

FINDING INNOVATIVE SOLUTIONS – TAKING NEW APPROACHES

HOF FREEZE DRYING SYSTEMS

THE SPECIALIST FOR INDIVIDUAL SOLUTIONS



www.hof-sonderanlagen.com

HOF

KNOWLEDGE AND EXPERIENCE YOU CAN RELY ON

With over 25 years' experience, HOF Sonderanlagenbau GmbH is the leading specialist in the manufacture of individual freeze drying systems, loading and unloading systems, as well as freeze thaw units for the pharmaceutical and biotechnological industry.

At our company site in Lohra, near Marburg, Germany, highly motivated and specially qualified employees work on the company's own production area of some 12,500 m². A flexible service team keeps close contact with our customers, both nationally and internationally, providing support for the users of HOF-systems.

ENSURING FUTURE SUCCESS

In the pharmaceutical and biotechnological environment, quality and reliability are the decisive parameters in determining whether a company will be successful or not. This is guaranteed by using HOF's customized systems, but also because the company's systems technology is developed with an eye on future requirements.



INNOVATIVE CAPACITY AS BRAND ESSENCE

HOF's answer to steadily new customer requirements is: innovation! The company focuses on the search for new and best solutions, always considering one perspective: the customer's perspective. An innovative capacity is essential for the customer's success.

THE HIGHEST QUALITY AT EVERY STEP OF THE WAY ■ ■ ■

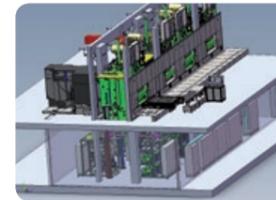
... distinguishes the company, a specialist in individual solutions, since its founding: from the idea to the fully developed plan, all the way to the scrupulous manufacturing of the system, which is customized and convincingly reliable. HOF-systems are always a good investment for the future.

INNOVATIVE SOLUTIONS – GAINED IN PRACTICE, FOR USE IN PRACTICE

For more than 25 years, HOF Sonderanlagenbau GmbH has been developing forward-looking technologies, nationally and internationally. An important requirement for all company departments is to develop and plan the future today. HOF employees focus on the technological innovations with the objective to meet new customers specific requirements.

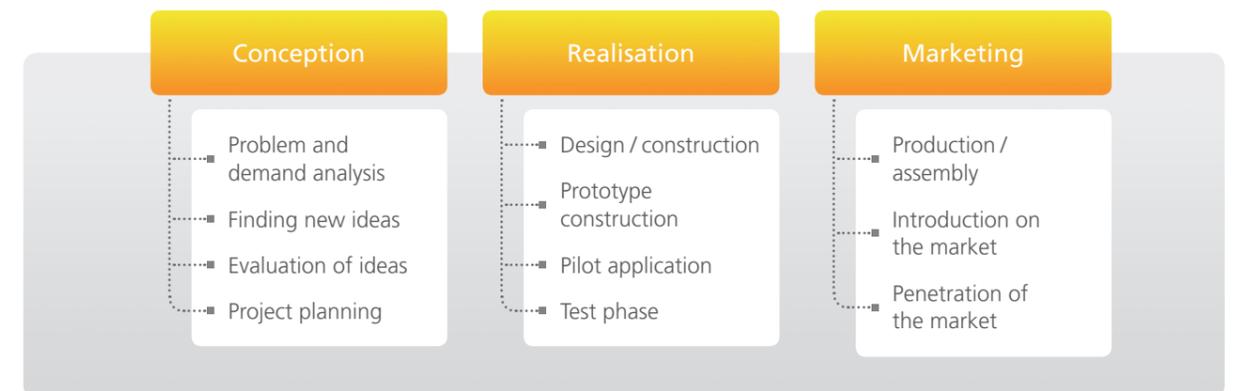
TECHNOLOGICAL PIONEER – NOW AND IN THE FUTURE

The company's aim for the future is to remain an innovative pioneer in research and development of freeze-drying systems. Innovative charging systems, flexible shelf adjustment, use of liquid nitrogen and natural refrigerants, control integration of advanced measuring systems such as NIR and mass spectrometers, HOF SynchroFreeze and vacuum insulation: these are some examples for the company's innovative potential and willingness to take on new approaches.



INNOVATIVE POTENTIAL – LOOKING FOR THE BEST SOLUTIONS

New technologies don't occur by chance. It is a result of thorough analysis, a lot of creativity, current knowledge and the right know-how. HOF's innovative potential is also in the tactic approach.

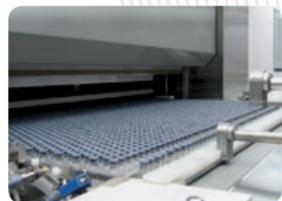


HOF ACS: AUTOMATIC LOADING AND UNLOADING SYSTEMS

FOR FREEZE-DRIERS IN THE PHARMACEUTICAL AND THE BIOTECHNOLOGY INDUSTRY

LOADING AND UNLOADING SYSTEMS – INNOVATIVE, CERTIFICATED AND QUICKLY READY FOR USE

The pharmaceutical and biotechnological industry's demand for high-class loading and unloading systems for freeze-drying systems is growing. In response to this demand, HOF finds innovative solutions and produces high-quality systems.



PATENTED QUALITY FROM GERMANY

HOF has developed a new system design, adapted to customer-specific requirements. Technically, our loading and unloading systems are highly efficient and reliable, which is typical for HOF.

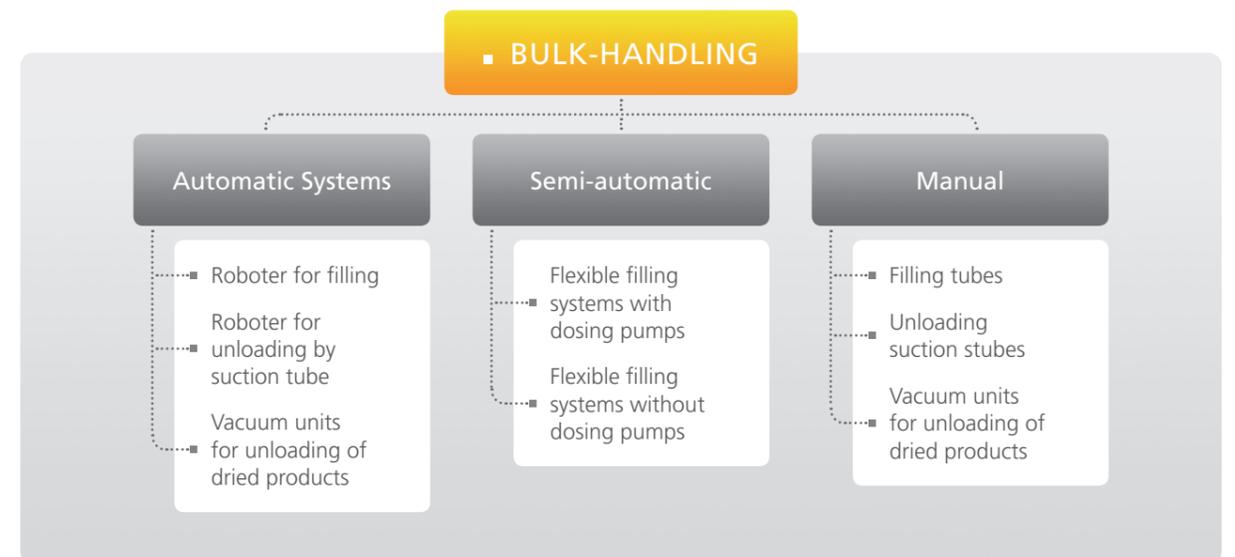
The performance range covers manual, semi-automatic or fully automated systems. Special packages, dual-chamber carpules or dual-chamber syringes are transported. Worldwide, patents for this innovative technology are held by HOF.



AND PRODUCED IN GERMANY

The loading and unloading systems are installed and tested in our own production area in combination with the freeze dryer or a specific equivalent dummy. All settings and functions can be tested extensively. This has the advantage that the installation and testing times are shorter at our customers site.

It is possible to upgrade existing freeze-driers with HOF loading and unloading systems and therefore to meet customer requirements. Depending on the requirement it is possible to couple a freeze-drying plant and loading and unloading system with isolator or RABS technology.



HOF SYNCHROFREEZE – FOR OPTIMIZED FREEZE-DRYING PROGRAMS

SYNCHRONIZED FREEZING OF FREEZE-DRYING PRODUCTS IN VIALS OR IN OTHER CONTAINERS

HOF SYNCHROFREEZE – HIGH QUALITY AND HIGH PROCESS RELIABILITY

HOF SynchroFreeze is a future oriented technology. This procedure allows a homogeneous freezing thanks to a synchronized nucleation during the freezing process – with a simultaneous reduction of the drying time.

This innovation of HOF, registered for patent approval, provides the customer with further tools to quality improvement of the pharmaceutical product and to more efficiency.



HOF SynchroFreeze distinguishes itself through a high process reliability and the possibility for retrofitting of existing freeze-drying systems.

BRIEF OVERVIEW OF HOF SYNCHROFREEZE

- Synchronization of freezing process in individual vials and product containers
- Increase of the product homogeneity
- Conditioning of product structure
- Reduction of drying times

HOF – TECHNOLOGICAL COMPETENCE WITH INNOVATIVE APPROACH

ENERGY SAVINGS POTENTIALS AND PROCESS OPTIMIZATION

NATURAL REFRIGERANTS

HOF's dogma is innovative solutions for freeze-drying on one side, an environmental protection and preservation on the other side. In search of halogen-free solutions for refrigerants in the freeze-drying process, the company HOF started in 2005 a cooperation with a renowned pharmaceutical company. A constructive technology based on natural refrigerants has been developed and has been already successfully implemented over the past years.

One natural refrigerant alone cannot reach the required temperatures, for this reason HOF implements a two-stage refrigeration system (cascade). This system uses the halogen-free refrigerant R170 in a cryogenic temperature circuit and R1270 in a high-temperature circuit providing a larger energy spectrum.

In addition to the cooling circuit of the chamber, a cooling circuit for the condenser is installed in a modular design. This enables a spatial separation of the freeze drying plant and the refrigeration system with hydrocarbon. ■ ■ ■



■ ■ ■ THIS HAS 3 ADVANTAGES:

- The encased refrigeration systems can be disposed in a flexible way indoors and outdoors.
- The ATEX-requirements only apply within the encased refrigeration system.
- Freeze drying plants with multiple refrigeration systems secure the process. In case of failure at one of the refrigeration systems, the second refrigeration system is sufficient to secure the product.

This pioneering refrigeration technology can be used for new freeze drying equipment as well as in retrofitting of existing plants.



ENERGY-EFFICIENT TRANSPORT OF DEEP COOLED DIATHERMIC LIQUIDS

For decentrally installed freeze-drying systems, there are energy losses arising from increased heat intakes for storage and transport. In response to this specific requirement, HOF has developed an innovative and high-efficient heat-transfer medium pipe installation. This unique solution focuses on high vacuum isolated double pipes with a nominal diameter up to DN100.

The pipelines are manufactured at HOF and are then installed at the customers site. This new technology currently offers the best possible long-term insulation and sets new standards on the market.



PROCESS DEVELOPMENT IN THE LABORATORY IN MORNSHAUSEN

Safe and stable freeze-drying processes are essentials in the production chain of our customers. For this reason, HOF has been offering a valuable support in process development and process optimization for many years now. This service unit is located in Mornshausen in our pilot-plant technical laboratory.

The pilot plant laboratory, equipped with modern appliances such as a HOF MiniLyso with radiation separator, a cryomicroscope and excellent resistance and temperature measuring devices, optimizes the drying processes at the highest stage.

Furthermore, the HOF MassAnalyzer enables the analysis of mass spectra, in particular traces of silicone oil, and the monitoring of water vapor concentrations in the process atmosphere under vacuum.



HOF – ECOLOGICAL THINKING: A CREDO FOR THE COMPANY

STRAW-PELLETS AS COMBUSTIBLE TO GENERATE ITS OWN HEAT SUPPLY
FEM CALCULATION, REDUCTION OF THE DRINKING WATER CONSUMPTION ■ ■ ■



FINDING INNOVATIVE SOLUTIONS – TAKING NEW APPROACHES

The protection of the environment is a central aspect of HOF's corporate management. An entrepreneurial commitment includes among other things the careful handling of natural resources.

OWN PELLETS AND OWN PELLET HEATING SYSTEM

Because energy is an important issue in the sustainable management, HOF has its own and innovative solution.

In order to supply the heat for the office and production area, HOF uses a technology, so far unique in Germany. The company owner and hobby farmer Hans-Georg Hof is a pioneer in concluding the entire value chain by working straw into combustible to generate its own heating energy.

The straw is a byproduct resulting from the cultivation of grain is worked into straw pellets during a complicated procedure in the own pellet plant. The pellets are then burned in the special biomass boiler for CO₂ neutral heat production. The ash obtained during the burning process is then further of use as an excellent fertilizer for the family's agricultural areas.

By means of the system, the 5,700 m² large part of the factory in Gladenbach-Mornshausen is successfully heated. The pellet plant is operated thanks to a photovoltaic system, so that the production of pellets happens in a self-sufficient way.



LESS STAINLESS STEEL FOR THE SAME PERFORMANCE

In order to optimize the materials usage, the physical properties of all chamber structures are tested by means of the finite-element-method (FEM). Thanks to this method, material savings of up to 30 percent compared to the usual calculation can be achieved in the stainless steel sector.



LESS WATER FOR THE SAME PERFORMANCE

Water is a vital asset, which must be protected. Therefore HOF bases on the use of a separate cooling water pond for cooling of heated water from the process runs, which for example occurs during commissioning and factory acceptance tests.



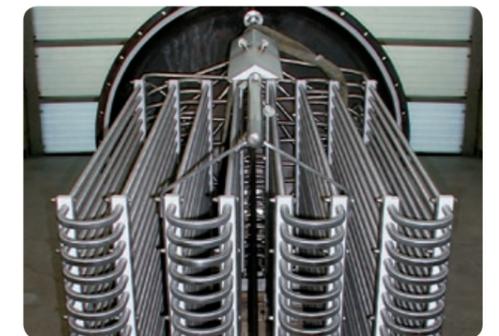
LESS ENERGY FOR THE SAME PERFORMANCE

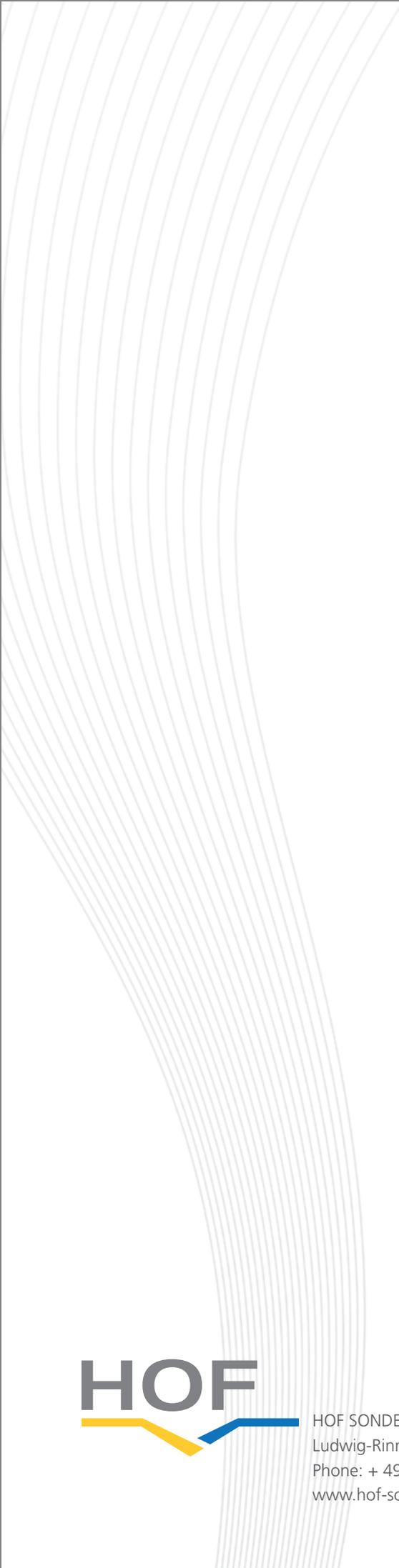
Through the reduced consumption of raw materials in the plant design, the energy consumption is also reduced – for example during a steam sterilization. Additionally, modern proportional valves for LN₂-cooling-systems and combined CIP-systems for WFI (water for injection) and PW (purified water) saving are used.

LIFE-CYCLE OF A FREEZE-DRYER

To provide a reliable operation of the machines over a long period, HOF specially takes care of diverse parameter. This includes the selection of the suppliers, the own production, the service of the machines at customer's site and the modernization and retrofitting of the plants.

For example in regard of a retrofit, new technologies are developed and seamless integrated into the systems in place.





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