



Mechanimix

ROTARY VACUUM DRYER | VD-R Series

Professional Mixing Technologies

VD-R Series Vacuum Dryer Introduction

The Rotary Vacuum Dryer is an advanced drying system widely used in the pharmaceutical, chemical, and food industries for the gentle and uniform drying of heat- or oxygen-sensitive materials. By combining continuous rotation of a double-cone vessel with high vacuum, it enables efficient moisture removal at low temperatures. Its unique design enhances heat transfer, promotes effective material movement, and reduces overall drying time. Additionally, the fully enclosed system ensures process safety and product purity. This equipment operates without the need for constant supervision and offers high efficiency with low energy consumption. Its easy-to-clean design (CIP-capable) makes it ideal for GMP-compliant production environments.



VD-R



Working Capacity	4-9000 [L]
Total Volume	6-14000 [L]
Feed Inlet (size)	DN100-DN450
Discharge Valve	DN100-DN300
Working Temperature	25-150 [°C]
Pressure	-1-0.4 [Bar]
Speed Range	3-13 [RPM]
Motor Power	0.18-11 [kW]
Materials	AISI 304, AISI 316, AISI 316L
Industries	Pharmaceutical, Chemical, Food, etc.

Innovative Mixing and Drying Technologies

Professional Mixing Technologies

FEATURES

Double-Cone Rotating Vessel

Ensures gentle and uniform mixing of materials, preventing clumping and ensuring even drying throughout the batch.

High-Efficiency Vacuum System

Removes moisture at low temperatures, ideal for drying heat-sensitive or oxygen-sensitive substances without degradation.

Low Energy Consumption

Operates efficiently under vacuum with minimal heat input, reducing overall energy costs.

Compact Footprint

Space-saving design allows for easy integration into existing production lines or cleanroom environments.

CIP (Clean-In-Place) Capability

Allows for easy, automated internal cleaning, saving time and complying with hygiene standards like GMP.

Automatic Operation & Control Panel

Integrated controls enable automated operation with minimal operator intervention, improving reliability and safety.



APPLICATIONS

Pharmaceutical Powders

Efficiently dries active pharmaceutical ingredients (APIs) and excipients while preserving potency and purity.

Heat-Sensitive Chemical

Ideal for drying compounds that degrade at high temperatures or in presence of oxygen.

Food Ingredients

Removes moisture from fine powders, flavors, and extracts while retaining taste and aroma.

Pigments and Dyes

Prevents oxidation and preserves color stability in sensitive pigments and colorants.

ADVANTAGES

• Gentle Drying Process

Prevents degradation of heat-sensitive or fragile materials.

• Efficient Moisture Removal

High vacuum enables effective drying at low temperatures.

• Uniform Drying & Mixing

Continuous rotation ensures even distribution and consistent drying.

• Safe and Easy to Operate

User-friendly interface and safe, enclosed design.



Computational Fluid Dynamics (CFD)

CFD simulations provide detailed analysis of fluid behavior inside real tanks and mixer setups in a virtual environment. This enables process performance to be verified and optimized before physical trials. With years of field experience, Mechanimix uses advanced CFD tools to increase equipment efficiency, improve mixing patterns, and eliminate dead zones, thereby achieving reliable and homogeneous drying results.

Examples of CFD Analyses for Vacuum Dryer

CFD Post A – Flow and Temperature Distribution

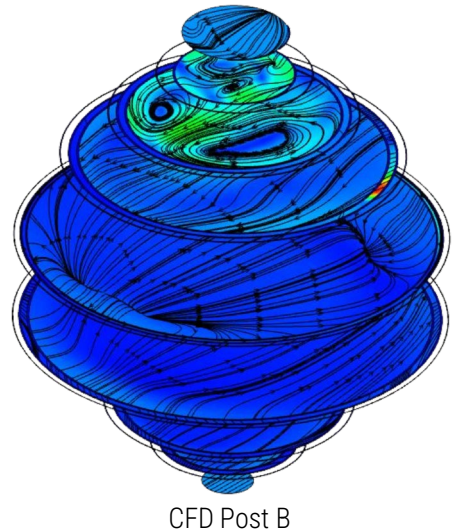
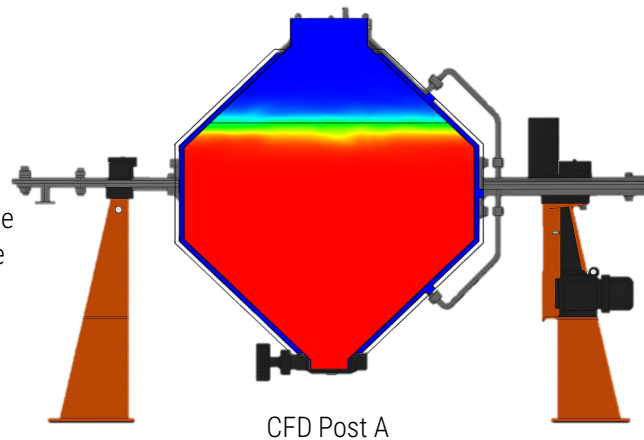
The CFD simulation shows that the top-inlet airflow creates a central swirl, ensuring even heat distribution inside the chamber. This swirl pattern increases heat transfer efficiency and prevents the formation of cold spots. In the color map, red areas indicate the highest temperature and velocity, green areas indicate medium values, and blue areas represent the lowest values. This temperature distribution enables homogeneous drying and consistent product quality.

CFD Post B – Homogeneous Mixing of the Material to Be Dried

The CFD analysis demonstrates that rotary motion combined with internal turbulence continuously redistributes particles inside the dryer, keeping temperature and moisture levels uniform. This particle circulation prevents overdrying or uneven moisture formation. In the visualization, red areas represent the highest mixing intensity, green areas represent medium levels, and blue areas show the lowest mixing levels. This pattern shortens the drying time and improves product quality.

CFD Post C – 3D Streamlines & Vortex Dynamics

The 3D flow lines obtained from the simulation clearly reveal vortices and spiral paths. These vortex structures improve particle transport, increase contact with the hot airflow, and enhance mixing. In the color map, lighter-colored lines indicate higher velocity and stronger swirl, while darker-colored lines show slower flow. These flow dynamics optimize the dryer's performance and increase efficiency.



Innovative Mixing & Deep Vacuum Tech

Professional Mixing Technologies

Rotating Double-Cone Chamber – Designed by Mechanimix, Built for High Performance

At Mechanimix, we specialize in precision-engineered double-cone vessels that offer gentle, efficient, and reliable drying. Every vessel is crafted with a focus on hygiene, uniformity, and long-term durability—meeting the exacting standards of the pharmaceutical, chemical, and food industries.

- **Core of the Dryer**

The double-cone vessel is the heart of the Rotary Vacuum Dryer—where all the drying magic happens.

- **Gentle Rotation, Uniform Drying**

As the vessel rotates slowly, powders tumble softly, ensuring even drying without harsh mixing.

- **No Clumping or Degradation**

No stuck material. No product damage. Perfect for fragile and heat-sensitive ingredients.

- **Smooth Interior = Easy Cleaning**

With no internal blades or agitators, cleaning is simple and fast. No product leftovers

- **No Internal Moving Parts**

Fewer parts inside means lower maintenance, less risk of contamination, and higher reliability.

- **Maximum Heat Contact**

The continuous motion exposes all particles to the heated wall, enhancing heat transfer.

- **Designed for Efficiency**

Smart geometry + rotation = better performance in less time, with lower energy use.

Vacuum System – Engineered for Precision Drying

At Mechanimix, our vacuum systems are designed to deliver deep and stable vacuum levels for efficient drying at low temperatures. By removing air and reducing pressure, they protect sensitive materials while enabling rapid moisture removal. Achieving vacuum levels as low as -1 to 0.4 Bar allow gentle drying even for heat-sensitive APIs and powders.

- **Air-Free Drying**

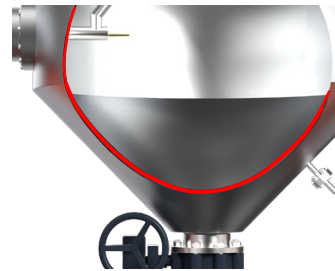
Vacuum drying prevents the product from coming into contact with air, thereby eliminating oxidation.

- **Smart Vacuum Control**

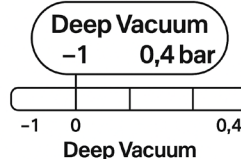
Automated vacuum regulators and sensors maintain precise pressure levels during the entire cycle.



Continuous Rotation = Uniform heat distribution & damage-free drying



- Peripheral Jacket
- Thermal Fluid Flow
- Uniform Heat Transfer
- Controlled Temperature

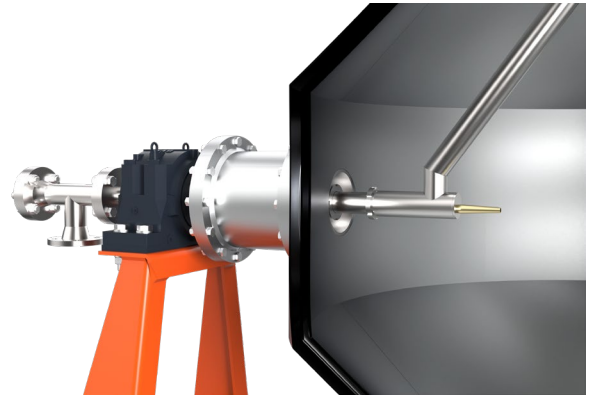


Advanced Monitoring & Control Systems

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Product Temperature and Control

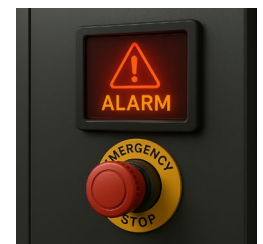
- **Installed in Mechanimix Rotary Dryers**
Each unit includes an internal Thermowell to measure product-core temperature.
- **Accurate Drying Control**
Reads real-time temperature inside the powder, not just vessel walls.
- **Ideal for Heat-Sensitive Materials**
Protects APIs, fine chemicals & delicate powders from overheating.
- **PLC-Integrated**
Sensor data connects directly to PLC for automatic cycle termination.
- **Hygienic & Safe**
No direct contact with product – easy to clean, calibrate, and replace.



- Precision Drying
- Real-time powder temperature
- Hygienic & replaceable

Smart Monitoring System

- **Integrated into Mechanimix Rotary Dryers**
Each unit is equipped with a PLC + HMI system for intelligent monitoring and process control.
- **Real-Time Display of Key Parameters**
Live monitoring of temperature, vacuum pressure, rotation status, time, and pump performance on a user-friendly touch panel.
- **Fully Programmable & Automated**
Allows creation and storage of custom drying cycles based on product requirements.
- **Intelligent Alarm System**
Real-time error detection, safety interlocks, and emergency stop alerts ensure safe operation.
- **Data Logging for Documentation**
Process data is recorded and exportable for batch traceability and quality assurance.



Sampling Port

- In-process sampling without interruption
- No vacuum loss or system shutdown
- Leak-proof, hygienic, and easy to clean
- Fully compliant with GMP standards
- Ideal for real-time quality control and documentation
- Enables batch traceability without affecting the cycle



Technical Configurations of Rotary Vacuum Dryers

Professional Mixing Technologies



Mechanimix Rotary Dryer Configurations

Type	VD-R1100	VD-R1530	VD-R1982	VD-R2520
Effective Volume [L]	1100	1530	1982	2520
Total Volume [L]	1465	2040	2642	3360
Feed Inlet [DN]	DN 400	DN 400	DN 400	DN 400
Discharge Valve [DN]	DN 200	DN 250	DN 250	DN 250
Swing Diameter [mm]	2200	2450	2650	2850
Discharge Type	Manual	Automatic	Automatic	Automatic
Control System	Manual	Semi-Automatic	PLC	HMI + PLC
Lump Breaking Agitator	✘	✘	✔	✔
Liquid Addition	✘	✔	✔	✔
Solids Sampler	✘	✘	✘	✔
Automated Drum Loading and Unloading System	✘	✘	✔	✔
CIP - Clean-In-Place Spray Nozzles	✔	✔	✔	✔
Explosion-proof 	✘	✘	✔	✔
Vacuum System	✔	✔	✔	✔
Hot Water or Hot Oil Temperature Control Systems	✔	✔	✔	✔

- The features listed under "Design Options" (e.g., Lump Breaking Agitator, XP Electrics, etc.) are configurable based on customer requirements. ✔ indicates the feature is included, ✘ indicates it is not included by default, and availability may vary depending on the specific model configuration or customization.
- Feed Inlet [DN] and Discharge Valve [DN]: These values represent the nominal diameter (DN) in millimeters, indicating compatibility with industrial piping systems. A uniform Feed Inlet (DN400) ensures consistent material input, while variable Discharge Valve sizes (DN 200 to DN 250) suggest a tailored discharge design for different capacities or flow rates.



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Mixing & Drying Technologies

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Vacuum Dried, Visibly Better, Functionally Superior

✘ Before Drying

- Moisture
- Stickiness
- Clumping
- Degradation

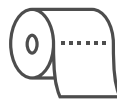
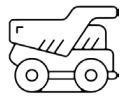
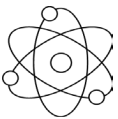


✔ After Drying

- Dryness
- Uniformity
- Processability
- Quality



Mechanimix Rotary Vacuum Dryers (4–9000 L) are ideal for drying sensitive materials with their wide capacity range. Thanks to vacuum operation and rotary design, they provide gentle and homogeneous drying for the pharmaceutical, food, and chemical industries.



Mechanimix offers a range of industrial vacuum dryers with versatile models delivering optimal drying solutions for various industries.

