

EIRICH Test Center

Center for process technology

Ideas and solutions for your
preparation processes



The EIRICH Test Center – platform for fascinating possibilities

Companies such as EIRICH, which has a reputation as a **technological leader in material preparation processes**, demand the highest standards in terms of their own ability to develop new process engineering solutions in close cooperation with companies in the user industries. It was precisely this objective that led to the creation of the EIRICH Test Center, which has remained true to the company's motto since its establishment in 1926 of "delivering the best and most advanced products and services to its customers" to develop into a **highly advanced technology and development center**.

The EIRICH Test Center is an experimental laboratory for testing and trialing, a platform for new ideas, a research & development center, and a hub for the international sharing of information – in short: **an engine for innovation in the field of material preparation**.

In almost **500 tests** carried out together with customers and users **each year at the seven Test Center sites around the world**, custom-tailored solutions are developed which range from feasibility studies for alternative methods of preparation to scale-up tests and customer-specific optimization solutions. This work is undertaken by a team of no less than 20 engineers and process technicians at the various different sites.

The comprehensive database built up by this work and the many years of practical experience **in virtually every field of material preparation** provide the basis for the safe and reliable layout of machines and systems for a wide diversity of industries and tasks.

Research & development have a high priority at EIRICH and are important cornerstones of our success as a company.

The Test Center makes a major contribution here, e.g. through close cooperation with universities and research institutes and our own research and development projects.

A selection of user industries which enjoy lasting benefits of the work of the EIRICH Test Center, e. g. as a result of new and groundbreaking process concepts:

- | | |
|-------------------------|-----------------------------|
| ■ Ceramic industry | ■ Battery industry |
| ■ Refractories industry | ■ Metallurgy |
| ■ Building materials | ■ Recycling |
| ■ Powder metallurgy | ■ Foundry molding materials |

You, too, can make the most of the fascinating possibilities offered by the EIRICH Test Center!



The development of new process engineering solutions in close cooperation with companies in the user industries is carried out in spacious premises using a wide range of machinery.

This is what you can expect from the technology in material preparation processes



As a test bed and platform for the performance of tests, the EIRICH Test Center provides you with support **right through to the successful start of production and beyond**. This can cover the entire spectrum of basic process engineering operations.

Classical tasks for customers, research partners and other users include, e. g.:

- Consulting in process technology and the development of economical and ecologically responsible solutions
- Performance of tests with raw materials provided by the customer
- Development of preparation processes for new products
- Development and testing of new types of machine and measuring technologies
- Production of products in quantities which can be used for sampling by end users
- Layout of machinery and systems for a quick return on investment
- Analysis and optimization of production processes in operation or existing machines or systems
- Supply of machinery on a rental basis with the support of experienced engineers, for installation in production lines on a test basis (in-line or bypass)
- Process engineering training courses

*Agglomerating Moistening Coating Disagglomerating
Dispersing Deaerating Fine grinding Granulating
Homogenizing Hydrophobing Impregnating Kneading*

ogical leader



EIRICH Technology for infinite possibilities

EIRICH mixers offer enormous flexibility and diversity in terms of process alternatives, for both batch and continuous processes. Users often only have a limited awareness of these fascinating possibilities. As a result, the full potential of existing machines is not realized in many cases.

For example, when mixing or homogenizing powdery substances it is possible to achieve selective structural changes at the same time in the same process step through agglomeration, granulation, pelletizing, etc.

It is therefore well worth seeking advice in order to utilize the process engineering potential of your machine or system to the full for your application!

No matter what task you come to us with – you can always be sure of getting personal advice without obligation and individual assistance every time.

At every stage we give uppermost priority to confidentiality and make sure it is standard practice.

***Dissolving Mixing Re-grinding Wet grinding Pelletizing
Plasticizing Reacting Stripping Dry grinding
Drying Slurrying Crushing***

Worldwide presence – the locations of the EIRICH Test Center



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Equipment: EIRICH mixers of different sizes

There is an EIRICH Test Center at seven locations in the key economic regions of the world, true to the EIRICH policy of "operating internationally and thereby ensuring close proximity to every customer". Our specialists in your immediate vicinity speak your language and are therefore fully familiar with the specific situation of your region.

The worldwide locations of the EIRICH Test Center constitute a network with the Hardheim Test Center at its center. The individual locations maintain constant, intensive contact with each other to exchange information, and regular training courses ensure a continuous transfer of know-how.

This ensures that you as a user have direct access to their entire know-how, no matter where your tests are carried out among the different locations.

Mixing to perfection

Mixing is a key basic operation in material processing. This is defined as the systematic merging of at least two different materials to **result in a mixture which is as homogeneous as possible**. The quality of a mix, i.e. the mixing quality, is normally determined by sample taking and analytical evaluation. In relation to mixing quality and homogeneity, the mixing system which is used has a critical influence.

The special EIRICH mixing principle is characterized by the rotating mixing pan and the eccentrically mounted rotating mixing tool, which results in separation between the mixing process and the material transport. This fundamental difference compared to other systems opens up a whole **range of possibilities for influencing the process** through

- the speed of the mixing tool – this can be adjusted over wide ranges to enable the energy input to the mixing process to be varied
- the direction of rotation of the mixing tool
- individual tool geometries specifically tailored to the task at hand

This makes it possible to achieve results beyond the feasibility of other mixing systems:

- Much higher homogeneities
- Shorter mixing times
- Complete disintegration of agglomerates
- Prevention of demixing effects

- Setting of different load factors (from extremely gentle to aggressive), even during a mixing cycle

The advantages of the EIRICH mixing system really come into their own when it comes **to demanding mixing tasks** which are considered to be difficult, e. g.

- involving large differences in density between the basic materials
- involving admixing of fibrous materials
- for disagglomeration of ultrafine materials to nanoparticles
- involving homogeneous admixing of tiniest amounts of solid or liquid additives down to the ppm or ppb level
- for high demands in terms of low-contamination preparation (e.g. where there is a need to prevent contamination resulting from abrasion)

By combining with **EIRICH vacuum technology** it is also possible to achieve high levels of homogeneity and rates of disagglomeration for ultrafine material systems involving the need for small quantities to be mixed in homogeneously, e. g. pigments. Removing the air from the material can facilitate the transfer of higher shearing forces and thereby enable even heavily agglomerated raw materials to be completely disintegrated and mixed in homogeneously.

*Friction lining products
Colored plaster
Refractory products*





Granulation for every requirement

Granules (latin: granum = grain) are created when individual particles are built up to form a solidified composite with a rounded shape. The individual particles of the granule are no longer identifiable at a macroscopic scale. The moisture content required for the formation of granules has to be determined by experimentation for each specific material system, whereby normal granulation moisture levels are in the range of 5-50 %.

In addition, sufficient particle fineness is also required for the production of granules, with a fine fraction of at least 70 % smaller than 100 µm.

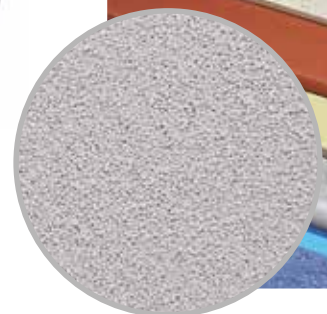
Granulating mixers and disk pelletizers from EIRICH offer a wide spectrum of solutions for **agglomerating, granulating and pelletizing**. They range from the production of dust-free bulk material to the selective production of solidified and rounded compact grains with predefined sphericities and excellent flow properties.

The agglomeration or granulation process itself is by means of wet granulation involving the addition of liquids, or alternatively by means of hot melt granulation. The granule size distributions can be varied within a very wide adjustment range.

In addition to the production of dust-free agglomerates such as microgranules ranging from < 200 µm to < 1000 µm as substitutes for spray granules, it is also possible to produce spherical granules in the 1-25 mm range in variable distribution ranges without any difficulty.

The **EIRICH granulation system** can be used for granulating an almost unlimited range of materials or material systems such as, e. g.

- for the production of microgranules to granules of several centimeters in size or pellets
- for the production of different sphericities and surface structures
- for the incorporation of fibrous products in granules as well, up to certain fiber lengths
- for the formation of highly stable and abrasion-resistant granules through the addition of binders
- for the production of granules with the highest possible densities as a result of granulation after the plastic phase involving the addition of dry materials or the removal of liquid by drying



Lawn fertilizer
Cat litter
Pressed granules for tiles



Kneading, plasticizing and dispersing

Kneading and **plasticizing** involves the uniform wetting of dry raw material components with liquids or thermoplastics to produce an end product which is plastic in form.

In the EIRICH mixer the production of plastic masses is carried out in two stages: In the dry mixing stage the dry, powdery components are first mixed together homogeneously. This is followed by the addition of the liquid in the quantity specified in the formula. Where binders are added in the form of dry material, they start the dissolving and swelling process as soon as the liquid is added. The preparation process itself is then finished within just a few minutes.

The EIRICH mixer demonstrates its strengths to optimum effect here when it comes to the production of homogeneous dry mixes and for the excellent wetting of the surfaces of solid particles with liquids - in contrast to classical kneading with its well-known problems with the distribution of the dry and liquid components in the mixing chamber and resultant lengthy preparation times.

Advantages of EIRICH mixers for kneading and plasticizing

- Very short processing times compared to a kneader, i.e. the preparation process is completed in just minutes instead of hours, with correspondingly less energy input
- Binders are distributed homogeneously in the material due to the dry mixing process, meaning that there is no danger of the dreaded formation of lumps when the liquid is added.
- The shearing and stress regimens in the plastic material can be varied by selecting different tool geometries and speeds according to specific requirements.
- In addition to powdery components it is also possible to completely separate fibrous substances or fiber bundles as well and distribute them homogeneously in the mix.

Examples of products for kneading

- Manufacture of honeycomb structures
- Manufacture of extruded round rods used in powder metallurgy

For **dispersing** solid matter or the production of suspensions EIRICH uses the mixer's strength of being capable of processing a highly plastic phase as well. The **suspension** is not prepared by adding the powder to a liquid pre-mix, as this generally leads to the formation of lumps and therefore more time needed to prepare the suspension. In the EIRICH mixer the suspension is produced in a single pot process involving the continuous addition of liquid to what is initially a dry phase which subsequently becomes plastic, along with further dilution.

Advantages of EIRICH mixers for dispersing

- Drastic reduction in processing times; from hours to just minutes
- Any desired suspension viscosity can be achieved by varying the controls for the amount of liquid added.
- The processing properties can be adjusted by adding dispersing agents and/or thickeners in minute quantities during processing.
- Homogeneous distribution results in major savings on dispersing agents and additives compared to other processes in certain cases.

Examples of applications for dispersing

- Clay slurry for ceramic applications
- Coating slurries for lithium-ion batteries
- Paper coating compounds



© Duravit AG.



Sanitary ware

Ceramic honeycombs

Ceramic foils

Coating, hydrophobing and functionalizing

The particular strength of the EIRICH mixer is that it is capable of distributing the tiniest amounts of liquids or solids homogeneously onto the surfaces of solid matter by applying shearing forces of sufficient strength. To do this, different tool speeds and geometries are used here depending on the specific product. They are configured to prevent any negative impacts on the original components and ensure that the material is completely covered.

This means that the list of potential applications is almost unlimited:

- With the use of chemical additives dissolved in water or solvents it is possible to precisely functionalize the surfaces of solid particles or granules.
- In hydrophobing this involves the application of silanes, for example. Temperature control can also be used here for reaction control purposes.

- Superimposed re-drying can also be used to remove any excess carrier liquids again, leaving only the additive on the surfaces of the particles in the tiniest of quantities, even down to the ppb scale if required.
- Granules or coarse-grained feedstock are also capable of being coated with liquids and/or powdery solids. This is also possible in multiple layers.
- The liquid can be added by pouring or spraying.

Examples of applications

- Hydrophobing of sand
- Increasing the flowability of cohesive bulk material by adding aerosils
- Coating of abrasive grit
- Coating of instant products





Drying, reacting and grinding

The EIRICH mixer has a practically unlimited range of applications and with the relevant functional peripherals it can also be used for **drying**, e. g. of filter cakes and sludge, and even for **reaction control** for chemical solid matter or solid matter and liquid reactions. EVACTHERM® technology offers excellent temperature control and monitoring possibilities here, even where strong exothermal reactions are involved.

With regard to **drying technology**, the removal of the liquid can be carried out on both an atmospheric basis or under vacuum using conductive and convective drying processes with hot air, inert gases or superheated steam, both with or without explosion protection.

In addition to just straight drying it is also possible to integrate the coating, granulation and mixing of raw material components as well. The drying process takes place in a mechanically generated fluid bed and permits any consistency to be processed, ranging from suspensions to filter cakes and dry materials, which need to be wetted with liquids at the start.

Examples of applications for drying

- Galvanic sludges
- Pesticides
- High-tech ceramics
- Friction linings
- Paint sludges

The versatility of the EIRICH mixer is also demonstrated by the fact that the functional principle can also be used for in the field of **size reduction technology or grinding technology**.

It is precisely this principle that has been applied to the **MaxxMill® agitated media mill**, which is designed for dry and wet grinding in the 5-70 µm range. Here, grinding balls in the rotating mixing/grinding chamber are set in motion by the eccentric mixing/grinding tool. True size reduction of the original product takes place as a result of impact and friction in the moving pack of balls.

Examples of applications for grinding

- Frits
- Silica sand
- Fillers

These are supplemented by large-scale **TowerMill agitated media mills** for bulk products such as ores.



Lead acid pastes for starter batteries
Pesticides
Engobes/glazes for roof tiles





The right technology for your task



Spacious premises with 2,500 sqm of floorspace house modern machines which are constantly modernized and added to for all relevant applications:

- Laboratory and pilot machines, both for batch and continuous operation
- Complete processing lines with extensive peripheral equipment
- Process data acquisition
- State-of-the-art computation and simulation methods

An in-house test laboratory offers the following extensive equipment:

- Standard processes for particle measurement (dry and wet screening, air jet screening, camsizer, laser diffraction analysis)
- Microscopes with image capture
- Quick-test moisture measurement devices
- Drying chambers, muffle furnaces, diverse scales for analytical, fine and coarse weighing
- Molding sand testing units
- Photometers, IR cameras
- REM microscope
- Texture analyzer (a testing machine for determining the physical properties of diverse materials) for, e.g. determining granule strength



It is also possible to set up **temporary plant installations** for realistic investigations of process and system constellations.

Explosion-protected machines and systems enable tests to be carried out with combustible and potentially explosive solid materials and solvents.

Many customers and users make use of the opportunity to have **tests carried out with original materials**.

On a laboratory scale materials in amounts of at least 50 g can be processed. On a production scale material amounts of up to approx. 500 kg can be processed.

You, too, can make the most of the fascinating possibilities offered by the EIRICH Test Center and arrange a consulting meeting with us without obligation – and it can take place at your premises if you wish. Our professional team will be glad to advise you!

Industrial Mixing and Fine Grinding Technology

Tradition and innovation since 1863

EIRICH stands worldwide for a comprehensive range of products and services in the field of preparation technology. Its particular focus is on mixing and fine grinding technology, with know-how developed over 150 years of close cooperation with industrial users, universities and research institutions.

Pursuing a corporate philosophy of operating internationally and thereby ensuring close proximity to every customer, the EIRICH Group has secured its place in all the key economic regions of the world.

The focus is on innovative technology for machinery and systems engineering designed to offer solutions for high-standard preparation tasks from a single source.

Applications and process technology with own test centers, a high vertical range of production and comprehensive after-sales service provide the ideal basis for the development of modern and economical processes for a multitude of industries.

**Building materials – Ceramics – Glass – Carbon paste – Battery paste
Friction linings – Metallurgy – Foundries – Environmental protection**

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