LÖDIGE
PROCESS TECHNOLOGY

System Solutions for Environmental Technology

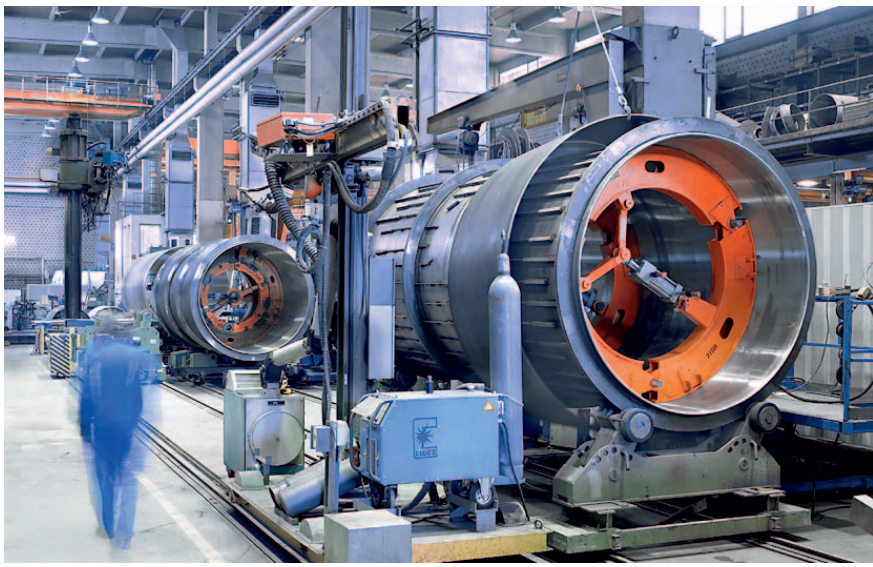
[Sludge | Dust | Recycling]

LÖDIGE – ALWAYS THE RIGHT MIX

Economical Treatment Technology for the Environmental Sector

Environmental Protection is Civilization. Prevention and Minimisation of Waste, Conservation of Natural Resources, Recirculation, Recycling, Re-utilization – the Lödige Systems do it

Lödige stands for robust, stable systems for the mechanical, chemical and thermal treatment of sludge, ash, dust and other residual materials in the disposal lines of the local authority and industrial sector.
In close cooperation with the customer and on the basis of our expertise in mixing and treatment processes, we provide solutions for every application that is tailored to the project and application. For decades, system operators and planners in the disposal and recycling sector have come to value Lödige systems.



The Environment and its Protection – An economic Good with huge Potential for Industries taking Responsability

Between the preferred path of waste prevention in terms of sustainability and the dumping of that waste which is not sustainable, there lies the broad space for recovery, recycling and re-use. All these 3 topics have one thing in common: they can not function without process technology. The limit of our resources defines the process parameters. The machine and plant design have to meet a clear challenge: to take responsability for future generations by finding intelligent technological solutions which are then also subject to constant innovation - and to promote them in a global manner. Our engineering-based industry must provide sensible solutions which clearly indicate the advantages. There is no reason for economy and ecology to be contradictory in a high-tech industrial country.

Partnership and Cooperation ensure Problem Solving and Project Success

We develop optimum concepts for individual applications in close cooperation with our customers. We regard our services to the customer as being one that is aimed at developing and installing a processing system of highest quality. Competent process engineers confer with the customer to develop first solutions. Practice-orientated trials at our state-of-the-art Research and Test Centre provide the back up for development of a customer-specific system.
Qualified engineers convert the process concept into a system combining high quality machine technology with tailormade controls. Modern production systems and certified manufacturing methods are guarantees for system quality and punctual delivery. Experienced technical personnel and commissioning engineers integrate Lödige systems efficiently and punctually into production units worldwide. Our reliable maintenance and repair service is available 24 hours a day.

You will find detailed descriptions of our systems in our brochures about machines and controls.

Lödige Systems cover broad Areas in the Treatment of Sludge, Fly Ash and Residual Materials

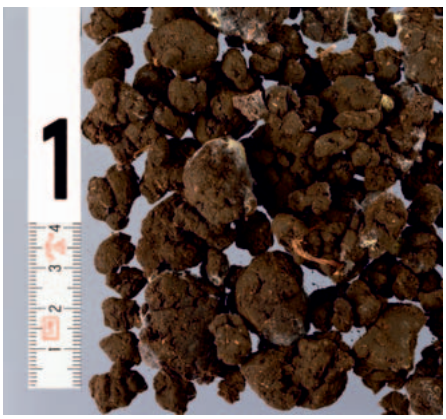
All waste and residual materials have their own demands in terms of the treatment required. It calls for a high degree of experience in dealing with these materials and detailed knowledge how these materials behave to enable them to be treated to best effect and to develop suitable systems.
With over 1000 mixing and treatment systems built and in operation throughout the world, Lödige has developed - with its customers - innovative and economical solutions for the environmental sector. Our customers include local authority works, energy supply companies, disposal business of various sizes, disposal associations and the disposal departments of large industrial companies.

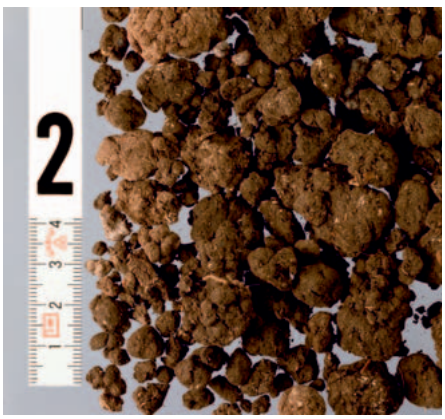
Treatment of sludge and slurry
- Domestic biosolids
- Industrial biosolids
- Drilling mud
- Dilute acid
- Paint sludge
- Oil sludge
- Sludge from paper production

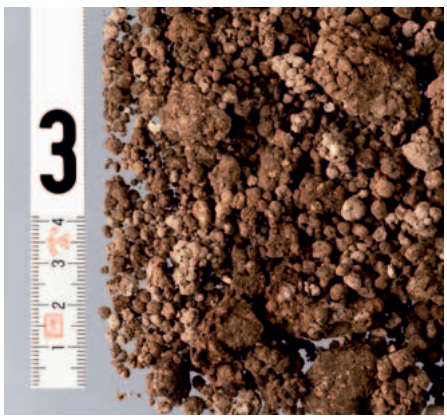
by
- solidification
- hygienization
- neutralization
- agglomeration
- drying
- preparation for compost
- preparation for incineration
- recycling of dilute acid

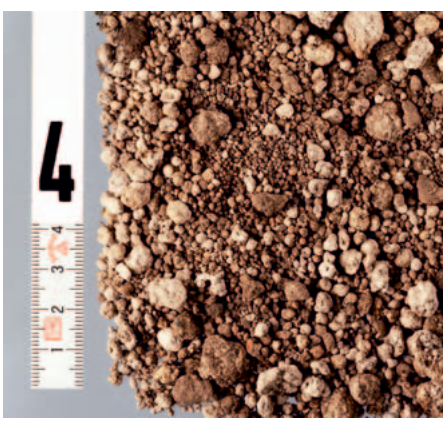
Treatment of soils
- Contaminated soils
- Quick cooling of soils incinerated at 500°C
- Recycled building rubbish

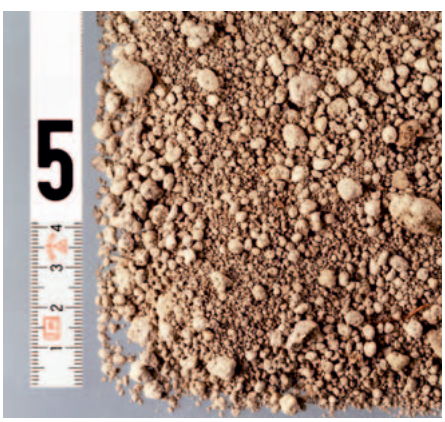
by
- mixing with microorganisms
- encapsulation
- extraction
- stripping
- cooling
- agglomeration
- structure transformation by mixing reactive additives

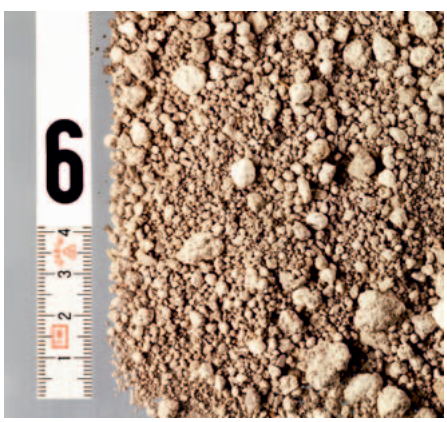












Treatment of dusts and ashes

- Ashes with 400°C
- Asbestos dust
- Carbonation lime
- Fly ash from waste incineration plant
- Fly ash from power stations
- Fly ash from wood burning
- Blast furnace dust
- Foundry dust
- Converter dust
- Cupola dust
- Burdening dust
- Products of flue gas desulphurization
- Shaft furnace dust
- Dust from sintering units
- Dust from sandblasting
- Dust from cement bypass
- Dust containing zinc

by

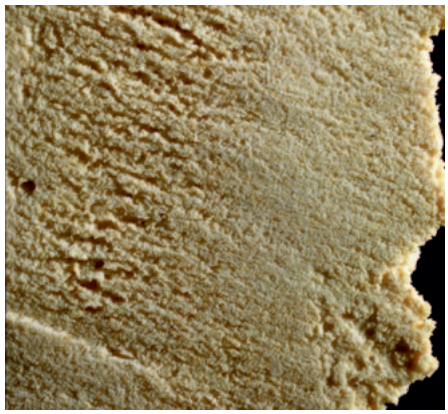
- moistening
- fixation with binding agent
- agglomeration / granulation
- solidification
- reaction and transformation
- extreme cooling

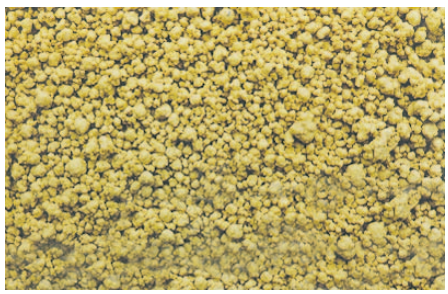
Treatment of other residual materials / contaminated materials

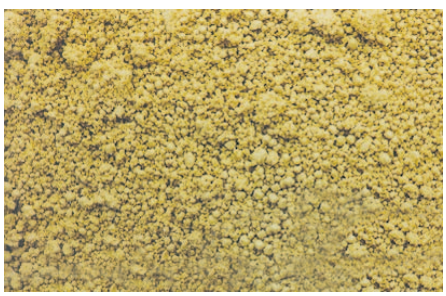
- Asbestos materials
- Toxic and radioactive sludge
- Used tires
- Plastics

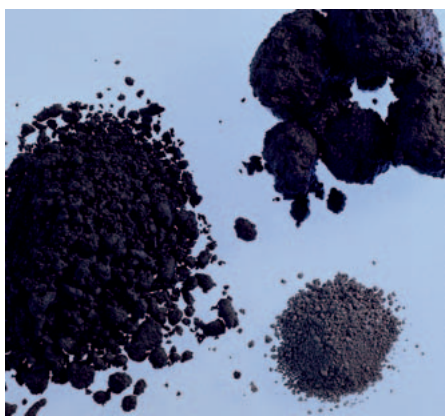
by

- agglomeration
- solidification with binding agent
- transformation into mortar/putty
- liquefaction
- drying with stabilization
- thermal separation
- pyrolysis









Diverse agglomeration phases

Further Examples of Solutions for our Customers for a wide Variety of Application Areas

Power stations

Mixing technology for the microgranulation of fly ash from power stations
- Transfer to trucks/wagons as dust-agglomerated product
- Non-clogging, self-cleaning mixer design
- Sizes up to a throughput of 550 t/h

Stabilizing power station byproducts
- Continuous process for high performance
- Quality mix with short residence time and homogeneous product
- Machine sizes for 20 t/h to 850 t/h

Steelworks

Shock cooling for slag and dust
- Rapid treatment through flush steaming
- Input over 650°C
- Discharge under 100°C
- Micro or macrogranulated end material

Unit for micro and macrogranulation of dust from steelworks
- Consultation and engineering
- Mixing and dosing unit manufacture with measurement and control techniques
- Commissioning

Mixing technology for micro and macrogranulation of dust from steelworks
- Discharge of the product in free-flowing, non-slimy form
- Micro and macrogranulated product
- Sizes for throughput up to 200 t/h

Mixing granulation of iron slurry, ferrous oxide and iron dust
- End material can be reused for the steel production
- Continuous process possible
- Granulate sizes can be controlled

Sewage sludge

Treatment of dewatered biosolids
- Dewatered biosolids is rendered hygienic
- Neutralization of sludge
- Biosolids granulation for feeding continuous dryers
- New drying process for biosolids using exhaust energy from block-type thermal power stations
- Provision of fat sludge for agricultural use
- Dispersion of filtercake boards from chamber filter presses
- Treatment of sludge for aerobic composting

Waste incineration plants

Immobilisation of residual materials containing hazardous substances
- Precision mixing with hydraulic binding agents in batch mode
- Hazardous materials are safely integrated in the solids matrix
- Treatment in closed circuit
- Self-cleaning machine

Mixing process for changing environment-related residual material properties
- Reduction in the potential danger of residual material
- Lower dumping class entitlement
- Machines are easier to integrate in existing units

Mixing processes for special waste to avoid peak loads in flue gas scrubbing
- Homogenisation of materials having high and low calorific value
- Provides more uniform waste incineration
- Emission peaks in flue gas scrubbing are reduced

Sugar factories

Dust agglomeration of carbonation lime through agglomeration
- Continuous process, international patent awarded
- Controllable agglomerate sizes
- No additives required

Disposal business and waste dumps

Mobile mixing units with dosing levels and autonomous power supply
- Version for container rolling tilter
- Process with high tolerance for foreign bodies
- Sizes for throughputs of 5, 15, 50 and 100 t/h

Universal high-speed mixer for production of covering material
- Dispersion of agglomerations and mixing process in continuous operation
- Sludge processing also possible

Removal of mining material
- Continuous high-speed mixer for producing rock-salt concrete
- Mixer for producing paste back fill

Compost preparation
- Mixer for mixing carboniferrous material in sludge
- Mixer for producing an aerobic compostable material

Components for soil purification
- Screening of soil by means of a Lödige fluid bed and removal of CFC's through evaporation and condensation
- Purifying soil of military pollution (explosives, nitrotoluene)
- Effectiveness, irrespective of soil type, temperature and moisture content
- Sizes up to 30 m^3 per batch

The high Standards required for Processing Residual Material and Waste are precisely fulfilled by our coordinated Mixing and System Technology

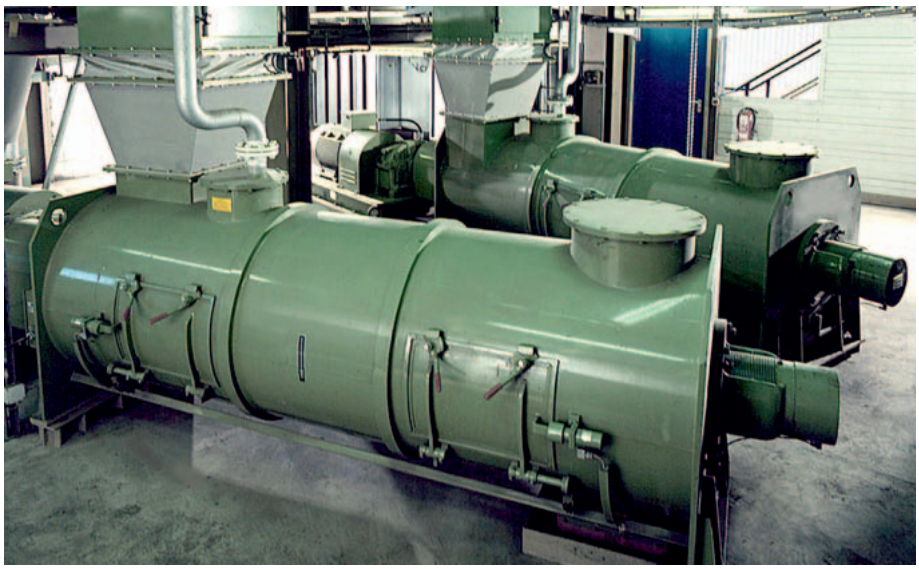


Fig. at the top: Continuous Mixer KM 3000 in tandem arrangement for processing ash in a heating power plant
Fig. in the middle: KM 4200 with large vapour opening and jacket for heating/ cooling
Fig. on the left: Mobile processing system

Lödige has experience to meet such requirements and, from a technical process perspective, offers the best possible, efficient technology in consistent heavy-duty design.

- Compensation for extreme variations of the product properties through the specific selection of mixing tools.
- Short mixing and retention times in association with perfectly adapted drive performance minimise energy consumption.
- Materials and surface qualities meet the stringent wear and tear requirements to a large degree thanks to appropriate selection and processing and thereby ensure long service life.
- Easy access for inspection, cleaning and for the replacement of wear and tear parts reduce maintenance works and standstills.
- The use of specific seals in line with products ensures continuous, heavy duty operations.
- Technically optimised solutions thanks to the combination of different construction types and processes (stationary / mobile / continuous / discontinuous).
- Varying cycles of the mixing phases including standstills and restarting – this depending on the product's properties – can be implemented without difficulty with the Lödige system in most cases.
- A detailed knowledge of the choice of materials for preventing wear and tear, in particular in the case of mixing elements under extreme stress, permits optimum adaptation to the requirements made by the properties of the product.
- Worn tools can be replaced immediately thanks to comprehensive stocks and prompt production of new parts as part of our rapid reaction Customer Service.

The Invention of the Ploughshare® Mixer and its specific Mode of Operation has set a High Standard for Mixing and Processing Technology

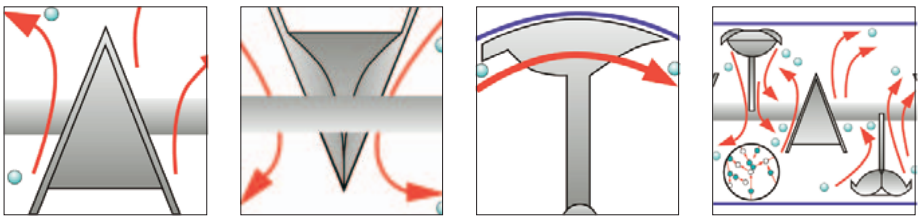
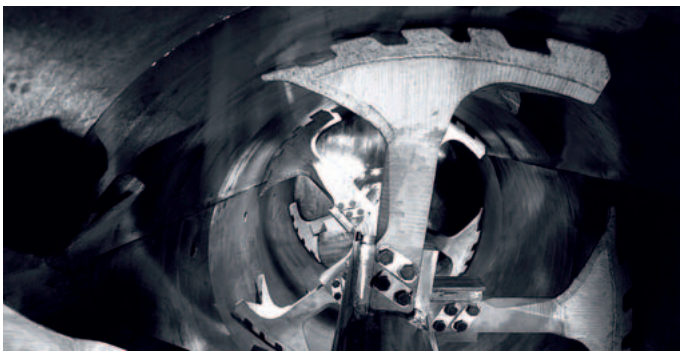
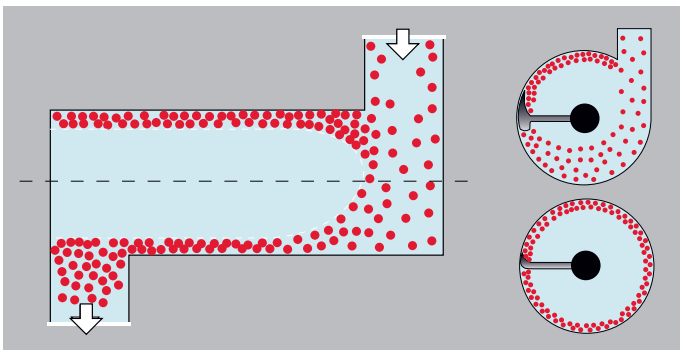


Fig. on the left: Schematic representation of the mechanically generated fluid bed; many patented innovations are based on the Ploughshare® Mixer System
Fig. at the bottom: Principle of the Ringlayer Mixer





Mixing and Processing in a Horizontal System

Ploughshare® Shovels rotate as mixing elements in special arrangement on a horizontal shaft in a horizontal, cylindrical mixing drum.

The size, number and positioning, geometric shape and peripheral speed of the mixing elements are coordinated to cause three dimensional movement of the components. Turbulence in the product, with total involvement of all material, prevents the formation of dead or low-movement zones in the mixing drum and promotes high speed, precision mixing.

The specially shaped shovels lift the product radially from the wall of the drum to prevent particles from becoming squashed between the mixing elements and the drum wall. The mechanically generated fluid bed is, therefore, ideal for mixing components with widely varied bulk densities, particle sizes, rheological properties and mass fractions. The specially shaped shovel edges prevent product build-up to the walls. We use materials and/or wear protections in accordance with the abrasive products in the environment.

In the case of special applications, it is sometimes necessary to back up the mixing effect by using separately driven, high-speed choppers. These choppers are equipped with the same type of wear protection as the mixing shovels.

Mixing and Processing in a Ringlayer System

The product to be mixed flows through different zones in a horizontal, cylindrical mixing chamber. Transporting, separating and mixing elements, adapted to the individual requirements of the process, guarantee optimum mixing, granulating, dispersion and densification. The transporting elements in the feeding zone convert the product into a ringlayer which is conveyed axially through the mixing chamber. The mixing and separating elements cause friction in the compact ringlayer of product both between the solid particles and between the particles and the chamber wall. If liquid is added the product is granulated.

The shape and arrangement of the transport and separating elements are specifically adapted for separating coarse products, as is necessary in recycling processes or in the case of tough filter cakes that contain solids. An appropriate surface finish is provided to prevent wear and tear. The advantage of the Ringlayer Mixer in the treatment of tough and lumpy products is that the material can be controlled automatically by means of the feeding shovels.

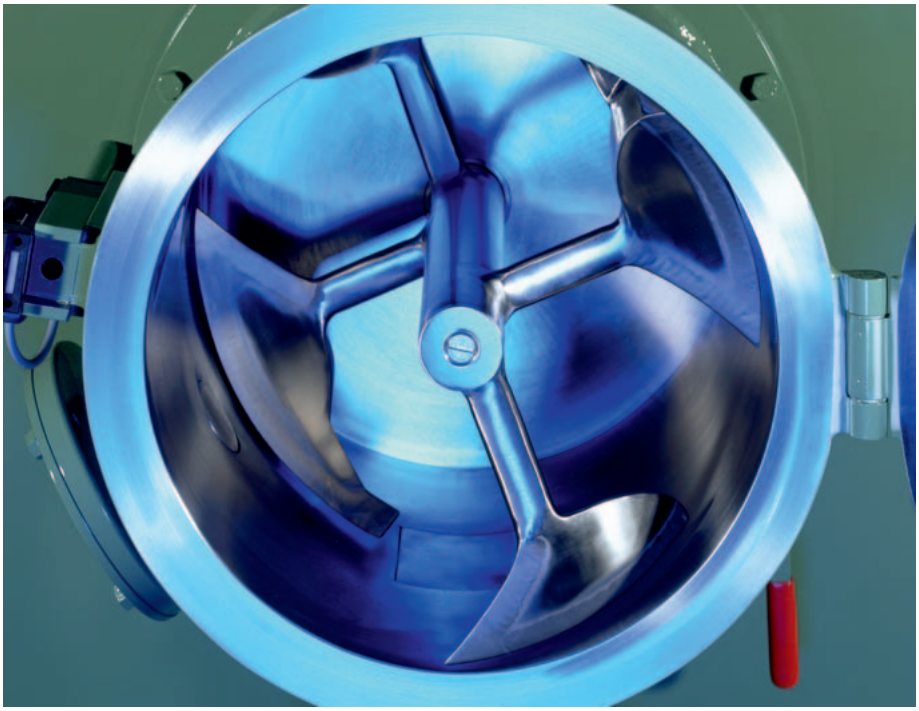
This system is used to treat filter cakes from chamber filter presses, partially dried sludge with approx. 55 % dry substance from drying systems, and to produce micro-pellets for special drying processes. This mixing principle is also used in the microgranulation of fluid bulk materials.

Mixing and Granulating Systems

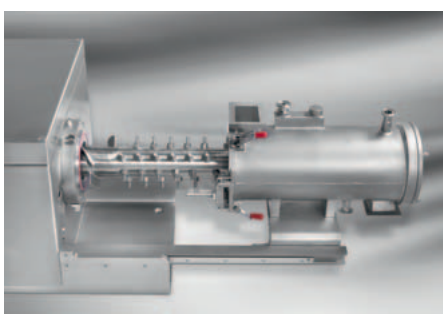
Machines for Product Development

Lödige laboratory systems are ideal for the development of products under real industrial conditions. They provide unlimited scale-up to product size of parameters obtained during trials and relevant know-how concerning product behaviour.

Essential criteria for special mixing applications in small production quantities – which mainly depend on the storage silos from various units – are provided by processing systems in practical, graded sizes. The machines are designed for semi-automatic or automatic operation. The process must be flexible in accordance to time and feed rate. The machine technology and availability must meet these requirements.



Laboratory Ploughshare® Mixer L 5 with exchangeable mixing vessels



Laboratory Ringlayer Mixer CoriMix® CM 5

Laboratory Dryer DRUVATHERM® VT 20

New Laboratory Mixer L 5 with stationary mixing vessels 5, 10 and 20 l

Mixing and Granulating Systems

Machines for high throughputs
Mixers with high throughputs are required for power station by-products in particular:

- for rapid loading of disposal trucks with de-dusted material
- for the return of stabilised residual materials to the open cast mining pit in accordance with mining regulations.

These requirements are met by continuous Lödige machines which provide a quality in a quick and reliable manner without the dead times for feeding and discharge phases which characterise otherwise batch mixers.
Waste incineration plants also demand high throughput rates for the treatment of residual materials in order to minimise truck waiting times.
The lower investment costs of mixing in a continuous process often offers benefits over conventional processes in discontinuous mode.

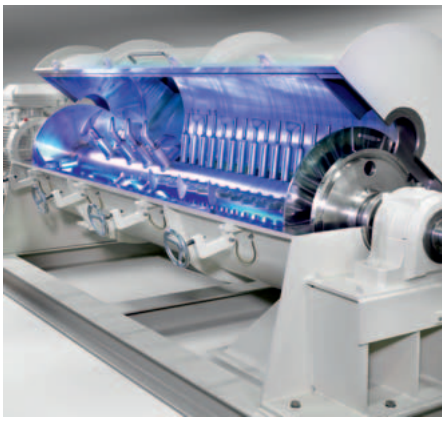
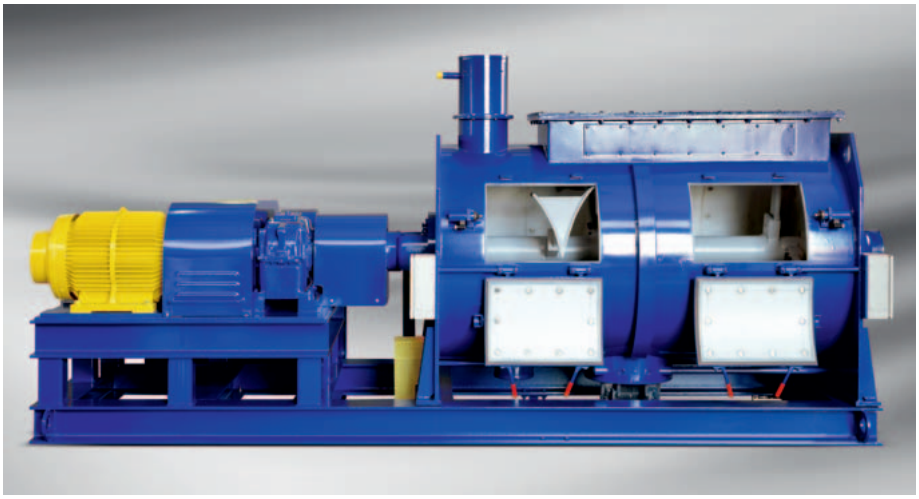


Fig. at the top: Continuous Mixer, type KM with jacket for heating/cooling and suitable for load cells
Fig. in the middle at the left: Ringlayer Mixer, type CoriMix® CM; mixing system suitable for high throughputs
Fig. in the middle at the right: Continuous Mixer, type KM-D with electro-driven weir adjustment
Fig. left: Continuous Mixer, type KM-D with large inlet. KM systems are available for throughputs up to max. 1200 t/h

Machines for batch process
Batch mixers are the preferred option for the processing of smaller amounts of residual material. If, for example, there are more than 3 components and if output is correspondingly low at 50 t/h, then the design of the dosing conveyor screw is of decisive importance for the selection of the batch or continuous mixing system. Batch processes provide a controllable, enclosed mixing space in which several process steps can be carried out in succession or in parallel, for example mixing, wetting, reaction, granulation and drying of the surfaces.



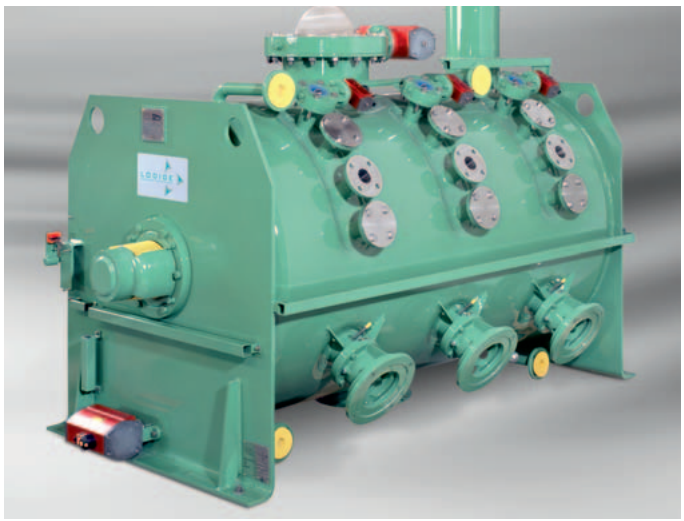


Fig. at the top on the right: Batch Mixer, type FKM; double base frame with load cells, wear lining for drum and mixing elements
Fig. in the middle at the left: Batch Mixer, type DBE for automatic operation; with special quick discharge system; available for throughputs up to 350 t/h
Fig. in the middle at the right: Batch Mixer, type FKM with various feeding devices and heating jacket
Fig. left: Eco-line Batch Mixer; standardized mixer design with various options

Systems for Thermal Product Treatment

Mixing and vacuum dryers
The excellent dispersion and crushing properties that can be achieved with Lödige mixing technology support the thermal treatment of materials for opening new disposal ways or for achieving a recycled material. We use the following for the thermal treatment of materials:

- contact vacuum dryers for reducing the temperature of evaporation of materials to be expulsed
- contact dryers, whereby it it also possible to pass through toughened plastic phases
- convection dryers for materials with a high surface availability
- granulating dryers for contaminated solutions and suspensions through extra concentration
- combination mixing and drying systems for achieving materials that are generally recognised as safe or that can be reused.

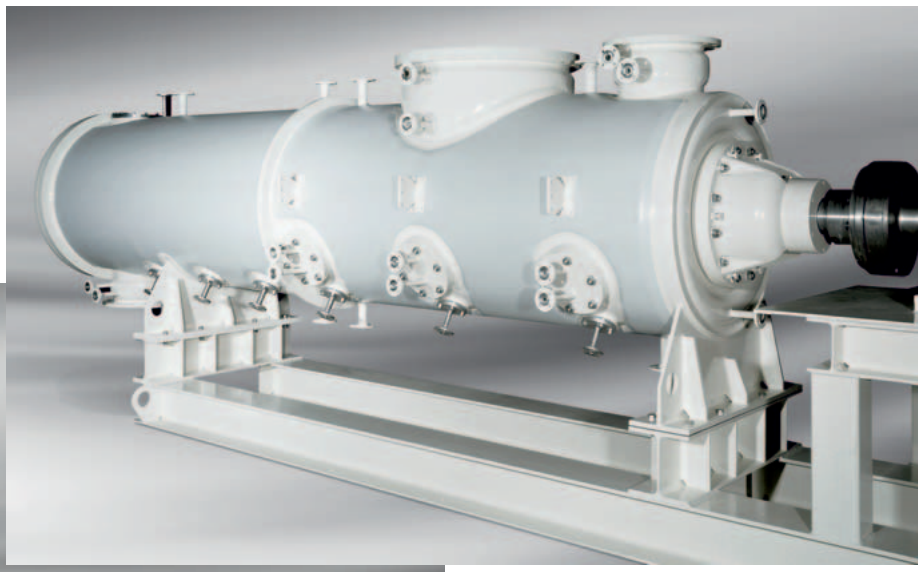


Fig. at the top: Horizontal Dryer, type DRUVATHERM® VT
Fig. in the middle: Continuous Granulating Dryer, type DRUVATHERM® CGT
Fig. on the left: Continuous Dryer for utilization of exhaust energy (convection drying process)

Mixing Systems for Automatic Units with Measurement and Control Techniques

We develop individual systems for high precision mixing of large quantities of product within the shortest time. Specific machine configuration, peripheral unit components and measurement and control techniques are supplied to the unit manufacturer or to the user according to requirements.

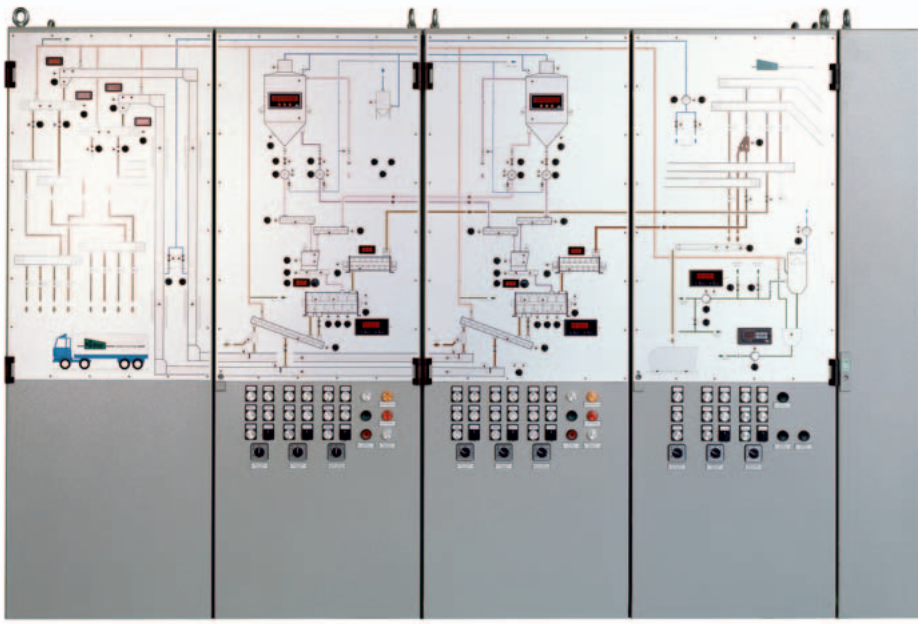
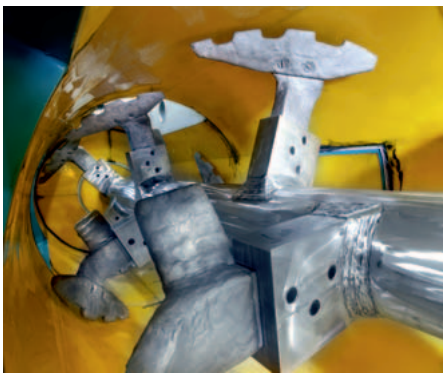


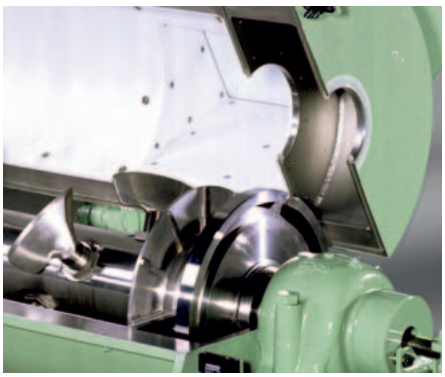
Fig. at the top: Stationary system for mixing and granulating dust
Fig. at the top on the right: Unit for the treatment of ash in a combined heating and power station
Fig. in the middle on the right: Switching and control point of a sludge treatment unit
Fig. at the bottom on the right: Mobile mixing unit with feeding and dosing devices for the treatment of sludge for subsequent briquetting; this unit is equipped with PLC controls

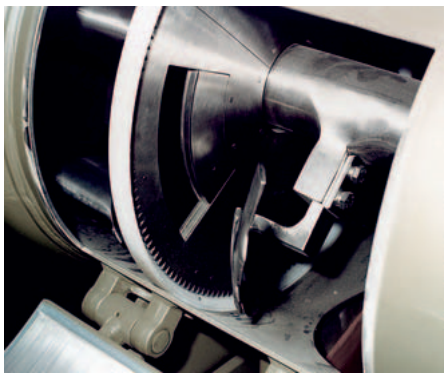
The Focus has changed in Environmental issues – It's now the Details that count

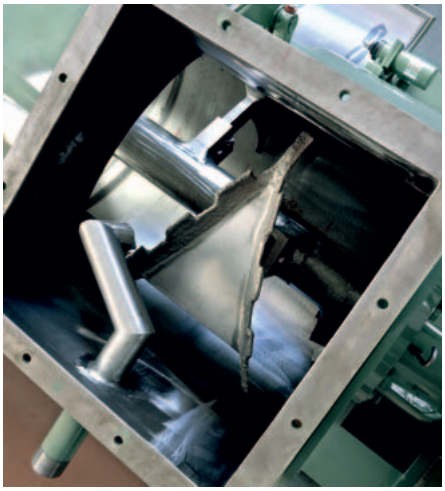
The high-level requirements made by materials to be processed in environmental technology are met by our systems through quality down to the finest detail. The precise coordination of mixing elements, materials and protection against wear enables us to achieve the required availability.

Two-phase unit for treating dewatered biosolids. In the first phase the clumped material is broken up, while in the second phase it is mixed and granulated









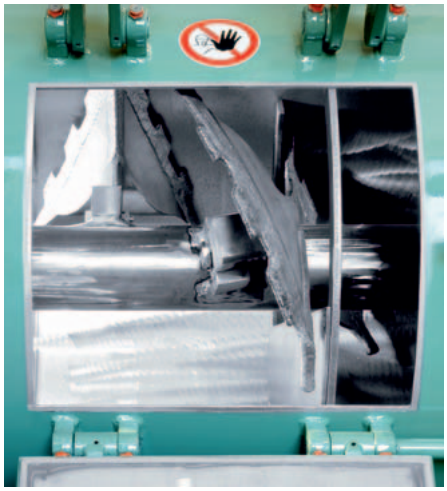
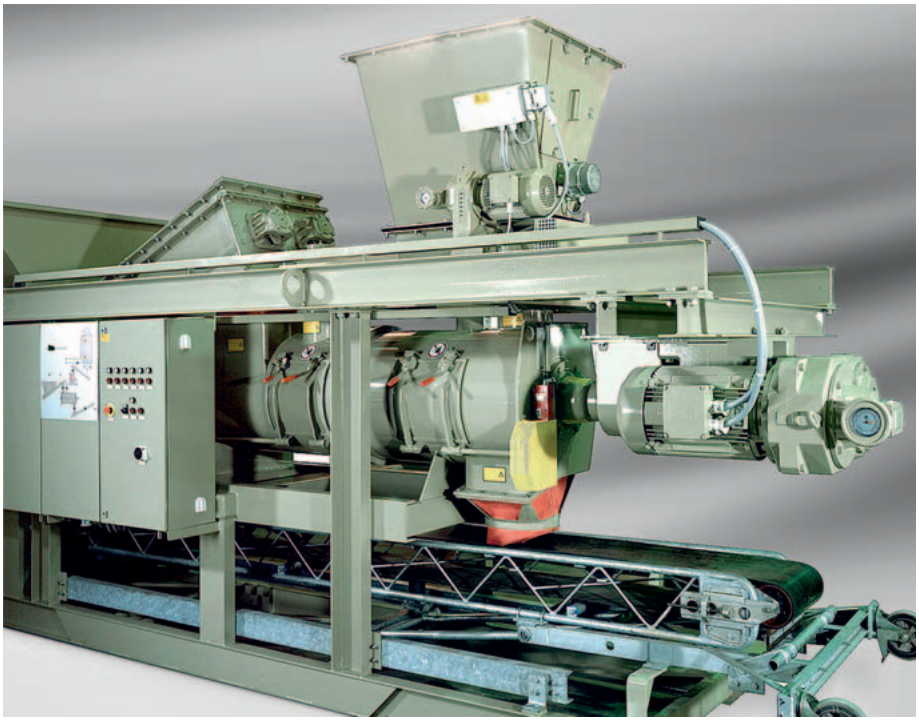


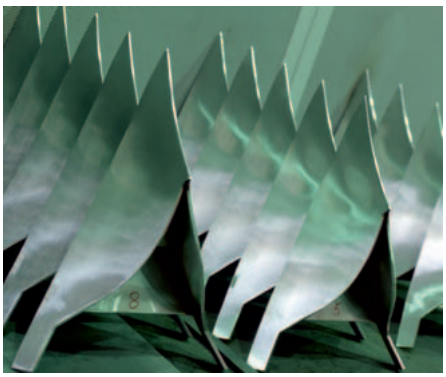
Fig. at the top and in the middle right: Abrasive materials mostly require the complete inside lining of the mixer drum and outlet chute
Fig. on the right and far right in the middle: An adjustable outlet ensures the optimum handling of pastes and bulk products in the Lödige mixer; serrated shovels prevent the build-up of deposits

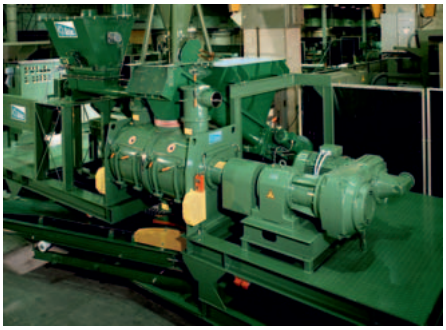
Qualified Commissioning enables us to get your Disposal Solution under Way – and you can always rely on our Customer Service

Our services ensure the smooth operation of your systems. The function of our Customer Service is to ensure the long life of the systems delivered. We use demand-based service contracts to ensure qualified monitoring of wear and tears parts and prompt provisions for the necessary measures.

In addition to this, we can also provide advice on inspection intervals, inspection methods and spare parts to be held in stock and answer questions regarding modification of the system.
Furthermore, we provide information on new applications for a unit system and for optimization or modification of processes. Find out about the wide range of facilities available for running trials at our pilot plant. A number of pilot batch machines are available on site to deal with any applications you may have.
In addition to the product-orientated production system, Lödige offers you a competent partnership which includes services to safeguard your investment and to enable the long life of our system.







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Lödige supplies high-grade components, subsystems and systems for technical processing applications in a wide range of industries. We are specialized in the field of mixing, granulating, coating, drying and reaction. Our profound knowledge of processes, development and production enables us to contribute to the success of our partners throughout the world.

Lödige, which was founded in 1938, is a family-run business in its third generation now.
With the invention of the Ploughshare® Mixer, Lödige created a mixing unit that can cover a wide range of different processing tasks. This unit forms the basis for numerous 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.
Over 500 patents and more than 30,000 machines and systems demonstrate our experience with customer-oriented system solutions. Lödige operates with more than 300 employees worldwide and supports its customers with a network of subsidiaries, technical offices and agencies.

LÖDIGE – ALWAYS THE RIGHT MIX