FLUIDIZED BED REACTORS

SCHWING supplies fluidized bed reactors as stand-alone components or within a complete system. The customer requirements and/or the application thereby determine the reactor type and the scope of the system.

The systems from SCHWING can be designed as individual components or complete systems, including control, gas preparation, energy recovery, product cooling. Planning, engineering and manufacturing of all systems thereby always take place in consideration of the CE-identification and compliance with all applicable environmental stipulations.

THE REACTOR

The reactor is either a cylindrical or for continuous processes, a trough-shaped design, which is heated either electrically or with gas.

THE GAS DISTRIBUTOR PLATE

The proprietary gas distributor plate allows the optimal distribution of the process gases – even at highest temperatures – and a fluidization of the solids even at low gas velocities.

THE FILTER SYSTEM

The modern block back filter system retains fine particles. Metallic candle filter or cyclone are used.

THE PRODUCT DISCHARGE

The special product discharge guarantees the optimal emptying of the reactor without affecting fluidization.

LAB REACTORS

The fluidized bed systems from the BSR model series from SCHWING constitute diverse high-temperature lab reactors for the treatment of nano-scale powders with reaction gases in atmospheres up to 1100 °C.

The BSR systems offer excellent heat and mass transfer properties at top temperature accuracy for typical applications such as:
- Calcining
- Oxidizing / reducing
- Tempering or
- Surface modification through different reaction gases or mixes from several gases.

BSR MODEL SERIES

Principally, the design of the BSR lab reactors from SCHWING correspond to the reactor construction shown on the opposite side. In addition, the BSR model series offers the following advantages:
- Mobile compact design, smallest footprint
- Gas velocities from 2 to 50 cm/s
- Temperature monitoring ±2 °C at 1100 °C
- Can be used already from 1.5 liters useful volume
- Advanced, easy to operate process control

FLUIDIZED BED PROCESS TECHNIQUE

High temperature reactors for gas / solid reactions up to 1100 °C
High temperature reactors for gas / solid reactions up to 1100 °C

**FLUIDIZED BED REACTORS**

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- calcining
- sedimenting / reducing
- tempering or
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**BSR MODEL SERIES**

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- Gas velocities from 2 to 50 cm/s
- Temperature monitoring at +/−2 °C at 1100 °C
- Can be used already from 1.5 liters useful volume
- Advanced, easy to operate process control

**CONTACT**

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APPLICATIONS UP TO 1100 °C

Based on over 40 years of development, experience and success, SCHWING manufactures specific high-temperature reactors based on the fluidized bed technology for the thermo-chemical treatment of powders with reaction gases at temperatures up to 1100 °C. In addition to the typical applications such as:

- reducing, calcining, tempering,
- thermal reactions, gas mixtures as well as
- burning and melting processes,

new developments. In the surface modification of nano-scale powders and the use of various reaction gases opens up many new applications.

The offerings of SCHWING range from conducting technical heading scales (fluidization tests, pilot trials, are often dip and scale-up reactors) for product manufacturing and process development on pilot scale up to the delivery of complete systems for the continuous or intermittent operation.

Based on its comprehensive expertise in the area of high-temperature technology SCHWING offers its customers worldwide knowledge and thus competitive advantages.

PERFECTED TECHNOLOGY

The uniform distribution of the gas in the solid is the essential prerequisite for good fluidization. The greater the contact surface between gas and solid, the greater the benefit of the fluidized bed technology. Using the project-specific reaction agents, powders with different grain sizes can be superfly fluidized at low gas velocities.

The separation of the gases from the solid is just as important as the distribution of the gas in the solid. A special filter system specifically developed for this purpose ensures that even nanoscale particles remain in the reactor and do not need to be elaborately returned in the cycle via a cyclone. Using specifically suitable materials, the filter system works perfectly even in the high-temperature range. A sophisticated backflush system cleans the filter in alternating fashion from the solids attached on the outside.

The simplicity of the fluidized bed technology, combined with optimized dimensioned components and state-of-the-art measurement and control technology, not only ensure extremely easy operability of the systems but also the precision and reproducibility of the thermo-chemical processes. Temperatures up to 1100 °C as well as the use of aggressive media are hereby possible.

The excellent material and heat transmission properties of the SCHWING fluidized bed reactors and their compact design permit, in addition, energy savings up to 40% compared to conventional rotary kiln technologies.

ULTIMATE EFFICIENCY

SCHWING develops, engineers and builds fluidized bed systems both at the bench scale and the production scale for batch and continuous operations. Multistage fluidized bed reactors are used for the continuous execution of chemical reactions which are designed as multistage reactors also for calcining or drying powders or granulates with up to 150 thermally mixing stages.

The SCHWING Lab+Tech CENTER is located at the company’s headquarters in Neubrandenburg-Vineta (Germany). Customers and interested parties from diverse industries and countries here utilize the capability of testing the available technologies and processes and to run specific test series. A variety of fluidized bed systems of different sizes and types are available here for the production of sample amounts up to 1 ton of material.

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The excellent material and heat transmission properties of the SCHWING fluidized bed reactors and their compact design permit, in addition, energy savings up to 40% compared to conventional rotary kiln technologies.

The benefits:

- Optimal heat transmission
- Tubular fuel distributor
- Maximum temperature accuracy
- Excellent mass transfer
- Short dwell times
- Simple system design
- Low space demand
- Minimum energy usage
- Easy to repeatable

SCHWING LAB+TECH CENTER

The SCHWING Lab+Tech CENTER is located at the company’s headquarters in Neubrandenburg-Vineta (Germany). Customers and interested parties from diverse industries and countries here utilize the capability of testing the available technologies and processes and to run specific test series. A variety of fluidized bed systems of different sizes and types are available here for the production of sample amounts up to 1 ton of material.

THE PROCEDURE

The successful employment or development of a high-performance fluidized bed reactor for process applications requires close cooperation between the system builder and the customer. SCHWING offers a procedure proven particularly practical in innumerable test series and takes the specific requirements of the respective chemical process, the material properties and the required product parameters and quality grades into account.
APPLICATIONS UP TO 1100 °C

Based on over 40 years of development, experience and success, SCHWING manufactures specific high-temperature reactors based on the fluidized bed technology for the thermo-chemical treatment of powders with reaction gases. It is experienced thermal treatment up to 1100 °C. In addition to typical applications such as:

- Distilling, reducing, calcining, tempering,
- Isolating reactions, gas-solid reactions as well as
- Heating and melting processes,

new developments. In the surface modification of nano-scale powders and the use of various reaction gases open up new applications.

The offerings of SCHWING range from conducting technical feasibility studies (fluidization tests, pilot trials in different fashion from the solids attached on the outside).

Based on its comprehensive expertise in the area of high-temperature systems, SCHWING offers its customers worldwide know-how and thus competitive advantages.

PERFECTED TECHNOLOGY

The uniform distribution of the gas in the solids is the essential prerequisite for good fluidization. The greater the contact surface between gas and solid, the greater the benefit of the fluidized bed technology. Using the projector screen as a model for chemical reactions, powders with different grain sizes can be superficially fluidized at low gas velocities.

The separation of the gases from the solids is just as important as the distribution of the gas in the solids. A special filter system specifically developed for this purpose ensures that even nano-scale particles remain in the reactor and do not need to be elaborately returned in the cycle via a cyclone or similar. Using specifically suitable materials, the filter system works perfectly even in the high-temperature range. A sophisticated multi-fluid system cleans the filter at a tolerating bottom from the solids attached on the outside.

The simplicity of the fluidized bed technology, combined with optimally dimensioned systems and state-of-the-art measurement and control technology, not only ensures extremely easy operability of the systems but also provides optimized results in the thermo-chemical processes. Temperatures up to 1100 °C as well as the use of aggressive media are hereby possible.

The excellent material and heat transmission properties of the SCHWING fluidized bed reactors and their compact design permit, in addition, energy savings up to 40% compared to conventional (rotary pipe) technologies.

ULTIMATE EFFICIENCY

SCHWING develops, engineer and builds fluidized bed systems both at the bench scale and the production scale for batch and continuous operation. Multistage fluidized bed reactors are used for the continuous execution of chemical reactions which are designed as multistage reactors also for calcining or drying powders or granulates with up to 10 theoretical mixing stages.

The SCHWING LAB+TECH CENTER is located at the company’s headquarters in Neukirchen-Vluyn (Germany). Customers and interested parties from diverse industries and countries here utilize the capability of testing the available technologies and processes and to run specified test series. A variety of fluidized bed systems of different sizes and configurations are available for the production of sample amounts up to one ton of material.

SCHWING develops, engineers and builds fluidized bed systems both at the bench scale and the production scale for batch and continuous operation. Multistage fluidized bed reactors are used for the continuous execution of chemical reactions which are designed as multistage reactors also for calcining or drying powders or granulates with up to 10 theoretical mixing stages.

The simplicity of the fluidized bed technology, combined with optimally dimensioned systems and state-of-the-art measurement and control technology, not only ensures extremely easy operability of the systems but also provides optimized results in the thermo-chemical processes. Temperatures up to 1100 °C as well as the use of aggressive media are hereby possible.

The excellence materials and heat transmission properties of the SCHWING fluidized bed reactors and their compact design permit, in addition, energy savings up to 40% compared to conventional (rotary pipe) technologies.

THE BENEFITS

- Optimal heat transmissivity
- Tubular heat distributor
- Maximum temperature accuracy
- Excellent mass transfer
- Short dwell times
- Simple system supervision
- Low space demand
- Minimum energy usage
- Easy to reoperate

THE PROCEDURE

1. **COLD TRIAL PHASE**
   - Design meeting Determination of technical parameters, visit of lab and technical center facilities
   - Determination of process conditions, etc.
   - Offer proposing the fluidization and documentation of all process data
   - Technical center trials and preparation of technical report

2. **HOT TRIAL PHASE**
   - Design meeting Determination of trial runs and process parameters, visit of lab and technical center facilities
   - Technical report with detailed technical parameters and concept preparation of production system
   - Technical report and possibly initial planning of production system

SCALE-UP PHASE

A

- Offer proposing the fluidization and documentation of scale-up trials

B

- Technical report with detailed technical parameters and concept preparation of production system

C

- Scale-up trials up to 100% of the technical scale (or semi-continuous operation possible)

D

- Technical report and possibly initial planning of production system

PRODUCTION PHASE

E

- Determination of required system and process parameters and contract preparation of production system building

F

- Contact production, order placement, production order / order placement

G

- Offer preparing for production system / order placement

H

- Engineering, delivery, assembly, assembly AFD and startup

I

- Online questionnaire for raw material, technical parameters, visit of lab and technical center facilities

J

- Technical center trials and preparation of technical report

K

- Technical report with detailed technical parameters and concept preparation of production system

L

- Technical report and possibly initial planning of production system

N

- Optional in advance: Mutual confidentiality declaration and/or confidentiality statement

O

- Feedback for raw material, technical parameters, visit of lab and technical center facilities

P

- Online questionnaire for raw material, technical parameters, visit of lab and technical center facilities

Q

- Technical center trials and preparation of technical report

R

- Technical report with detailed technical parameters and concept preparation of production system

S

- Technical report and possibly initial planning of production system

THE SUCCESSFUL EMPLOYMENT OR DEVELOPMENT OF A HIGH-PERFORMANCE FLUIDIZED BED REACTOR FOR PROCESS APPLICATIONS REQUIRES CLOSE COOPERATION BETWEEN THE SYSTEM BUILDER AND THE CUSTOMER.

SCHWING offers a procedure proven particularly practical in innumerable test series and takes the specific requirements of the respective chemical process, the material properties, and the required product parameters and quality grades into account.
APPLICATIONS UP TO 1100 °C

Based on over 40 years of development, experience and success, SCHWING manufactures specific high-temperature reactors based on the fluidized bed technology for the thermo-chemical treatment of powders with reaction gases at temperatures up to 1100 °C. In addition to the typical applications such as:

- milling, reducing, calcining, tempering,
- poling reactions, gasoloids reactions as well as
- scaling and process applications.

New developments. In the surface modification of nanoscale powders and the use of various reaction gases open up many new applications.

The offerings of SCHWING range from conducting technical findings studies (Fluidization tests, pilot trials), to different dip and scale-up reactors for product manufacturing and process development on pilot scale, up to the delivery of complete systems for the continuous or intermittent operation.

Based on its comprehensive expertise in the area of high-temperature technologies SCHWING offers its customers tailor-made solutions and products up to 120 liters at the SCHWING LAB+TECH CENTER.

The SCHWING LAB+TECH CENTER is located at the company’s headquarters in Neckarsulm/Vaihingen (Germany). Customers and interested parties from diverse industries and countries worldwide utilize the capability of testing the available technologies and processes and to run specific test series.

SCHWING offers a procedure proven particularly practicable in innumerable test series and takes the specific requirements of the respective chemical process, the material properties and the required product parameters and quality grade into account.

1. “COLD” TRIAL PHASE

- Design meeting determination of trial runs and process parameters, visit of lab and technical center facilities
- Online questionnaire on a test program for the respective Application

2. “HOT” TRIAL PHASE

- Technical report with recommendations for “hot” fluidization trials

ULTIMATE EFFICIENCY

SCHWING develops, engineers and builds fluidized bed systems both for bench scale and the production scale for batch and continuous operation.

Multistage fluidized bed reactors are used for the continuous execution of chemical reactions which are designed as multistage reactors also for drying or pyrolyzing powders or granulates with up to 150 theoretical mixing stages.

The separation of the gases from the solid is just as important as the distribution of the gas in the solid. A special filter system specifically developed for this purpose ensures that even nanoscale particles remain in the reactor and do not need to be elaborately removed in the cylix via a cyclone or sifter. Using specifically suitable materials, the filter system works perfectly even in the high-temperature range. A sophisticated backflush system cleans the filter in alternating fashion from the solids attached on the outside.

The simplicity of the fluidized bed technology, combined with optimally dimensioned instruments and state-of-the-art measurement and control technology, not only ensure extremely easy operability of the systems but also the perfect control of the reactor, the thermal-chemical processes, temperatures up to 1100 °C as well as the use of aggressive media are hereby possible.

The excellent materials and heat transmission properties of the SCHWING fluidized bed reactors and their compact design permit, in addition, energy savings up to 50% compared to conventional (rotary pipe) technologies.

The benefits:

- Optimal heat transmission
- Trouble free distributor
- Maximum temperature accuracy
- Excellent mass transfer
- Short dwell times
- Simple system supervision
- Low space demand
- Minimum energy usage
- Easy to operate

The SCHWING Lab+Tech Center is a state-of-the-art fluidization laboratory for various applications. The specific high-temperature technologies SCHWING offers its customers tailor-made solutions and products up to 120 liters at the SCHWING Lab+Tech Center.

The SCHWING Lab+Tech Center is located at the company’s headquarters in Neckarsulm/Vaihingen (Germany). Customers and interested parties from diverse industries and countries worldwide utilize the capability of testing the available technologies and processes and to run specific test series.

A variety of fluidized bed systems of different sizes and shapes are available technologies and processes and to run specific test series.

1. “COLD” TRIAL PHASE

- Design meeting determination of trial runs and process parameters, visit of lab and technical center facilities
- Online questionnaire on a test program for the respective Application

2. “HOT” TRIAL PHASE

- Technical report with recommendations for “hot” fluidization trials
FLUIDIZED BED REACTORS

SCHWING supplies fluidized bed reactors as stand-alone components or within a complete system. The customer requirements and/or the application thereby determine the reactor type and the scope of the system.

The systems from SCHWING can be designed as individual components or complete systems, including control, gas preparation, energy recovery, product cooling. Planning, engineering and manufacturing of all systems thereby always take place in consideration of the CE identification and compliance with all applicable environmental stipulations.

THE REACTOR

The reactor is either a cylindrical or for continuous process, a trough-shaped design, which is heated either electrically or with gas.

THE GAS DISTRIBUTOR PLATE

The proprietary gas distributor plate allows the optimal distribution of the process gases – even at highest temperatures – and a fluidization of the solids even at low gas velocities.

THE FILTER SYSTEM

The modern block back filter system retains fine particles. Metallic candle filter or cyclone are used.

THE PRODUCT DISCHARGE

The special product discharge guarantees the optimal emptying of the reactor without affecting fluidization.

LAB REACTORS

The fluidized bed systems from the BSR model series from SCHWING constitute diverse high-temperature lab reactors for the treatment of nano-scale powders with reaction gases in atmospheres up to 1100 °C.

The BSR systems offer excellent heat and mass transfer properties at top temperature accuracy for typical applications such as:
- Calcination
- Sintering / reducing
- Tempering or
- Surface modification through different reaction gases or mixes from several gases.

BSR MODEL SERIES

Principally, the design of the BSR lab reactors from SCHWING corresponds to the reactor construction shown on the opposite side. In addition, the BSR model series offers the following advantages:
- Mobile-compact design, smallest footprint
- Gas velocities from 2 to 50 cm/s
- Temperature monitoring ±2 °C at 1100 °C
- Can be used already from 1.5 liter useful volume
- Advanced, easy to operate process control

High temperature reactors for gas / solid reactions up to 1100 °C