

## Leading technology

At HOF, the product is not determined by the technology, but it is rather the product properties that determine the technology.

### The new HOF debottling system with water bath and cutting station

The innovative HOF system based on state-of-the-art robot technology – compact, reliable and safe.

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### The HOF smartVTS sets new standards

– for design, technology and functionality

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HOF – news

Looking forward,  
we would like to draw your attention  
to our 3rd HOF technical forum 2020.

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## Ladies and gentlemen

With the third edition of our HOFinsight, we place a focus on the knowledge of technology and its further development.

In this context, we want to look at which innovative technologies can be found in our field and present a few products from our company that show how new challenges can be overcome with the help of specialist technological competence.

### State-of-the-art technology – efficient and sustainable

This applies to our new HOF debottling system with water bath and cutting station, for example, which has many special features. Among these are the automated function of the defrosting process, the fully automated cutting station and the use of state-of-the-art robot technology. A product video of the new HOF debottling system is available to view online on our website.

The new HOF smartVTS is another example of how modern technology helps to achieve objectives. Here, “smart” is an acronym for “safe”, “modular”, “automated”, “reliable” and “time-efficient”. This precisely describes the characteristics of the new HOF smartVTS, with which we set new standards. It also applies with regard to technology, design and functionality of this innovative high-tech loading and unloading system for freeze drying plants in the pharmaceutical and biotechnology industries.



We are also reporting on the HOF FTU freezing and defrosting devices for the pharmaceutical and biotechnology industries as well as on innovative technical solutions for “natural refrigerants – the sustainable solution”.

We wish you continued good success, thank you for the positive feedback on the first two editions and hope you enjoy reading this new edition.

Sincerely  
The HOF Family



## 3rd HOF technical forum in autumn 2020

Looking forward, we would like to draw your attention to our 3rd HOF technical forum 2020. You can expect various interesting talks and current product developments. An exchange with HOF experts and other users will also take place again.

**We will send out more detailed information in good time.  
But we would appreciate if you could already note this event in your calendar!**



2014



2017

## Leading technology

Technology is only ever as good as its capability to solve a problem. At HOF, the product is therefore not determined by the technology, but it is rather the product properties that determine the technology. This is the only way to achieve set targets with the help of technology. To be successful in this, three preconditions always have to be met ...



### ■ Technology is never an end in itself

Firstly, there has to be a necessity to develop new technological solutions for existing or new requirements – technology is never an end in itself. Secondly, this process requires new approaches, new materials or new components. And thirdly, it requires people who work with motivation and know-how to translate new technical possibilities into practice.

HOF has accepted this role for more than 30 years, as a specialist market leader, as a technological leader. But how has HOF managed to maintain this pioneering role for such a long time? This question requires a differentiated answer. For one, it is certainly due to the spirit that characterises the company and is provided by Hans-Georg Hof to a great extent, supported by his son Dr. Alexander Hof, who has been working in the company for several years. On the other hand, it is down to the many highly qualified HOF employees and their technological knowledge.

### ■ Creativity, knowledge and lots of experience

Listening, independent thinking and team-oriented working – these abilities are the foundation for a successful cooperation.

They are the key to technological success, considering the large portfolio of innovative technologies and machines developed in-house by HOF. This includes the latest technological highlight – the HOF debottling system with water bath and cutting station, the innovative, high-tech HOF smartVTS loading and unloading system for freeze drying plants, the use of liquid nitrogen and natural refrigerants, the control integration of pioneering measuring systems such as NIR and mass spectrometry, HOF SynchroFreeze and vacuum isolation.

Over the decades, this has allowed HOF to accumulate a large pool of knowledge and experience which is also fed continuously by the intensive work with new findings from research and development.

It is the sum total of all these factors that make HOF a technological leader. These factors have also ensured that HOF as a technology-driven company has been awarded the TOP 100 Seal for the most innovative companies in Germany four times since 2016.

This edition of HOFinsight once again highlights how creative and solution-oriented HOF still is, despite the long company history.

The HOF debottling system or the use of natural refrigerants are two examples which show that it is not technology that determines the products at HOF, but that it is rather the challenges of today and tomorrow that drive the technological innovations.

## HOF debottling system with water bath and cutting station

The innovative HOF debottling system, consisting of water bath and cutting station, was developed for automated, targeted defrosting of frozen plasma bottles, allowing the remaining frozen core and the surrounding liquid to be removed easily after cutting open the bottles.

### 1 Fully automated transport

First operators load the magazine which can contain up to 16 bottles. The bottles are then moved onto the conveyor belt and into the 4 tracks of the water bath.



### 2 Defrosting process of the human plasma

There, the plasma bottles move through the heated water bath while submerged. The defrosting causes a thin layer of the human plasma to thaw at the contact surface with the plastic bottles.

At the end of the water bath, the plasma bottles are sprayed with hot WFI to counteract germs and particles on the bottle surface. They now surpass an air knife to remove potential remaining condensate.



### 3 Fully automated cutting station – “guillotine”

Then the plasma bottles drop into the “collection hopper”, in an upright position for the first robot ... which grabs the plasma bottles and guides them into the subsequent cutting station. From the other side, the second robot grips the plasma bottles by the base. Then the bottles are cut in half.





#### 4 State-of-the-art robot technology

After cutting, both robots empty the bottles halves with the human plasma cores into the draining trays. Subsequently, the plasma slides or flows through a guiding channel into the pooling vessel.

Based on a sensing system, the bottles are checked if they are completely empty, before the empty bottle halves are placed on a discharge rail, leading to a disposal tube.



#### 5 Compact, reliable, safe

The HOF debottling system, consisting of water bath and cutting station, is a highly innovative technological solution. HOF systems can be described in three words:

powerful, practical  
and future-proof.



Take a look at  
the detailed product video!

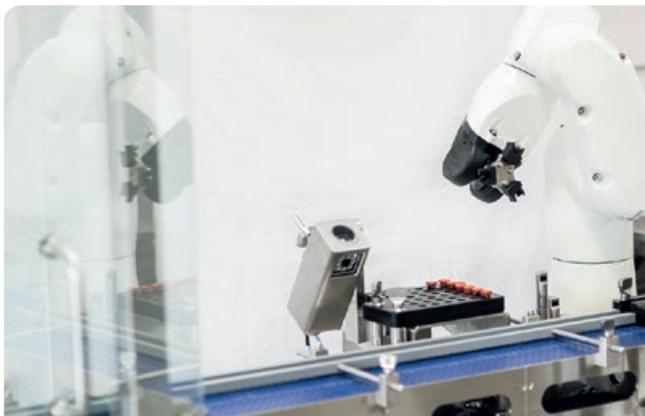
## The HOF smartVTS sets new standards for design, technology and functionality

### ■ Tailor-made quality, reliable and future-proof

The demand for high-quality loading and unloading systems for freeze-drying systems in the pharmaceutical and biotechnological industry is increasing and, with it, the technological requirements.

HOF fulfils this need – with the right innovative answers and the expansion of reliable and high-quality production.

Therefore, new developments have been continuously implemented in the field of loading and unloading systems in the past. The new HOF smartVTS meets the highest customer demands and is a good example of HOF's knowledge, creativity and innovative power.



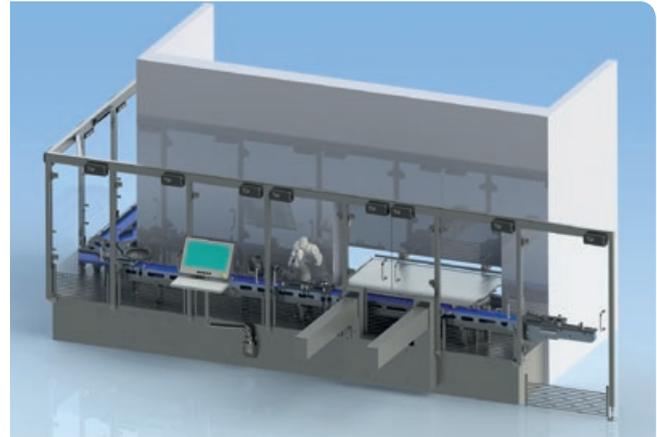
### ■ Reliable, functional and easy cleaning processes

Reliability and fast detection of individual objects all the way to hygienic design are crucial for HOF plant sensor technology. The same with the HOF smartVTS. The latest sensor technology made of stainless steel with adequate shape requires high functionality and guarantees optimal cleaning and sterilization results.

Production reliability is additionally increased by not having to readjust the positions during possible sensor replacement. All machine parts in the classified area have been tested with regard to the hygienic design so that the largest possible radii, selection of materials and easy disassembly for the cleaning process have a decisive influence on the results.



**S** – safe  
**M** – modular  
**A** – automated  
**R** – reliable  
**T** – time-efficient



### ■ Shorter changeover times

Changeover times with varying vial sizes will be significantly reduced in the future with the HOF VTS series through a simplified functional design of the format parts. The same with the new HOF smartVTS.

An exchange of format parts in a cRABS or an insulator is simplified even by glove intervention. Format parts with bottleneck guides are used at certain points to increase production safety. All format parts are designed to avoid confusion.



### ■ Flexible control technology and intuitive user guidance

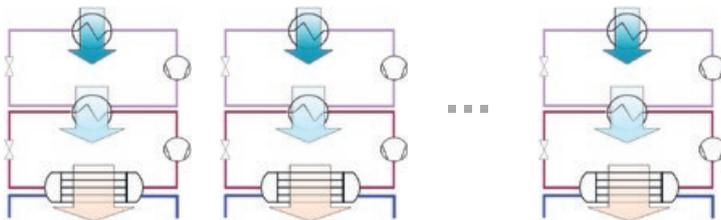
In the future, control technology of the loading and unloading systems will focus on the new possibilities offered by Siemens as part of the TIA Portal (Totally Integrated Automation Portal). The user software's user interface has been oriented towards the future and has been specially designed for application in the clean room. This increases flexibility and guarantees state-of-the-art, needs-based technical solutions.

Intuitive operator guidance via touchscreen, permanently assigned function keys or a combination of both, new control panels used by HOF, now standardized, provide an optimal solution for users. Displays with a wide viewing angle ensure an optimal overview of all plant conditions.

## Innovative refrigeration technology based on natural refrigerants

With the aim to protect and preserve the environment by reducing the greenhouse effect and in the resulting search for halogen-free alternative solutions for refrigerant in the freeze-drying process, we started in 2005 our cooperation with a renowned pharmaceutical company.

An innovative technology based on natural refrigerants has been developed and has already been successfully implemented by our customers at 60 plants over the past years.



### Reduction of conventional refrigerants

We have searched for applicable refrigerants in due consideration of the ODP, GWP and TEWI factors. A two-stage refrigeration system (cascade) is necessary because the low temperature of natural refrigerants can not be achieved in a single stage. The non-halogenated refrigerants R1270 and R170 with a larger energy spectrum (GWP = 3, ODP = 0; Bitzer Kühlmaschinenbau GmbH, Kältemittel-Report, 16. Auflage, page 36) can be chosen as a long-term alternative to conventional refrigerants.

The global warming potential is considerably reduced compared with the refrigerants such as R507A (GWP = 3850, ODP = 0; Bitzer Kühlmaschinenbau GmbH, Kältemittel-Report, 16. Auflage, page 36).

In addition to the cooling circuit of the chamber, a coolant 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.

Therefore, vacuum pumps, measurement units, amongst others, don't have to fill the ATEX requirements (explosion protection). The refrigeration systems are housed separately and are fitted with the appropriate safety concepts according to ATEX Zone 2. For process safety reasons, a redundant configuration with improved capability can effect the required cooling performance.

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

### THE ADVANTAGES AT A GLANCE

- The encased refrigeration systems can be spatially disposed in a flexible way inside or outside.
- The ATEX requirements only apply within the encased refrigeration systems.
- Freeze drying equipment 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.

## HOF FTU Plasma: Freeze-Thaw Units for blood transfusion services

### ■ Exact processes and proprietary software

Adjustable freezing speed and full control over the freezing process are among the top specifications for freezing systems from HOF. The total fill quantity is frozen evenly and independent of the bag size.

Each product bag has the same freezing conditions and, at the end, the same shape. This makes it possible for barcodes to be machine-read on the flat surface, for example of a plasma bag. Reliable temperature and time documentation is a matter of course.

### Adjustable freezing with full control and proprietary software

HOF's Freeze-Thaw Units guarantee quality-compliant storage of blood plasma because the product bags are frozen within 45 minutes to at least -30 °C at the bag's core. At the same time, up to 120 bags with a capacity of 400 ml can be processed. The frozen blood plasma can also be safely thawed again.



### ■ Custom requirements – individual plant sizes

Because our customers have different product capacities, there are two model types available: On the one hand, systems for processing up to 60 of the 400 ml bags are manufactured and, on the other hand, systems for up to 120 of these bags.

For individual adaptation Plants are divided into two different types. The compact design accommodates all process-relevant components within the device. On the other hand, there is the possibility of split-construction to lower the sound pressure level directly on the device. Here, the refrigeration components outside the unit are mounted on a separate machine frame.



### ■ Advantage: uniform heights of bag systems

The integrated pneumatic adjusting plate system compresses the product bags for the freezing process, so that all processed product bags have the same height after freezing. The product bags also have flat surfaces on both sides: Barcodes can be machine-read and storage is greatly simplified.

### ■ Transparent documentation

The HOF Freeze Viewer Professional software developed by HOF is available for the documentation of process-relevant data. This software, which is configured for blood transfusion services, collects data such as bar codes, process reports and temperature history and either prints them out in the form of a process report or electronically transfers them to a higher-level system.

### ■ More than just hardware and software

The device design for blood transfusion services is based on HOF's state-of-the-art technology. Apart from production, we also offer, as part of the scope of supply, special packaging, transport and handling support, as well as annual service and maintenance units.

## Customized quality – reliable and future-proof

- Energy-efficient and with indirect cooling
- Quality-compliant storage of blood plasma
- The area in contact with the product is easy to clean

## HOF FTU Pharma: Freeze-Thaw Units for the pharmaceutical industry and biotechnology

**HOF FTU Pharma  
is compatible**

with many commercially  
available Single-Use  
bag systems.



### ■ Exact processes and proprietary software

Adjustable freezing speed and full control over the freezing process are among the top specifications for freezing systems from HOF. The total fill quantity is frozen evenly and independent of the bag size.

Each product bag has the same freezing conditions and, at the end, the same shape. This allows bar codes to be machine-read on the flat surface, for example of a plasma bag. Reliable temperature and time documentation is a matter of course.



## Adjustable freezing with full control and proprietary software

### ■ Safe control of all parameters

Reliable process control is indispensable when freezing and thawing pharmaceutical and biotechnological products. The same applies to the adjustable freezing and thawing speed. Here, with the individual Freeze-Thaw Units (FTUs), HOF meets all the requirements of professional users from the industry.

The FTUs are each developed and manufactured according to customer-specific requirements. Products that have to be fed into bag systems can be transported into the plant either manually or by means of a semi-automatic loading aid developed by HOF.

### ■ Custom requirements – individual plant sizes

Two types are offered in order to respond flexibly to on-site installation possibilities. The compact design accommodates all process-relevant and electrotechnical components inside the device.

On the other hand, there is the possibility of split-construction to lower the sound pressure level directly on the device. Here, the refrigeration components outside the unit are mounted on a separate machine frame.



### ■ Reliable cooling, reliable heating

Product tempering takes place within the FTU via a plate system. The control panels are designed to freeze the entire load evenly and regardless of bag size.

For temperature control, silicone oil is cooled with a separate cooling system or heated with the built-in electric heater.

The integrated refrigeration system's design is specified according to customer requirements. Optionally, a R452A type hydrofluorocarbon compressor system, a natural refrigerant compressor system (ethane/propene), or a liquid nitrogen system are available.



■ Included in delivery:  
„HOF Freeze Viewer Professional“

The FTUs are equipped with a visualization system for process control, the „HOF Freeze Viewer Professional“. This system complies with FDA requirements according to 21 CFR Part 11. With this software, specially developed by HOF, all process-

relevant data, such as batch reports and temperature profiles can be printed out in the form of a process report or sent to a superordinate system. Customers can create respective recipes for the individual products individually.

■ Service is one of them

HOF's FTUs always comply with state-of-the-art technology and meet high safety standards. Apart from production, HOF stands for comprehensive project support.

At the same time, the entire project – from plant planning and production at HOF to commissioning – is entirely managed on-site by a project team.

HOF is also available during transport and during introduction of training courses and the annual service and maintenance units.

■ Customized quality – reliable and future-proof

- State-of-the-art technology and the highest safety standards
- Energy-efficient and with indirect cooling
- The area in contact with the product is easy to clean





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