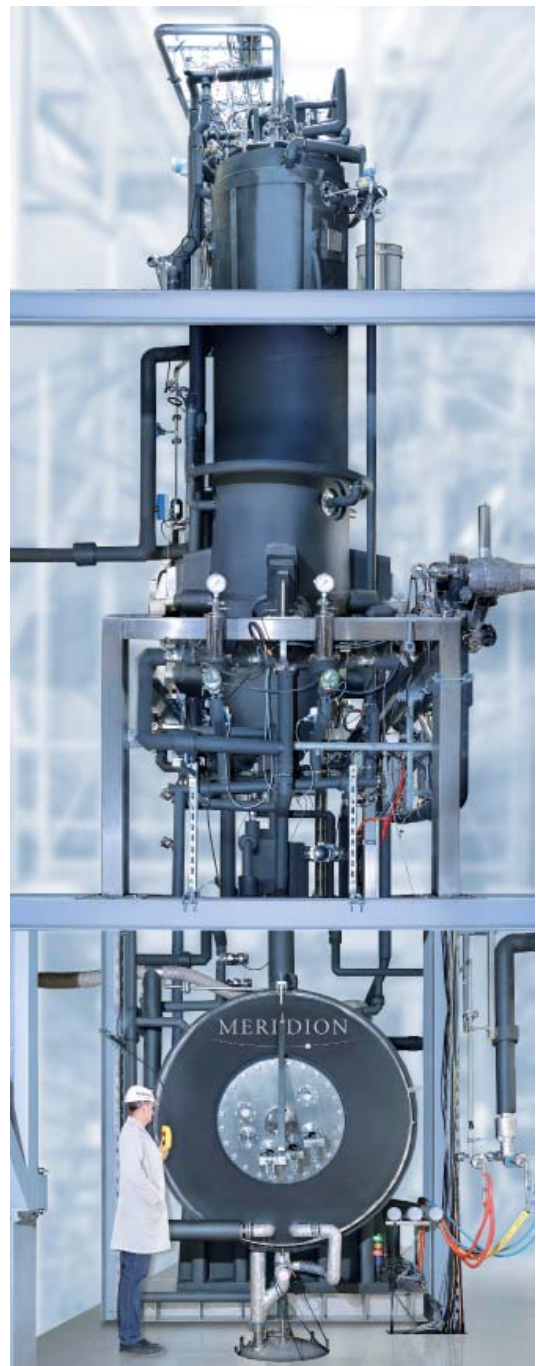


Innovative methods for freeze-drying pharmaceutical products GEMÜ 490 butterfly valve plays a key role

Many pharmaceutical manufacturing procedures are based on bio-technological processes. Often, their molecular structure is extremely complex and their liquid form is unstable, which is why many bio-pharmaceuticals cannot be stored directly. Freeze-drying is the gentlest procedure for conserving the active ingredient solution. Because of critical operating conditions the butterfly valve GEMÜ 490 is particularly important.

Conventional freeze-drying

In the dry-freezing plant, the solution is deep-frozen in the vials stored in utility spaces, initially at temperatures around -60 °C. A vacuum is then applied and the temperature is increased successively, thereby extracting liquid from the frozen solution (sublimation). After the final drying procedure freeze-dried powder is left in the vials. This means that the pharmaceutical preparation retains its bioactivity and can often be kept for several years. Before the compounds can be used, they must be dissolved in a solvent (reconstitution) and can then be injected. With this conventional process of dry-freezing (lyophilisation) the compound does not freeze homogeneously in the vial. Furthermore, handling the vials is logistically challenging and dosing is difficult, which is already a problem due to the poor flow characteristics of the freeze-dried product.



Dynamic freeze-dryer

Dynamic freeze-drying in bulk

To counteract these disadvantages, the company Meridion has developed an innovative technology which makes it possible to freeze-dry pharmaceuticals in bulk to counteract these disadvantages. The process is divided into the following steps:

- **Transfer of spray liquid**
The active ingredient solution, which already contains additives, is fed into the precision nozzles of a cooling tower.
- **Drop formation**
The medium is atomized in the container. Simultaneously, a resonant frequency is superimposed which makes the droplets the same size. As a result, 3000 to 4000 droplets are generated, created per nozzle and second.
- **Freezing the droplets to microspheres**
While the drops pass through the cooling tower (-80 to -120 °C) from the top downwards as a result of gravity, the frozen round particles (microspheres) are continuously fed into a pre-cooled rotation freeze-dryer which is under the cooling tower.
- **Freeze-drying**
The globules are lyophilized under vacuum and are continuously and gently blended. The sublimation energy is added via IR radiation and temperature-controlled drum surfaces.
- **Draining/filling**
Closed draining is then carried out in the bulk container.

Advantages of dynamic freeze-drying

- Dust-free product with good flow characteristics
- Higher drying speed
- Variable batch quantities
- Flexibility in production, with primary packaging materials (e.g. vial) and during formulation
- No handling of vials
- Combination of different lyophilized products

GEMÜ 490 butterfly valve

The GEMÜ 490 butterfly valve has a key role. It is based on the design of concentric soft seal valves and is lined with PTFE. After the frozen globules have fallen through the cooling tower and are collected in the freeze-dryer, the butterfly valve closes upwards and the vacuum can be applied.

Other GEMÜ 650 diaphragm valves with combi switchbox 4222 with integrated 3/2-way pilot valve are used for purification processes.



GEMÜ 650 diaphragm valves with combi switchbox GEMÜ 4222