CakeStand™

Vacuum Tray Dryer Technology

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The CakeStand™ Vacuum Tray Dryer has been carefully developed with efficiency, ergonomics and safety in mind. Designed to meet the process requirements necessary for drying sensitive or highly valuable products, it provides a scalable solution for use in laboratories, pilot plants, up to full size commercial production facilities.

Vacuum tray drying is well-established in industries such as pharmaceuticals, ensuring sensitive materials are dried without inhibiting critical properties. Intermediates and active pharmaceutical ingredients (APIs) are typically heat-sensitive which makes them unsuitable for high-temperature convection processes.

PSL's CakeStand™ technology uses a fully sealed vacuum chamber and direct heating shelves initiating optimum drying conditions and uniformity. Options include a free-standing solution, along with designs that can operate in cleanrooms, downflow booths or in conjunction with containment isolators (flexible or rigid).

Features and Benefits

- **Optimum Drying Uniformity**

  Vacuum chamber combined with direct heating shelves

- **Industry Compliance**

  cGMP design for pharmaceutical applications

- **Design Flexibility**

  Configurable shelf and tray options

- **Batch Reproducibility**

  PSL software automation package available

- **Containment-ready**

  Can be combined with containment isolators and downflow booths

- **Scale-up Capability**

  Choice of sizes to suit lab, pilot and commercial production

CakeStand™ at a Glance

Direct Tray Heating

- Efficiently performs static drying by placing wet slurries or cake in trays that are placed on heated shelves within a vacuum oven chamber
- Heating uniformity across the heating shelves optimises homogeneity across product trays
- Low volume shelf design to reduce heating fluid requirements and increase energy efficiency
- Heating fluid flow control of shelves allows isolation of individual sections in case of batch size variation

Enhanced Ergonomics

- Designed to reduce the opportunity for over-reaching or accidental spillage
- Optimum tray size for manual loading and handling ergonomics: multiple trays on larger shelves, handles on tray for secure grip
- Double hinge design for effective door positioning and repeatable sealing
- For larger sizes with multiple shelves and trays, loading trolleys can be provided

Cleaning Simplicity

- Designed with no hidden pockets or inaccessible gaps
- Heating plates protrude directly from the chamber back wall
- Open floor inside the drying cabinet for full drainability
- Rounded edges and corners to facilitate manual wipe down

Process Features

Sizes and Materials of Construction

- Available in a range of sizes up to 13m²
- Each chamber size can accommodate different numbers of shelves to best suit the process needs (i.e. avoid heating unnecessary surface area if not required)
- The typical cake thickness in the trays ranges from 1cm up to 5cm
- Materials of Construction available as standard: 304L Stainless Steel, 316L Stainless Steel, Alloy C22. (others upon request and availability)

Temperature

- Operating drying temperatures are available up to 200°C
- The heating elements comprise heated shelves, pipework and HTF supply/return connections
- Temperature measurement provision on the supply and return lines for calorie loss calculation is incorporated

Gas Purging

- Distribution pipe inside the chamber comprises nozzles for the uniform supply of purging/inerting gas (typically nitrogen) within the chamber in between each shelf
- A dry purging gas used in a controlled manner acts as a moisture carrier to the vacuum system and reduces overall drying times
- Used for Wash-in-Place (WIP) of the chamber and shelves
- CakeStand™ Tray Dryers are suitable for integration into Hazardous Areas (ATEX, NFPA)

Shelf and Tray Configurations*					
Model Name / Type	A	B	C	D	E
Typical Number of Shelves (min / max)	3 / 6	2 / 4	3 / 6	5 / 10	6 / 12
Usable Shelf Area (min / max) (m²)	0.18 / 0.37	0.37 / 1.5	2.0 / 4.0	4.0 / 8.0	6.5 / 13.0
Chamber Volume	85 L	350 L	530 L	1350 L	2150 L
Downflow Booth Integration	Yes				
Glovebox Integration (Rigid or Flexible)	Yes	No	No	No	No

* Other configurations available upon request.

Integrated Solutions

CakeStand™ Tray Dryers can be provided as stand-alone equipment for client/third-party integration or in combination with a PSL Software and Automation package. Different levels of control and automation can be supplied to add speed and flexibility to manufacturing processes.

PSL can comply with major international practices and regulations for Software Automation, including GAMP5 (Good Automated Manufacturing Practice, version 5 by ISPE) and 21 CFR Part 11 established by the US FDA for electronic records and signatures.

PSL Software Automation

- Field Instrumentation and Valves only, wired to local junction boxes for the client to integrate to their DCS (Distributed Control System)
- Basic PLC and HMI Package for controlling Tray Dryer and Valves with process exchange signals to client ancillaries (Vacuum and Temperature set-point, Timer)
- Advanced PLC and HMI Package, giving full control of the Tray Dryer, Valves and Ancillaries with Programmable Recipes and Data Recording capabilities (SCADA)

Temperature Control System

- CakeStand™ Tray Dryers rely on a circulating fluid through the heated shelves and require an external Temperature Control Unit (TCU). PSL can offer this ancillary item as stand-alone or integrated to the PSL Control/Software System
- Typical maximum temperature operating conditions for selecting the right TCU: 100°C, 150°C up to 200°C

Vacuum Pump and Solvent Recovery Skids

- Along with temperature control, vacuum conditions are another key parameter. CakeStand™ Tray Dryers can easily be associated to existing installations. For turnkey packages, PSL can supply the Vacuum Pump Skid, often with Solvent Recovery Capability
- Ultimate vacuum level at Pump: 20mbar; lower vacuum levels available upon request
- Solvent recovery via means of liquid separator and condenser (condenser chiller can be included)

Containment-Ready

Although the drying phase within a vacuum tray dryer requires no physical operator intervention, the loading and unloading of the product trays remains manual. If the product is potent/toxic or oxygen sensitive, as it is often the case within pharmaceutical applications with API or HPAPI, these steps need to be contained.

Several containment measures can apply depending on the product classification. CakeStand™ Tray Dryers are versatile enough to be integrated with most of them.

Stand-alone

- Within a downflow booth
- Benchtop versions available with the smaller sizes
- All sizes are suitable for uncontrolled area installation
- On larger sizes, process room through wall configurations can be an asset to keep process manifolds in technical areas

Integrated to the back wall of a Downflow Booth

- To minimise the footprint into the valuable air-swept area
- Keeping the back process manifold in technical areas, limiting surface areas to be cleaned down

Integrated to the back wall of a Glovebox / Isolator

- In this configuration, Tray Dryer size restrictions may apply due to the ergonomic challenges of working through gloves. Special double-hinge door for containment chamber depth considerations
- Compatible with all types of Containment Isolator from 3rd parties: flexible or rigid type
- PSL Tray Dryer Glovebox also available upon request

Taking your process further, together.

For over 35 years, Powder Systems Limited (PSL) has been at the forefront of designing and engineering advanced technology to support process development. We are a globally recognised, award-winning business with expertise in pharmaceutical and chemical processing.

Our focus is to help clients and partners address challenging manufacturing processes by providing fit-for-purpose solutions from our wide range of Microsphere Processing, Filtration and Drying ranges.

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