

Drying Systems

for mixing, granulating and drying in a single machine



- Convection drying
- Superheated steam drying
- Contact drying

The Pioneer in Material Processing®



Individual drying solutions ...

The addition of a range of application-specific drying equipment to EIRICH mixing systems now opens up an even wider spectrum of possibilities for the selective design of product characteristics.

Whereas EIRICH laboratory scale drying systems are predominantly based on contact drying, the energy input in production machines is convective. This involves forcing drying gas through a mechanically produced fluidized bed, the product surface thus being used for heat and mass transfer purpose.

This results in extremely high specific vaporization capacities without any encrustation of the heated container walls or the tools involved. The use of superheated steam as the drying medium permits highly energy-efficient preparation in an inert atmosphere. Convection drying offers excellent scale-up capability, from lab scale to production scale. In this system the EIRICH mixing principle permits the perfect homogenization of the basic material, from the dry mixing phase through to the pasty kneading phase. All agglomerates, lumps and clods are completely decomposed by the high-speed mixing tool. By withdrawing the liquid on a continuous basis the product undergoes a constant change in consistency. Once a certain product-specific moisture content is reached the adherent pasty mass disintegrates into lumps. Further withdrawal of liquid turns the product into granulate form. Both the size and range of distribution of the granulates can for the most part be adjusted to requirements by regulating the speed of the mixing tool.

All-in-one process

Being a universal machine, the discontinuous EIRICH mixer is suitable for even extremely complex preparation processes. Basic processing operations such as

- mixing ■ granulating ■ heating
- reacting ■ drying ■ cooling

can all be carried out either simultaneously or in sequence in a single machine.

Custom-made plants tailored to specific requirements can be planned and, depending on customer requirements, manufactured either as parts of wider plants or as complete turnkey solutions including all necessary peripheral equipment. Intelligent control systems produced in-house permit process control which is both operationally reliable and flexible.

Advantages

- Greater process control flexibility
- Simple formula change-over
- Trouble-free processing of all consistencies without preconditioning
- No caking on heated walls or internal attachments
- Compensation of variable starting moisture content
- Dust-free end product
- Granulates of highest densities and bulk weights
- Adjustable granulate size distribution
- Fully automatic plant operation
- Short start-up and shutdown times
- Low exhaust gas emissions
- Environment-friendly preparation process

Servicing, maintenance and repair

- No seals exposed to product
- Excellent access for cleaning and maintenance
- Minimum cleaning required when changing products
- Minimum number of wearing parts, easy to replace

... for demanding applications

EIRICH has the experience which comes from having installed countless drying systems around the world. We have specialist know-how in the following areas:

- Grinding wheel materials
- Modern high-performance materials
- Ceramic materials
- Crop protection agents
- Washing powder compounds
- Friction lining materials (clutch, brakes)
- Isostatic refractory bodies
- Cellulose derivatives (CMC, MC)
- Aqueous or solvent-containing sludges
- Sewage sludge
- Metal-containing sludges
- Paint sludges



EVACTHERM® machine design

1. Pressure-proof casing
2. Maintenance door for pressure-proof casing
3. Mixing container
4. Maintenance door for mixing container
5. Material charging
6. Drying gas inlet
7. Transfer to the vapor filter

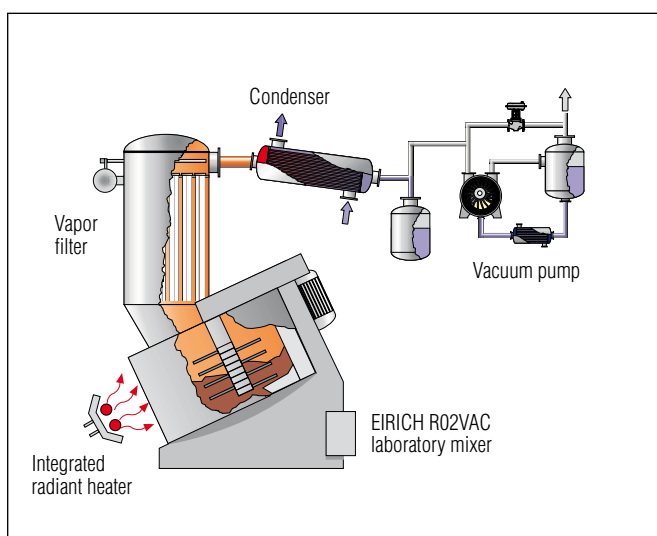
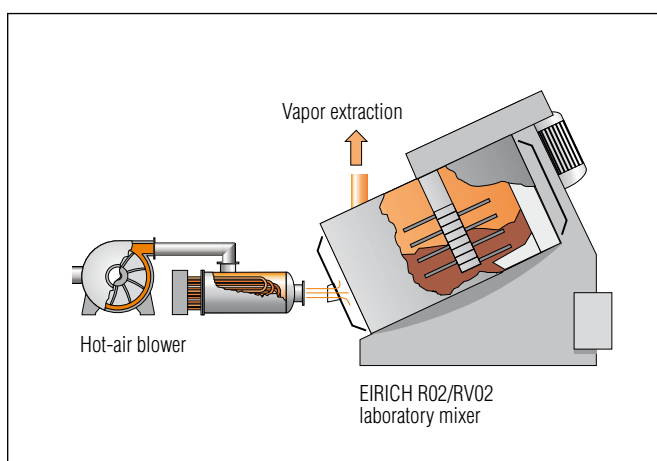
	Laboratory machines		Production machines	
	Standard	EVACTHERM®	Standard	EVACTHERM®
Machine type	R02/RV02/R02E	R02VAC	R05 - R24 / DW31	R08VAC - RV32VAC
Capacity	3 - 10 l	3 - 5 l	45 - 7000 l	75 - 7000 l
Drying capacity*	< 1 kg/h	< 1 kg/h	5 - 1000 kg/h	25 - 2500 kg/h
Explosion protection	Each case has to be checked separately	up to zone 0/20	Each case has to be checked separately	up to zone 0/20

* in terms of water

Drying on a laboratory scale

... atmospheric and under vacuum

EIRICH laboratory mixers are ideally suitable for drying processes. From the development of new products to the optimization of existing processes and even small batch production runs, they are suitable for a diverse range of applications in companies in a wide spectrum of industries and for research work in laboratories and universities all around the world.



Contact drying under atmospheric pressure

A combination of R02/RV02 standard laboratory mixers and a hot-air blower and mixing container cleading for the convection heating of the rotating mixing container is used. The material to be mixed is heated and dried by contact heat transfer. The vapor is extracted by the dust extractors installed by the customer.

Advantages

- Low capital investment
- Removable mixing containers
- Easy-to-change mixing tools
- Integrated measurement of the mixing material temperature

Vacuum contact drying

A small system featuring the EVACTHERM® R02VAC laboratory mixer with integrated radiant heater for heating the rotating mixing container. The material to be mixed is heated and dried by contact heat transfer under atmospheric conditions or by vacuum in an inert atmosphere. The top-mounted vapor filter is used for dust removal, the shell-and-tube heat exchanger for the condensation of the vapor. The pressure is controlled by a by-pass valve on the vacuum pump.

Advantages

- Preparation under explosion protection conditions up to zone 0/20
- High process flexibility
- Removable mixing container
- Easy-to-change mixing tools
- Integrated measurement of the mixing material temperature
- Visual monitoring of drying process possible
- Condensation of the vapor
- Exact temperature control by means of mixer pressure
- Vacuum vaporization cooling

Examples of applications

- Grinding wheel materials
- Technical ceramics
- High-performance materials



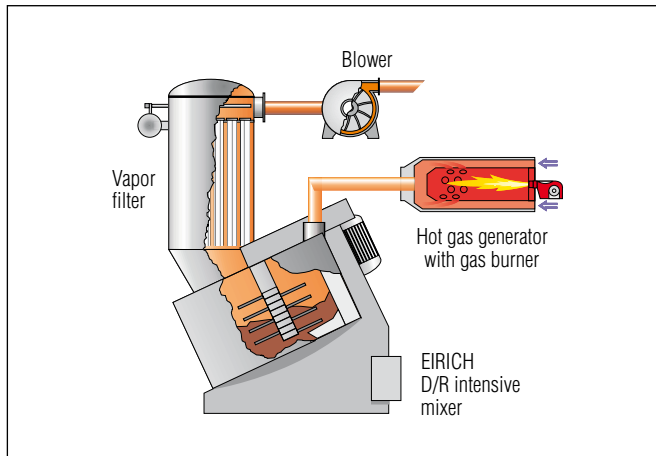
Fig. 5.1: R02VAC EVACTHERM® explosion-proof mini plant with mixing reactor (1), top-mounted vapor filter (2), condenser with integrated liquid collecting container (3) and vacuum pump module with pressure controller (4).



Fig. 5.2: R02E (1) with mixing container cleaning (2) and hot-air blower (3)

Drying of aqueous material systems

... with hot air or flue gas

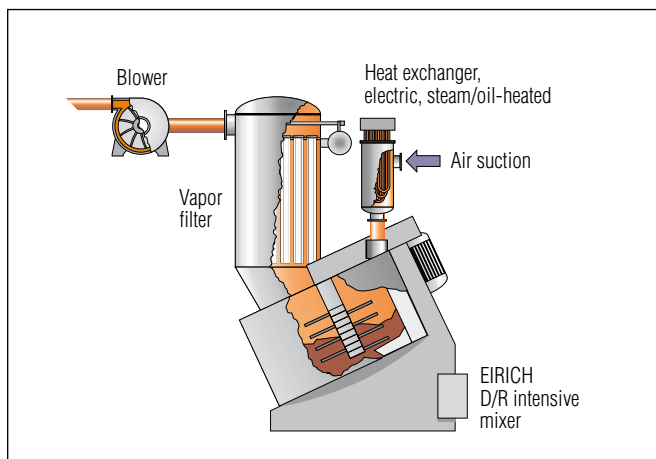


Convection drying in an open system of operation with flue gas

This involves the use of type D or R standard mixers for convection drying with flue gas from gas or oil burners in an open system of operation under atmospheric conditions. The exhaust gas is cleaned by a top-mounted vapour filter with automatic filter cleaning.

Advantages

- Simple plant technology
- Compact plant design
- High thermal efficiency
- Low mixing material temperatures
- Adjustable vaporization rates
- Virtually particle-free exhaust gas



Convection drying in an open system of operation with hot air

This involves the use of type D or R standard mixers for convection drying with heated air under atmospheric conditions. The air is heated by electric heaters or steam/oil-heated heat exchangers. The exhaust gas is cleaned by a top-mounted vapor filter with automatic filter cleaning.

Advantages

- Simple plant technology
- Compact plant design
- Low mixing material temperatures
- Adjustable vaporization rates
- Virtually particle-free exhaust gas

Examples of applications

- Crop protection agents
- Washing powder compounds
- Ceramic materials





Fig. 7.1:
Drying system
with gas burner
and RV19 intensive
mixer

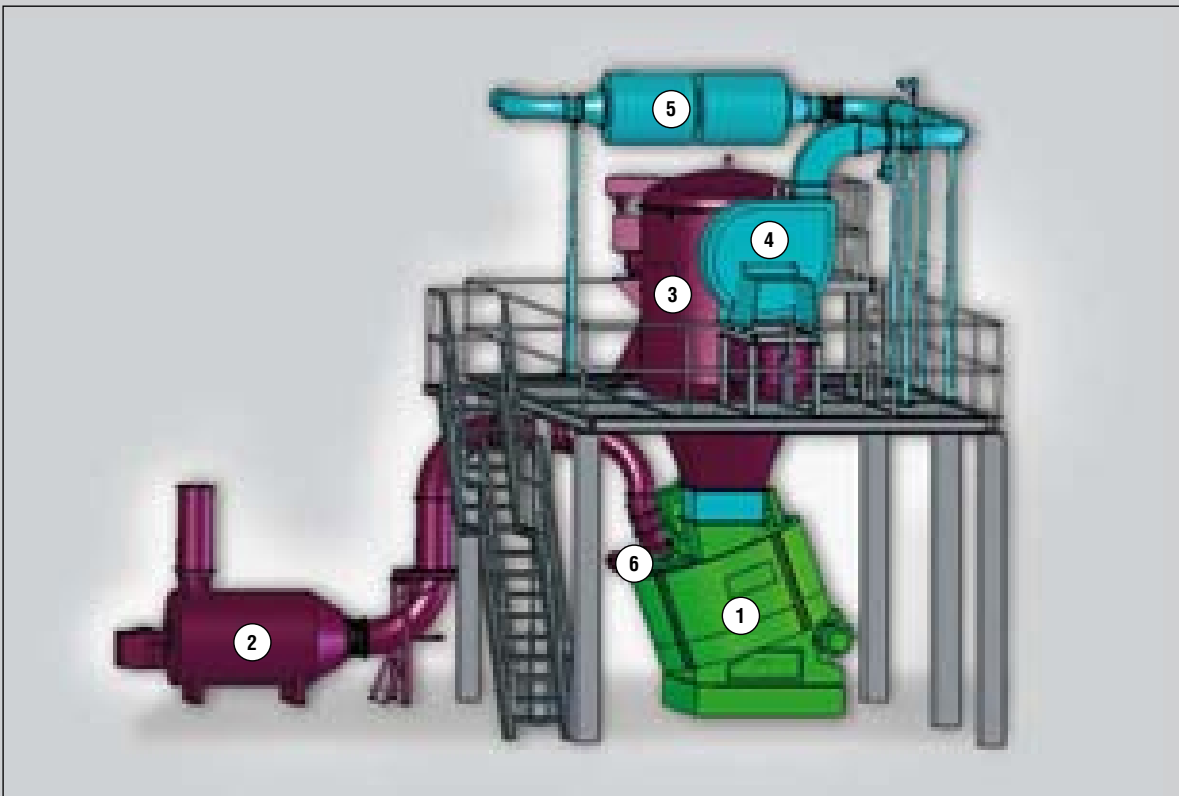
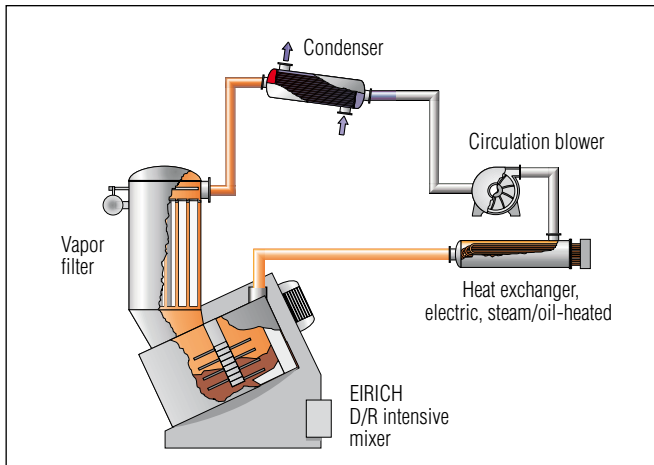


Fig. 7.2:
3-D view of system
layout with:
1. Intensive mixer
2. Hot gas generator
3. Vapor filter
4. Blower
5. Noise muffler
6. Connection for
product charging

Emission-free drying

... as well explosion-proof

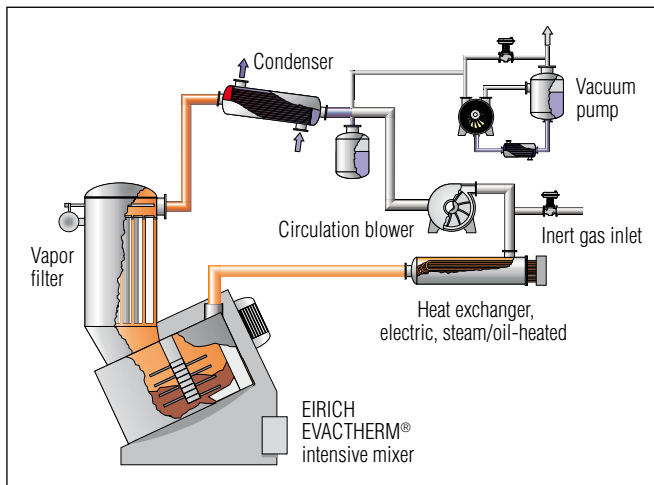


Convection drying in a closed circuit for aqueous material systems

This involves the use of type D/R standard mixers for convection drying with air in a closed circuit under atmospheric conditions. The exhaust air is cleaned by a top-mounted vapor filter with automatic filter cleaning. The air is heated by electric heaters or steam/oil-heated heat exchangers. The vapor is condensed in a water-cooled condenser.

Advantages

- Exact setting of moisture content in the mixing material
- Drying is independent of surrounding conditions
- No exhaust gas emissions



Vacuum convection drying in a closed circuit for aqueous material systems and material systems containing solvents

This involves the use of EVACTHERM® mixers for convection drying with inert gases (e.g. N₂, CO₂) in a closed circuit under vacuum. The exhaust gas is cleaned by a top-mounted vapor filter with automatic filter cleaning. The gas is heated by electric heaters or steam/oil-heated heat exchangers. The vapor is condensed in a water-cooled condenser. The pressure is controlled by a by-pass valve on the vacuum pump.

Advantages

- Mixing, drying, granulating and cooling in a single unit
- Preparation under explosion-proof conditions in an inert atmosphere up to zone 0/20
- Low inert gas consumption
- Exact setting of moisture content in the mixing material
- Drying is independent of surrounding conditions
- Minimal exhaust gas emissions
- Exact temperature control
- Vacuum vaporization cooling



Examples of applications

- Friction lining materials
- Isostatic refractory materials
- Cellulose derivatives (CMC, MC)



Fig. 9.1:
R08VAC
EVACTHERM®
drying system for
the preparation
of friction lining
materials

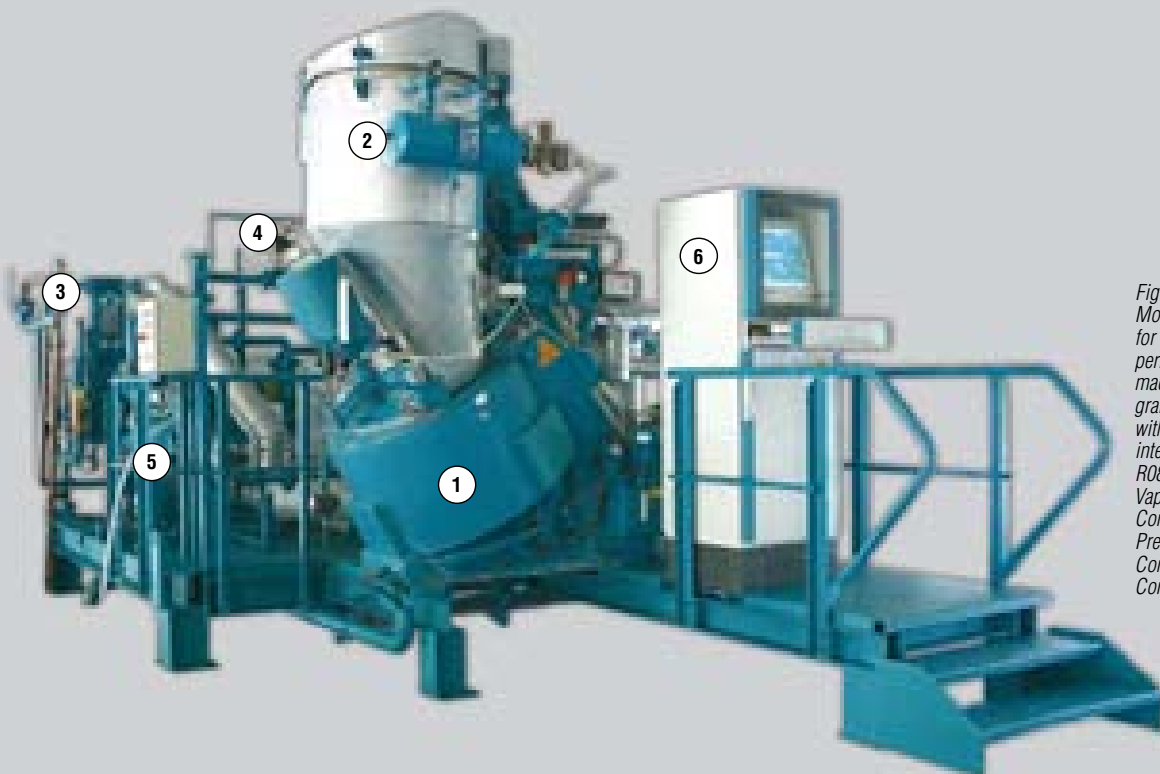
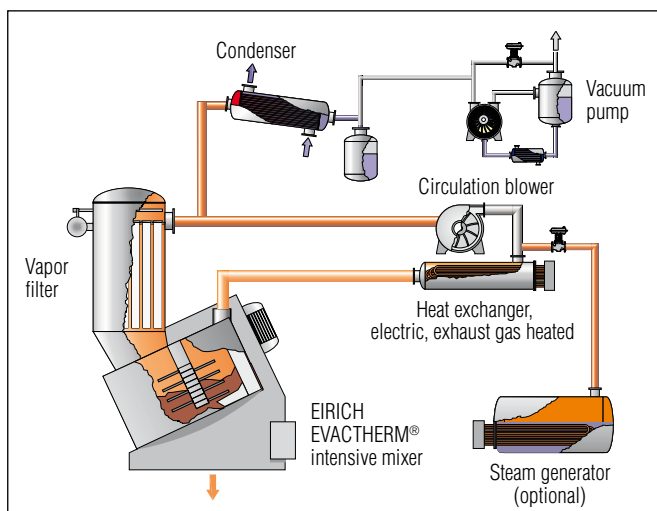


Fig. 9.2:
Modular drying system
for the production of high-
performance ceramic
made from high-density
granulates
with EVACTHERM®
intensive mixer
R08VAC (1)
Vapor filter (2)
Condenser (3)
Pressure controller (4)
Condensate scale (5)
Control system (6)

Drying with superheated steam

... and integrated vaporization cooling



Vacuum and hot steam drying in an EVACTHERM® mixer in a closed circuit with integrated vaporization cooling

This involves the use of EIRICH EVACTHERM® mixers for convection drying with superheated steam (water/solvent) in a closed circuit under vacuum. The exhaust air is cleaned by a top-mounted vapor filter with automatic filter cleaning. The superheated steam is generated by electric heaters or heat exchangers heated by flue gas. The vapor is totally condensed in a water-cooled condenser. The pressure is controlled by a by-pass valve on the vacuum pump. The product is heated by circulating hot gas or saturated steam generated externally.



Advantages

- Mixing, drying, granulating and cooling in a single unit
- Self-inerting, closed system – suitable for up to zone 0/20
- Low inert gas consumption
- High heat transfer coefficient
- High volume-specific vaporization capacity
- Minimum energy requirements
- High rate of solvent recovery
- Fast product heating

Examples of applications

- Aqueous or solvent-containing sludges
- Sewage sludge
- Paint sludge
- Metal-containing sludges
- Inflammable substances and materials
- Preparation of ceramic materials (tiles, insulators, ferrites)
- Preparation of friction lining materials



Fig. 11.1:
Drying system for
the treatment of
industrial sludges:
Drying capacity of
1000 kg/h, with an
EVACTHERM®
intensive mixer
RV23VAC (1)
vapor filter (2)
steam superheater (3)



Fig. 11.2:
Vacuum pump module
for RV23VAC
with condenser (4)
vacuum pump (5)
pressure controller (6)

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 145 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 plant 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 bodies – Battery pastes
Friction linings – Metallurgy – Foundries – Environmental protection**

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