lödige plans, designs and manufactures machines in all sizes. An operator-friendly control system is always an integral part of our service.

Solution and service provider

Investment security is not just a buzzword for Lödige, but a promise. Our customer-focused quality philosophy guarantees a high level of system availability throughout their entire life cycle. As a solution and service provider, we ensure the high quality of the system we supply thanks to our expert after-sales service team and provide the support required to resolve problems as quickly as possible every time – should the need ever arise – and across the globe. As well as performing or supervising assembly work and carrying out mechanical and process-related commissioning, our service also includes advising on inspection intervals, conducting inspections and keeping a stock of spare parts to hand. In addition to these services, we can also help with validation and with the actions required to keep a machine in its validated condition. As well as finding the best process-related solution for its customers, Lödige also offers them an expert partnership that will protect their investment and maintain a high level of system quality over the long term.



System example with mixing line, big bag station, storage vessel, liquid dosing and Lödige Ploughshare® Mixer FKM 1200 D



Example control cabinet with control system for either one or more Ploughshare® Mixers or for a complete mixing line with all system components (depending on customer requirements)



The Lödige technical centre uses state-of-the-art machines to guarantee tests under production-compliant, hygienic conditions. The following process steps can be carried out:

- Mixing
- Kneading
- Dispersing
- Emulsifying
- Moist granulation
- Drying
- Heating/cooling
- Coating

In the Lödige technical centre, test capacities are available on more than 400 square metres with more than 30 machines. A laboratory for physical analyses is connected. All machines are also suitable for small-scale production.



Ploughshare® Mixer FM 130 for batch operation

After sales

The task of our qualified, worldwide after-sales service is to ensure the high quality of the delivered system through regular maintenance.

Our service team will respond quickly to any request in order to help our customers solve any problems that may occur.



Always at hand: The Lödige Service



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Lödige offers high-quality partial systems and services for process engineering applications in various industries in the fields of mixing, granulating, coating, drying, reacting 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 unit that can cover a wide range of different processing tasks. This unit forms the basis for numerous innovations in the field 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. Over 500 patents and more than 35,000 machines and systems delivered demonstrate the extent of our experience in developing customised system solutions. With a staff of over 500, Lödige is an internationally operating company and supports its customers with a network of subsidiaries, technical offices and representatives.

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