



# *Freeze drying and alternative technologies for drying of biopharmaceutical products*

*PDA Israel Chapter*

*Basics and Recent Developments for Autoclaves and Lyophilizers*

*Dan Accadia Hotel, Herzliya 13.11.2017*

*Sarel Chen-Tov - CEO*

*Biopharmax LTD*

- *Well known method*
- *Removal of water without excessive heating*
- *Chemical decomposition is minimized*
- *Enhanced product stability in a dry state*
- *Ease of processing a liquid, simplifies aseptic handling*
- *High consistency*
- *Recognized by industry, researchers and authorities*
- *The default choice*

- *Require large, heavy equipment- increase floor load and space occupation*
- *Requires investment in utilities – CIP, cooling/heating system.*
- *Complex vial handling (Alus etc')*
- *Technically complex – operation and maintenance*
- *Long cycle time*
- *High capital investment*
- *High energy costs*

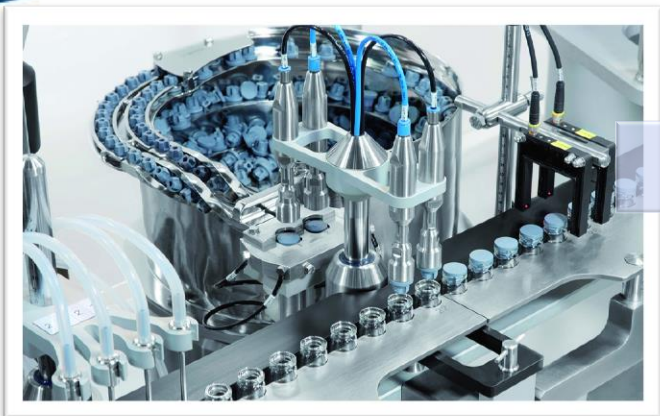
## *Who is affected by these drawbacks?*

- *Large volume – low value products*
- *Low volume – medium value products (such as Biosimilars)*

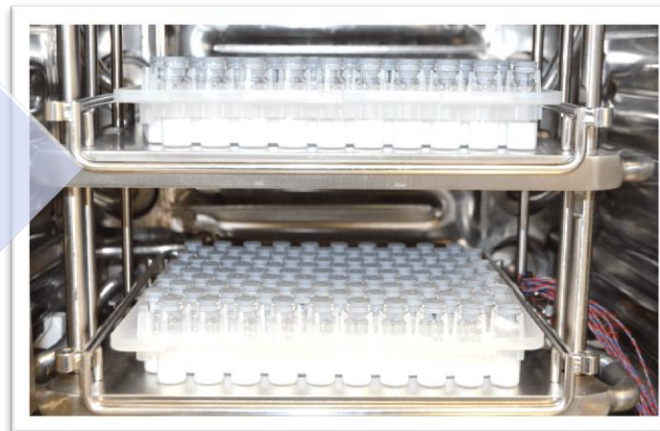
1. Bulk freeze drying
2. Spray drying
3. ANFD - Agitated Nutsche Filter Dryer

**Not suitable for every product !**

# Bulk freeze drying

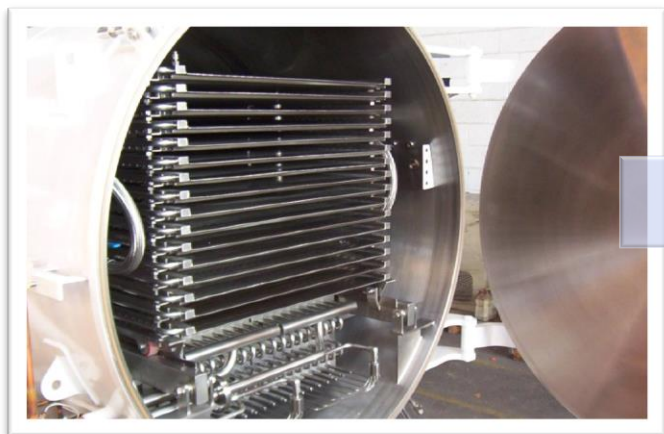


*LIQUID FILL*



*VIAL FD*

*Vs.*



*BULK FD*



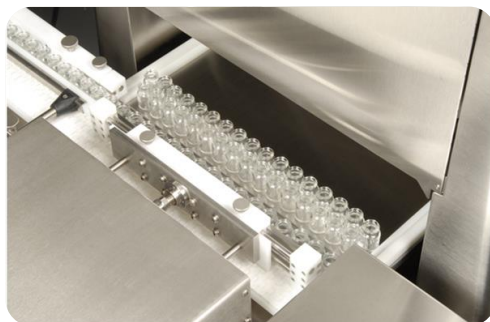
*POWDER FILLING*<sup>6</sup>

- a. Space occupation – full shelf utilization (no loose of space between vials)
- b. Improved heat transfer – direct connection between product and SS tray (no glass to isolate)
- c. Maximum surface area for evaporation – height of cake can be increased
- d. Shorter cycle time



➤ **Resulting in up to 40% capacity increase**

e. Elimination of vial handling



f. Useful for filling unstable containers





- 1. Open powder handling*
- 2. Lump generation*
- 3. Powder filling*

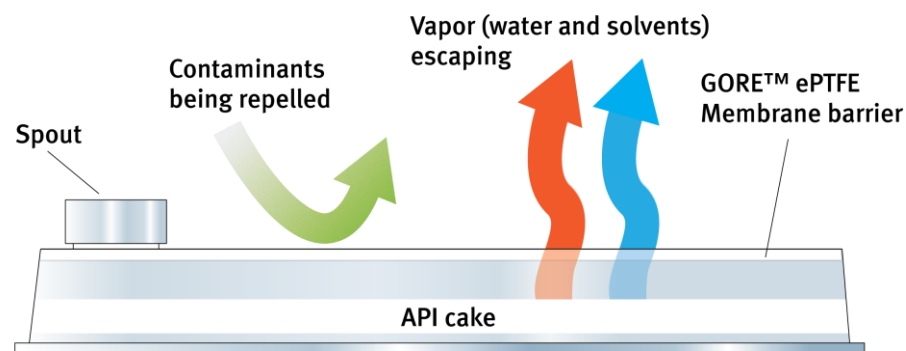
## Lyoguard<sup>®</sup> - Alternative to the standard SS open trays



Tray top- an integrated GORETEX Membrane that has microporous structure for vapor transmission so water and solvents can escape. The membrane also provides barrier protection for the product.

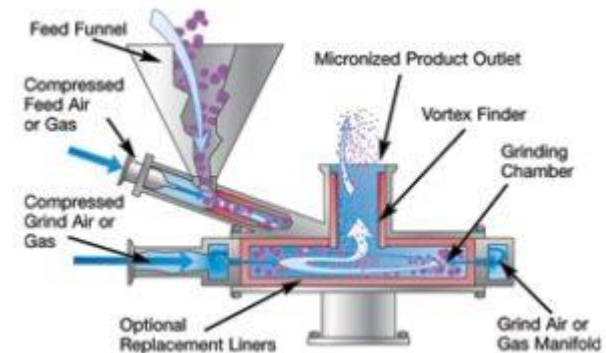


Tray base - flexible, thin-film polypropylene closely conforms to dryer shelves, for efficient and uniform heat transfer

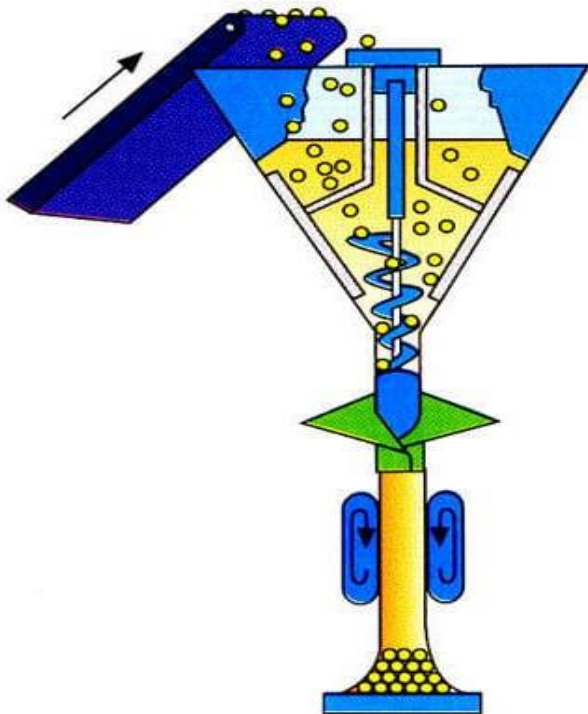


## Size reduction technologies

- Quadro<sup>®</sup> Comil - milling and powder size reduction technology for achieving uniform particle size distributions, suitable for aseptic products.
- Micronizer<sup>®</sup> - employs a fluid energy grinding system to generate particle-on-particle impact and produce sub-micron particle sizes.



Auger doser- Filling mechanism which measures out the powder, using an auger which is rotated for a predetermined number of revolutions in a conical hopper to discharge the required volume of product. Frequently used in conjunction with a weighing instrument.

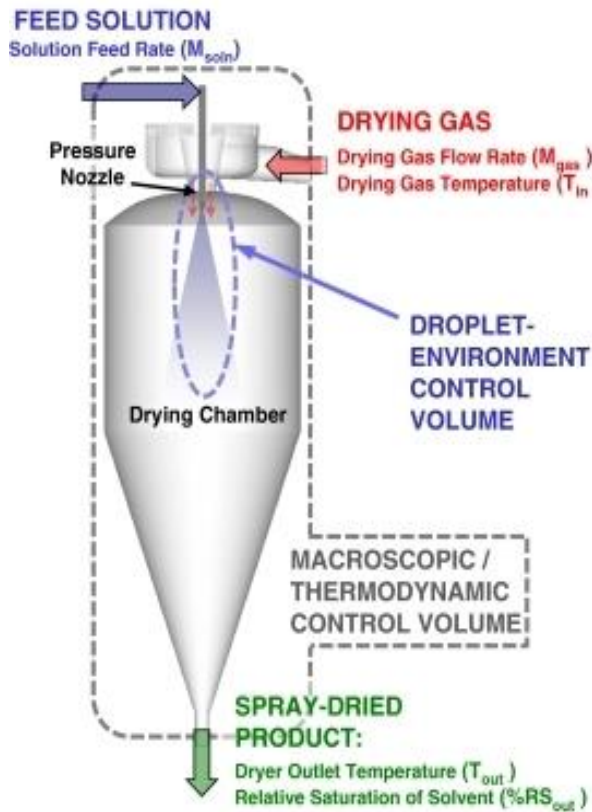


*1. Open powder handling*

*2. Lump generation*

*3. Powder filling*

➤ *All mentioned solutions can be used in aseptic processing and integrated in closed systems*



*The spray drying process allows for liquid solutions and solid materials to be transformed into dry granular powders.*

- a. Hot air enters the spray dryer horizontally*
- b. Liquid enters the spray dryer vertically through the air disperser at high velocity and sprayed through a pressure nozzle*
- c. Evaporation takes place when the liquid pressure drops in the drying chamber*
- d. The dried product is collected at the bottom*

## Advantages

- *Large capacity*
- *Continuous operation*
- *Suitable for bulk processing – back to powder filling*
- *Full CIP/SIP*

## Main challenge

- *Exposure of heat sensitive material to high temperature (though it is for very short time)*

Closed vessel designed to separate solid and liquid by filtration under pressure or vacuum

Wet cake can be re - slurried and washed thoroughly with water or solvents, or be dried by means of vacuum.

The discharge of dry powder is automatic. ►





## Advantages

- *Short cycle time: hours Vs days*
- *Easy to operate – simple loading and discharge procedures*
- *Suitable for bulk processing – back to powder filling*
- *Full CIP/SIP*

## Main challenge

- *Suitable only for suspensions*

1. Bulk freeze drying
2. Spray drying
3. ANFD-Agitated Nutsche Filter Dryer

**Each product should be tested for optimal technologies at  
R&D stage!**



Thank you !

[Sarel@biopharmax.com](mailto:Sarel@biopharmax.com)

[Inna@biopharmax.com](mailto:Inna@biopharmax.com)