

## Laboratory-Scale Vacuum Rotary Drum Filter

Laboratory-Scale Vacuum Rotary Drum Filter is a small-scale, batch or semi-continuous experimental device for solid-liquid separation. It is mainly used in process development, feasibility testing, and educational demonstrations.

# Laboratory-Scale Vacuum Rotary Drum Filter

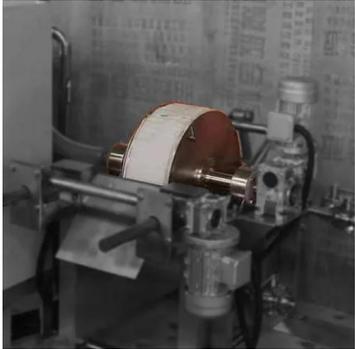
## Equipment Description

Laboratory-Scale Vacuum Rotary Drum Filter is a small-scale, batch or semi-continuous experimental device for solid-liquid separation. It is mainly used in process development, feasibility testing, and educational demonstrations.

The laboratory vacuum drum filter is a miniaturized device that simulates the operation of large-scale industrial vacuum drum filters. Its core design features a horizontal cylindrical drum, which is partially submerged in a slurry tank and has a cake coated on its surface.



# The main components include:



## **Drum**

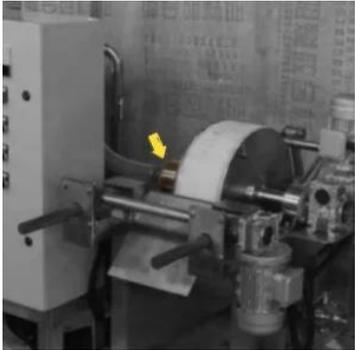
Typically constructed from stainless steel or corrosion-resistant materials, it has a relatively small diameter (commonly ranging from 100mm to 300mm) and its interior is divided into several fan-shaped compartments. Each compartment is connected via a pipeline to a distribution head valve located on the hollow journal of the drum.



## **Slurry Tank**

A tank that holds the suspension (slurry) to be filtered. It is typically equipped with an agitator to prevent the sedimentation of solid particles and ensure uniform filtration concentration.

# The main components include:



## **Distributor Valve**

Distributor Valve (also known as a Diaphragm Valve): This is a critical component of the equipment. It is fixed in place and fits tightly with the drum's journal. Through the distributor valve, different areas of the drum can be controlled to connect sequentially to a vacuum source or a compressed air source, enabling cyclic operations such as filtration, drying, washing, and discharging.



## **Vacuum System**

Vacuum System: Typically consisting of a vacuum pump, a buffer tank (vacuum receiver tank), a vacuum gauge, and piping, it provides the necessary negative pressure power for filtration.

# The main components include:



## Drive System

A small motor and reduction gear mechanism that drives the drum to rotate at a constant, very slow speed (typically adjustable, e.g., 0.1 to 2 rpm).



## Discharge Mechanism

Laboratory models typically use a fixed scraper. Once the filter cake rotates out of the slurry liquid level, the scraper peels it off the drum surface.



## Frame and Control Panel

A support structure that integrates all components, along with switches and speed control devices for regulating drum rotation speed and starting/stopping the agitator.

# Working Principle

Its operation is based on vacuum negative pressure. As the drum rotates, multiple processes are continuously completed on a single device, forming a cycle. A complete cycle typically consists of the following zones:

## Filtration Zone

The section of the drum that is submerged in the slurry tank. In this zone, the compartments inside the drum are connected to the vacuum system via the distributor valve. Under vacuum suction, the liquid (filtrate) passes through the filter cloth and enters the pipes inside the drum, while solid particles are trapped on the surface of the filter cloth, forming a gradually thickening filter cake.

1

## Drying Zone

The drum exits the slurry liquid level, but the compartments remain connected to the vacuum. The vacuum continues to suction, further drawing out the residual mother liquor from the filter cake to reduce the cake's moisture content.

2

## Washing Zone (Optional)

If required by the process, a wash liquid spray system can be installed in this zone. The wash liquid is sprayed onto the filter cake, and the vacuum suctions it away together with the residual mother liquor, enabling displacement washing or reslurrying washing to remove impurities.

3

# Working Principle

Its operation is based on vacuum negative pressure. As the drum rotates, multiple processes are continuously completed on a single device, forming a cycle. A complete cycle typically consists of the following zones:

## Secondary Drying Zone

The washed filter cake is again suctioned by the vacuum to remove excess wash liquid.

4

## Discharge Zone

As the drum rotates to the scraper position, the distributor valve disconnects that compartment from the vacuum. In some designs, a brief burst of low-pressure compressed air ("blowback"; this feature is omitted if not specifically required) is introduced to help separate the filter cake from the filter cloth. The fixed scraper then removes the dried filter cake, completing the discharge process.

5

## Regeneration Zone

After discharge, a water or air jet system may be used to clean the surface of the filter cloth. This prevents pore blockage and prepares the cloth for the next filtration cycle.

The drum rotates slowly and continuously, with the above process repeating in a cycle, enabling semi-continuous solid-liquid separation.

6

# Floor Space

Laboratory-scale vacuum rotary drum filters are highly space-efficient equipment.

## Typical Dimensions

The floor space required for the main unit itself is usually very compact, typically ranging from 0.3m(3.28 feet) \* 0.6m(1.97 feet) to 0.5m(1.64 feet) \* 1.0m(3.28 feet).

## Total System Footprint

However, the entire filtration system also includes the vacuum pump and buffer tank. When accounting for operational and maintenance space, a complete laboratory setup typically requires planning for a bench area or floor space of approximately 1.2m(3.94 feet) \* 1.5m(4.92 feet) (around 1.8 square meters-19.375 ft<sup>2</sup>).

# Equipment List

When purchasing a complete laboratory-scale vacuum rotary drum filtration system, it typically includes the following components

## Main Unit

Vacuum rotary drum filter main body (including drum, slurry tank, and agitator)

Distributor valve (air distributor / rotary joint)

Drive motor and speed control system

Scraper discharge device

Frame

## Vacuum System

Laboratory vacuum pump

Vacuum buffer tank (liquid receiver), used for collecting filtrate and preventing liquid from entering the vacuum pump

Vacuum gauge and control valve

Pipelines and Fittings

All necessary vacuum hoses, connectors, and valves

## Spare Parts and Tools

Spare filter cloths / screens with different pore sizes

Special wrenches and other installation tools

## Agitation Tank

Agitation motor and reducer

Slurry tank

## Optional Accessories

Filter cake washing device (spray pipe)

Filter cloth rinsing device

Compressed air blowback port

Frequency converter for more precise speed control

# Applications

Laboratory-scale vacuum rotary drum filters are primarily used in the following scenarios:

## Process R&D and Optimization

- Testing whether a specific material is suitable for vacuum drum filtration.
- Determining optimal filtration process parameters, such as drum speed, vacuum level, filter cake thickness, and wash liquid dosage.
- Providing key data for industrial scale-up design (e.g., filtration rate, filter cake moisture content, washing efficiency).

## Small-Batch Production

- Used for handling small quantities of materials generated in laboratories or pilot plants.

## Education and Training

- Used in universities and vocational colleges to demonstrate the principles and operations of continuous filtration.

# Applications

Laboratory-scale vacuum rotary drum filters are primarily used in the following scenarios:

## Material Property Evaluation

- Comparing the effectiveness of different filter aids or flocculants.

## Suitable Material Properties

- Solids with moderate or slow settling rates.
- Materials that form porous filter cakes with good air and water permeability.
- Solid concentrations typically ranging from 5% to 30%.
- Not suitable for handling highly viscous materials, materials that form impermeable filter cakes, or extremely fine particles (e.g., colloids) — unless filter aids are used.

# Filter Media

Filter media is the critical material covering the drum surface, and its selection directly impacts filtration performance and efficiency. Common types are as follows:



## Metal Screens

Made of stainless steel or other alloys, they offer high strength, wear resistance, and easy cleaning and regeneration. Suitable for filtering coarser particles.



## Filter Cloths

**Materials:** Polyester (PET), polypropylene (PP), nylon (PA), cotton, wool, etc.

**Forms:** Monofilament, multifilament, or staple fiber woven cloths. Monofilament cloths have a smooth surface for easy cake discharge; staple fiber cloths have strong retention capacity but may be prone to clogging.

# Filter Media

Filter media is the critical material covering the drum surface, and its selection directly impacts filtration performance and efficiency. Common types are as follows:



## Composite Filter Cloths

A non-woven fabric or microporous membrane is laminated on the base cloth to achieve higher filtration precision.



## Filter Papers

Disposable, used in applications requiring high cleanliness or filtration of extremely fine particles.

# Selection Criteria

In laboratories, a variety of filter media with different materials and pore sizes are typically prepared to test and achieve optimal filtration results.

<b>Filtration Precision (Retention Capacity)</b>	Select an appropriate pore size based on the solid particle size to ensure a clear filtrate.
<b>Air/Water Permeability</b>	Influences the filtration rate.
<b>Chemical Resistance</b>	Must withstand the chemical properties of the slurry and wash liquid.
<b>Mechanical Strength</b>	Capable of withstanding vacuum suction, scraper action, and repeated cleaning.
<b>Cake Discharge Performance</b>	Media with a smooth surface (e.g., monofilament filter cloth) allows for easier filter cake detachment.

## Contact us

---

Should you have any requirements related to vacuum drum filters (such as model selection, technical parameters, application solutions, etc.), please feel free to contact Yinuo for consultation at any time! Our professional team will provide you with accurate answers and customized support to help you advance your project efficiently.

XINXIANG YINUO MACHINERIES CO., LTD.

Email: [info@vacuumdrumfilters.com](mailto:info@vacuumdrumfilters.com)

Tel: +86 17329378900

Address: Xiawan New Village, Funingji Town, Yuanyang County,  
Xinxiang City, Henan Province, China