Boyee博亿

Core Standalone Equipment for Nanomaterial Preparation

| Wet Grinding | Dry Grinding | Mixing
| Dispersion | Homogenization | FCCVD Growth System

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Grinding & Dispersion Solutions

Core Standalone Equipment for Nanomaterial Preparation

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- BYZr Ceramic Turbine Bead Mill
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Who is Boyee? —— A Chinese Benchmark in Grinding and Dispersion

Boyee not only focuses on standard equipment but also possesses strong project management capabilities, providing turnkey solutions for nano-material production lines.

Boyee's nano-level grinding technology breaks international monopolies

Ultra-fine grinding and uniform dispersion

Self-developed turbine and pin-type rotors

Boyee was founded in 2004 and is headquartered in Shenzhen. As a national-level "Specialized, Sophisticated, Distinctive, and Innovative" (Little Giant) enterprise and a national high-tech enterprise, the company specializes in the R&D and manu -facturing of grinding and dispersion equipment. With over 20 years of expertise in wet grinding and dispersion technology, it has become a leader in the field.

As early as 2007, Boyee successfully developed an all-ceramic structured nano-level bead mill, breaking foreign technological monopolies. Since then, it has continued to innovate, developing and manufacturing equipment such as nano-scale grinding and dispersion systems for lithium iron phosphate (LFP) battery cathode materials and silicon-carbon anode materials, consi -stently driving technological development in the industry.

Boyee applies mechanical, shear, and impact forces to achieve precise and efficient particle-size reduction and uniform dispersion. Its self-developed turbine and pin-type rotor structures can be matched to different material characteristics, generating the forces required for ultrafine grinding and homogeneous dispersion.



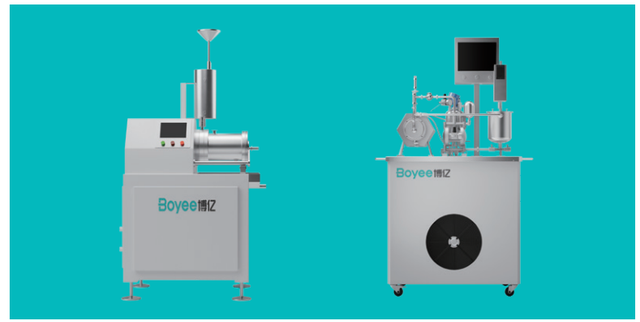
Product Development

Boyee advances steadily in materials processing through its microparticle technology. In particle-size reduction, the technology is used to control energy transfer and optimize interparticle interaction, enabling even hard and structurally complex materials to be processed efficiently to the desired particle size with a uniform, controllable distribution.

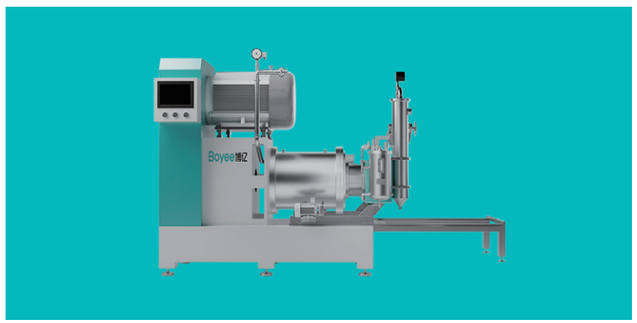
In dispersion, Boyee precisely controls the trajectories and forces acting on microparticles to break up agglomerates and disperse particles of different properties uniformly in the medium. Based on its particle technology and grinding and dispersion capabilities, Boyee offers products ranging from precision bead mills to efficient mixing equipment, providing professional solutions for a wide range of industries.



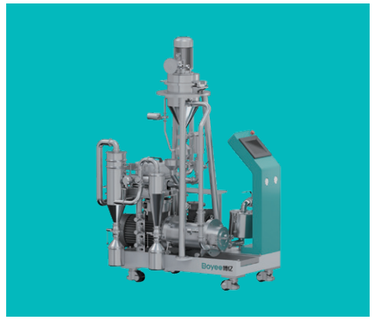
The first all-ceramic bead mill mass production in 2007



Post-development SW/NMM laboratory machine



Mass production model NMM/LMM



Dry bead mill technology breakthrough

Application Fields

New Energy Battery Materials	Inks and Coatings	Semiconductors
Pharmaceuticals	Food	Electronic Ceramics
Cosmetics	Advanced Materials	Minerals and Mining

Nanoscale Grinding and Uniform Dispersion

—— From micrometers to nanometers, Boyee provides advanced nano-scale technology solutions

The Physical Distinction between Grinding and Dispersion

Grinding is the process of reducing particle size through mechanical stress. It may involve bond breakage and disruption of crystal structure. Dispersion is a physical process in which particle agglomerates are broken up by shearing, wetting, and related actions while the original particle morphology is retained. The essential distinction is whether the material' s crystal structure and surface characteristics are changed.

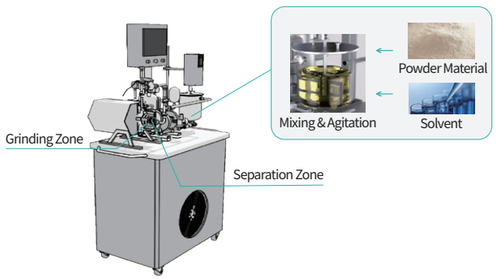
Working Principle of Wet Bead Mill

1. **Material Pre-treatment & Feeding**
The material is pre-dispersed and wetted in a mixing tank, then pumped into the bead-mill chamber, where it is mixed with grinding media such as zirconia beads.

2. **High-speed Grinding & Dispersion**
The main shaft drives the disperser at high speed. The grinding media generate intense collision, friction, and shear forces, refining particles to the nanoscale and achieving uniform dispersion.

3. **Dynamic Separation & Discharge**
The processed material passes through a dynamic separator screen, retaining the grinding media while continuously discharging the final slurry from the outlet.

4. **Cooling & PLC Intelligent Control**
The cooling system prevents overheating. The control system monitors pressure, temperature, flow rate, and other parameters in real time to optimize grinding efficiency.

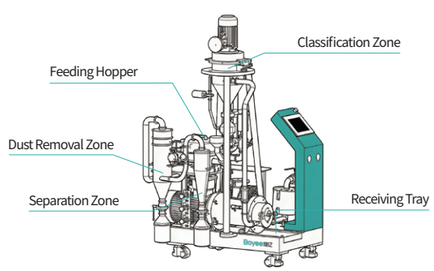


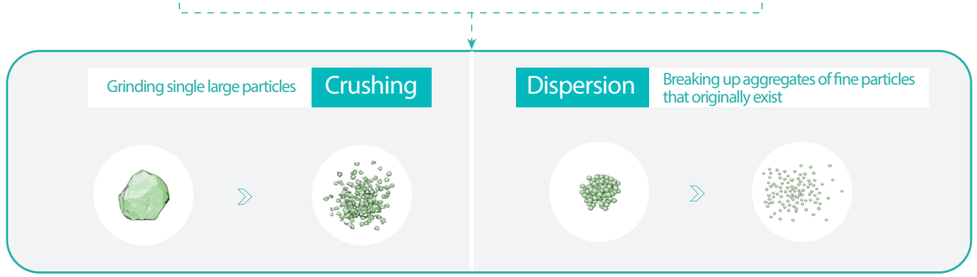
Working Principle of Dry Bead Mill

- **Material & Media Feeding**
Dry material and grinding media enter the grinding chamber through the inlet. No pre-wetting is required.

- **Three-stage Grinding & Dispersion**
Pre-grinding: the shaft-driven impeller forms an axial spiral flow that pushes material into the fine-grinding chamber.
Fine grinding: paired impellers apply intensive shear and impact.
Precision grinding: optimized impeller contact surfaces and a pre-screen baffle complete the final refinement.

- **Screen Separation & Discharge**
The screen separates the processed material from the grinding media. Powder is discharged from the outlet, and screen aperture can be adjusted to suit the process.



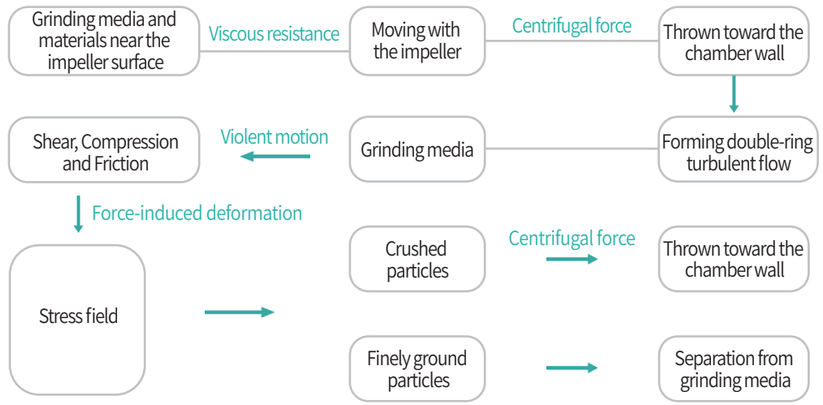


Grinding and Dispersion Technology 1

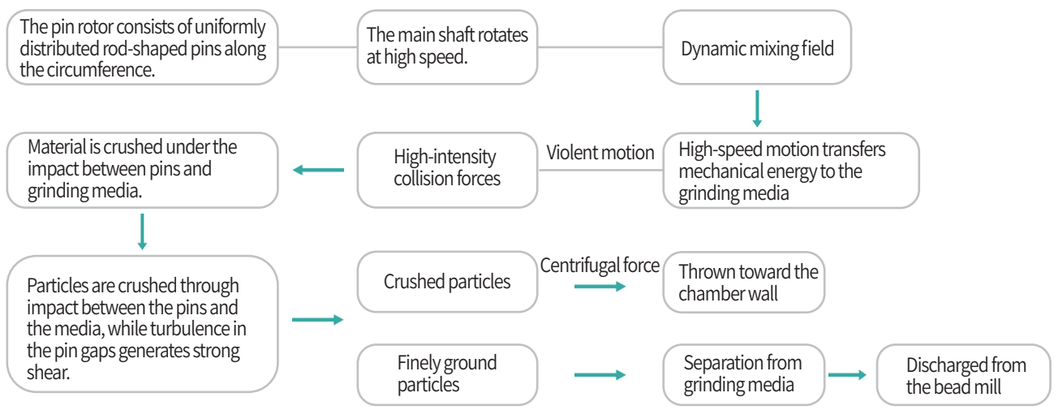
Working Principle of Bead Mill

A bead mill is a grinding and dispersion device that refines target materials to the nanoscale. A rotor on the rotating shaft drives the zirconia beads, or grinding media, inside the grinding chamber. Collisions, friction, and shear between the beads and the material reduce particle size. A screen or another separation structure at the chamber outlet retains the beads in the chamber while allowing the processed material to discharge.

Working Principle of Turbine Rotor



Working Principle of Pin Rotor



Grinding and Dispersion Technology 2

Analysis of Grinding Process Technology: Principles and Effects

01 Single-machine Continuous Grinding Process

Principle

Material completes grinding in a single pass through one machine, without recirculation. Rotor speed and zirconia -bead filling ratio, typically 70%–85%, can be adjusted dynamically to balance productivity and precision.

Effect on Materials

High output & low consumption: Energy consumption ⩽25kWh per ton, suitable for mass production like LFPWide applicability: Adapts to particle sizes from 50mm to 10μm, but limited support for ultra-narrow distribution.

02 Multi-machine Series Grinding Process

Principle

Multiple grinding units are arranged in series, with each unit assigned process parameters such as speed and media ratio. The material passes through each unit in sequence to achieve gradient grinding from coarse to intermediate and then fine grinding.

Effect on Materials

Ultra-narrow distribution: Meets demands of high-end nanomaterials (e.g., carbon nanotube slurries).

03 Combined Cyclic Grinding Process

Principle

The process combines continuous and recirculating modes. In the first pass, low-flow continuous grinding uses strong shear to rapidly break coarse particles. In the subsequent recirculating stage, material repeatedly passes through the grinding chamber; dynamic classification and refinement remove coarse particles precisely.

Effect on Materials

Uniform particle size: Reduces initial particle size and narrows distribution via cyclic screening.

Ideal for materials requiring extreme uniformity (e.g., new energy battery materials).

04 Single-tank Cyclic Grinding Process

Principle

Material circulates within a single tank, driven by a pump to repeatedly pass through the grinding chamber.Adjustable cycle count and flow rate to flexibly control grinding duration and fineness until target size is achieved.

Effect on Materials

Suitable for small-batch, multi-variant customized production, especially R&D or pilot stages, balancing efficiency and cost.

Process Comparison & Selection Guide

Boyee' s four grinding processes cover full-scenario needs from R&D to mass production, focusing on precise particle control and energy efficiency to push material performance limits.

Process Type	Core Advantage	Application
Combined Cyclic	Narrow distribution, low energy consumption	Mass production (e.g., Si-C anode)
Single-machine Continuous	High output, easy maintenance	LFP, conductive agents, large-scale production
Multi-machine Series	Multi-stage precision, ultra-fine dispersion	Nanomaterials (CNTs, solid electrolytes)
Single-tank Cyclic	Flexible and economical; suitable for R&D	Lab R&D, new material validation

Grinding and Dispersion Technology 3

Dry and Wet Grinding Technologies

Why different particle-size requirements call for different grinding processes?

Dry Grinding (Particle size ⩾1μm)

Uses large-diameter grinding media (1-8mm); centrifugal force drives media collisions for impact-based crushing. Ideal for coarse grinding of brittle materials.

Wet Grinding (Particle size ⩽100nm)

Employs micro/nano media (0.05-2.0mm); achieves ultra-fine dispersion via high shear (linear speed >10m/s) and viscous drag,Suitable for nanomaterial preparation.

How to Select Grinding Methods Based on Material Properties?

Material Property	Dry Grinding	Wet Grinding
Thermal Sensitivity	Mechanical friction generates heat and can limit application where temperature rise must be controlled	Liquid medium dissipates heat effectively, ideal for heat-sensitive materials
Agglomeration Tenden	High shear needed but airflow may worsen agglomeration	Liquid coating prevents particle agglomeration
Flowability	Poor powder flow risks chamber clogging	Slurry flow is controllable, suits complex channel designs
Dispersion Precision	Avoid over-grinding for surface-sensitive materials	Gentle dispersion preserves original particle properties

Dry vs. Wet Grinding Technology Comparison Table

Comparison Dimension	Dry Grinding	Wet Grinding
Grinding Principle	Achieves volumetric crushing through collisions, shear, and impact forces between grinding media (kinetic energy transfer via high-speed rotation)	Achieves deagglomeration via shear, compression, and friction in liquid medium (fluid dynamics dominated)
Dominant Force Types	Primary forces: Impact (media collisions) + Shear (inter-media friction)	Primary forces: Fluid shear (laminar-turbulent flow) + Compressive stress (inter-media pressure).
Particle Size Control Precision	Depends on media size, rotation speed, and flow rate; broader distribution	Optimized via media size, slurry concentration, and cycle count; narrower distribution.
Energy Consumption	Relatively high because high rotational speed is required to drive the media; no-load energy consumption is significant	Moderate (pump energy dominates; liquid environment enhances energy transfer efficiency; lower overall energy for fine grinding)
Shaft Sealing Requirements	Simple (gas sealing suffices to prevent powder leakage)	Precise (mechanical sealing required to prevent liquid leakage; higher maintenance cost)
Component Wear	Lower (no liquid corrosion; media wear is primary)	Higher (dual effects of liquid corrosion + media wear; corrosion-resistant materials required)
Particle Agglomeration Tendency	Strong	[Weak] (liquid medium coats particles, enhancing dispersion
Particle Compositing	Good	[Possible] (shear-dominated; lower compositing efficiency)
Mechanochemical Effects	Significant (high-frequency collisions induce lattice defects/surface activation)	[Minimal] (liquid buffers localized stress concentration

Grinding and Dispersion Technology 4

Effect of Zirconia Beads on Material Breakage

How Do Grinding Media Parameters Affect Grinding Efficiency?

Pameter	Dry Process	Wet Process	Mechanism
Bead Diameter	1-8mm (coarse crushing)	0.05 -0.2mm (nano dispersion	Diameter reduction → 400% increase in media count per unit volume (by volume ratio))
Filling Rate	60-70% (high kinetic impact)	70-85% (high shear density)	Filling rate increase → 25% more contact points
Linear Speed	4-6m/s (impact-dominated)	10 -15m/s (shear-dominated)	Speed doubled → shear stress quadrupled

Bead Diameter and Efficiency

01 Coarse Grinding: 3-5mm beads preferred (impact-dominated)

02 Fine Grinding: 0.3-1mm microbeads required (shear contributes 70%)

03 Efficiency Gain:
When bead size reduces from ϕ5mm to ϕ1mm (25x more beads).
Contact point density increases 10x; refinement rate accelerates 5-8x

Optimizing Media Filling Rate

Dry Process: 60-70% filling rate (20-30% porosity) ensures fluidization

Wet Process: 70-85% filling rate prevents sedimentation/layering

Effect of Zirconia-bead Diameter and Quantity

Type	Effect	Application
Reducing Bead Dimension	Increases contact points, enhancing grinding efficiency.	Nano-level fineness (wet process preferrevd)
Increasing Bead Quantity	Improves grinding uniformity via centrifugal media distribution (e.g., 300% higher collision frequency at 70-85% filling rate).	Requires balancing to avoid excessive energy consumption (dry: larger beads; wet: smaller beads)

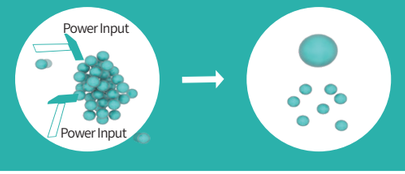
Advantages of Gentle Dispersion

Gentle dispersion is Boyee's proprietary technology that maintains the size, shape, crystalline structure, and surface state of secondary particles during the dispersion process.

Particle Characteristics Preservation | Re-agglomeration Suppression | Reduced Dispersant Dosage

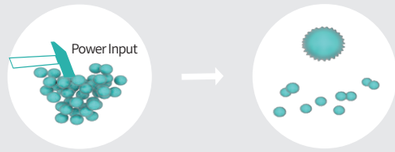
Gentle Dispersion

Prevents over-dispersion and particle damage, enabling high-quality and high-precision.



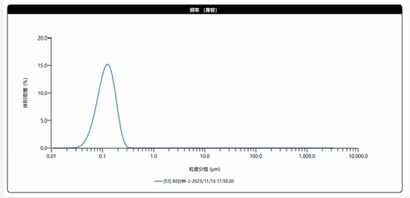
Traditional Dispersion

Over-dispersion can damage particles, promote re-agglomeration, and adversely affect product characteristics.

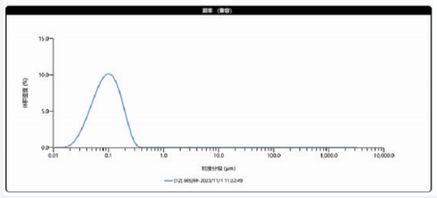


Gentle Dispersion Case Study (Barium Sulfate)

Raw Material Particle Size: D50=118nm



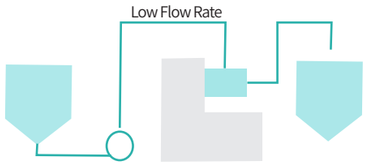
Gentle Dispersion with Particle Size: D50=92.8nm



Efficient and Refined High-Flow Circulation Operation

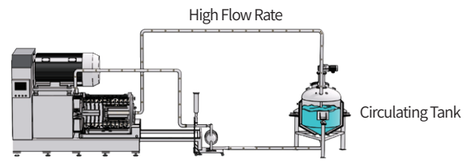
Traditional Circulation Method

Conventional bead mills often use single-machine recirculation or recirculation through two tanks in series. Material moves back and forth between the feed tank and grinding chamber, while a screen separates the grinding media from slurry. This approach can be constrained by low flow rate, less effective particle -size control.



Boyee High Flow Circulation Operation Method

Boyee' s high-flow recirculation combines dynamic separation with forced high-flow circulation. It enables continuous and efficient deagglomeration of high-viscosity and high-solids slurries in a nanoscale grinding-media field. With closed-loop temperature control and online particle-size monitoring, it supports high-flow micronization and clog-free continuous dispersion.



*Based on target particle size (nano/submicron level), material characteristics (viscosity, solid content, hardness,thermal sensitivity), and process requirements (R&D/production), this guide systematically outlines key selection criteria for reference.

Key Selection Criteria 1 Prerequisite Confirmation

Parameter	Technical Key Points	Impact on Micronization
Bead Specification	Particle Size selection: Target particle size ≈1/1000 of bead diameter (e.g.,0.05mm beads for 50nm target)	Smaller targets require finer beads; higher bead hardness improves grinding efficiency but increases wear rate
	Material: Yttria-stabilized zirconia (high hardness)	
Linear Velocity	Standard range: 10-15m/s	Higher velocity ↑ → Increased shear force ↑ →Smaller particles ↓ but energy consumption and temperature rise
	High shear (>15m/s): Nanoscale dispersion	
	Low shear (<10m/s): Overheat protection	
Material Compatibility	Silicon carbide ceramic: Corrosion-resistant, zero contamination	Material determines corrosion resistance, contamination risk, and service life; full ceramic design required for pharmaceutical/semiconductor applications
	Stainless steel: Cost-effective (general chemical use)	
Cooling System	Jacketed kettle water cooling: ±1°C temperature control	Prevents material property degradation and reduces solvent evaporation
	Nitrogen protection: For thermally sensitive materials (e.g., PVDF binders)	
	Real-time temperature control: Dynamically adjusts cooling power	

Key Selection Criteria 2 Selection Logic: Lab-Scale vs. Production-Scale

Machine Type	Core Features	Core Features	Representative Models
Lab-Scale	Small capacity Adjustable parameters (speed, circulation cycles)	New material R&D, process validation	NMM Lab Machine, 0.3L Self-Circulation Bead Mill, GPM Dry Sand Mill
Production-Scale	High stability (24/7 continuous operation) Modular expansion (multi-unitparallel operation)	Large-scale production (10,000-ton level): • Anode/Cathode materials • Conductive slurries • Pharmaceutical raw materials	NMM High-Flow Model, LMM Centrifugal Model, SW Series, BYZR Series

Selection Decision Flowchart

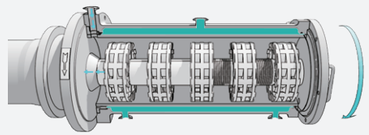
→ Confirm requirements (target particle size,solid content, etc.) → Lab testing
→ Matchmachine capacity→ Select rotor type/material → Choose beaddiameter
→ Scale-up to production

Key Selection Criteria 3 Selection Based on Structural Differences

Grinding & Dispersion Rotor Structures

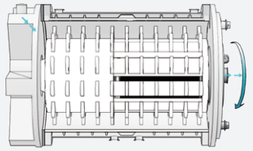
(Specific selection should consider material viscosity, target fineness, and energy consumption costs)

Turbine Rotor



Features a large-volume grinding chamber design combined with recirculation-capable beads. The turbine rotor structure precisely controls bead movement, creating a unique "spiral laminar flow" for damage-free, high-quality material refinement and dispersion.

Pin Rotor



Utilizes densely arranged pins between the rotor and grinding chamber to narrow the grinding zone, forming a uniform high-intensity shear field. Through powerful impact and shear forces, it achieves efficient grinding and fine dispersion of strongly cohesive particles, producing materials with narrow particle size distribution.

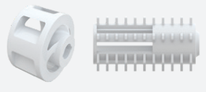
Comparison of Turbine and Pin Construction Features

Feature	Trubine Rotor	Pin Rotor
Particle Size Distribution	Narrow	Broad
Material Morphology & Structure	Intact morphology & structure	Significant structural damage
Heat Generation	Low	High
Wear Degree of Grinder	Low (long lifespan)	High(short lifespan)
Zirconia Bead Wear	Low breakage & wear	High breakage & wear
Price	High	Low
Suitable Viscosity	High viscosity	Low viscosity

Rotor Materials (Zirconia, Silicon Nitride, Polyurethane, Alumina, Tungsten Carbide, PU+Tungsten Carbide Alloy)

- ✓ Zirconia (ZrO_2): Ideal for battery materials, MLCC, inks, and pharmaceutical ingredients. Features high hardness, heat resistance, corrosion resistance, wear resistance, and low contamination.
- ✓ Silicon Nitride (Si_3N_4): Suitable for semiconductor ceramics and chemical materials. Offers exceptional heat resistance, oxidation resistance, corrosion resistance, and wear resistance.
- ✓ Polyurethane (PU): Compatible with battery materials, ceramics, chemicals, inks, and coatings. Provides high elasticity, wear resistance, lightweight properties, and corrosion resistance.
- ✓ Alumina (Al_2O_3): Used for ceramics, pharmaceuticals, and food additives. Exhibits high hardness, heat resistance, excellent electrical insulation, and chemical stability.
- ✓ Tungsten Carbide (WC): Designed for processing high-hardness, high-toughness materials. Delivers extreme hardness, wear resistance, heat resistance, and corrosion resistance.
- ✓ PU+Tungsten Carbide Alloy: Combines high hardness, wear resistance, heat resistance, and corrosion resistance, making it ideal for machining ultra-hard materials.

Zirconia (ZrO_2) Material



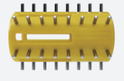
Polyurethane (PU) Material



Silicon Nitride (Si_3N_4), Silicon Carbide (SiC) Materials

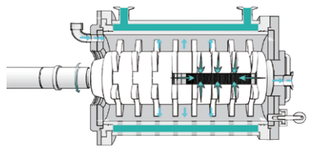


PU + Tungsten Carbide (Alloy)



Separation Method

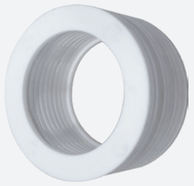
Select the separation method according to material characteristics, including particle size and viscosity, as well as the required separation precision.



Screen Separation Working Principle

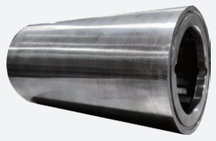
Screen separation operates on mesh filtration principles. Under pressure, material passes through the screen while oversized particles and grinding media are retained. Qualified material exits through the screen. Available in zirconia ceramic or wedge-wire stainless steel variants to suit different operational needs.

Screen Structures: Ceramic Disc Stack/Wedge Shape Screen



Ceramic Stacks

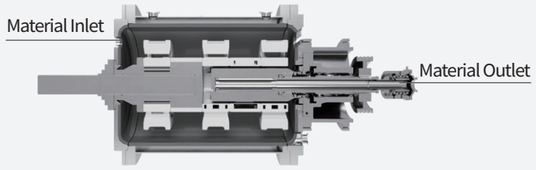
Multiple thin discs form a 3D filtration structure. Impurities are captured between disc walls and grooves for high efficiency filtration.



Wedge Shape Screen

Features trapezoidal wire cross-sections with tapered slots (narrow top/wide bottom). Constructed from corrosion-resistant materials (e.g., stainless steel) to minimize clogging. During operation: Grinding beads/ oversized particles larger than mesh openings are retained Material flows through the wedge shaped gaps.

Centrifugal Separator



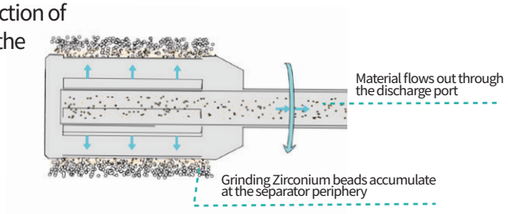
Picture: Schematic Diagram of Centrifugal Separation

Separator Structure

The separator consists of a cylindrical separation chamber and a control system. Its internal structure is designed to retain grinding media while allowing processed slurry to pass through.

Centrifugal Separation Principle

During the grinding phase, the bead mill refines materials through the action of grinding beads and the rotor. Subsequently, centrifugal force separates the ground material from the media, ensuring uniform product fineness.



Workflow

1. Grinding Phase: Processed material and media enter the separator.
2. Separation: The separator structure retains grinding beads while material flows out through the discharge port.
3. Recycling: Retained beads and residual material return to the grinding chamber for reprocessing.

Shaft Seal (Boyee's Proprietary Mechanical Seal Technology)

Boyee double-face design represents a significant technological innovation in mechanical seals. Compared to single-face seals, it demonstrates superior performance in maintaining precise alignment between rotating and stationary seal faces.

Core Advantages of Mechanical Seals

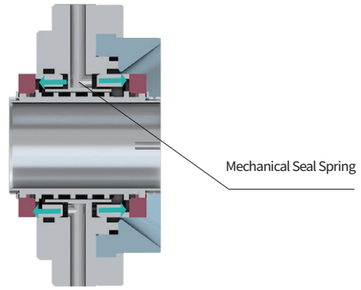


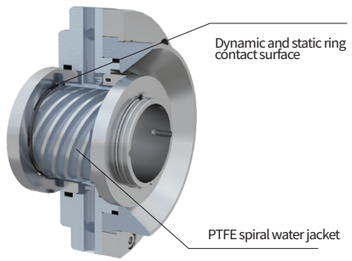
Material Leakage Prevention

During shaft eccentric operation, the double-face design utilizes precisely positioned stationary rings on both sides to effectively limit spiral sleeve displacement, thereby enhancing leak-proof performance.

Elastic Components Create "Zero-Gap" Sealing Defense

The seal spring pre-tensions the stationary and rotating face seals. Under combined action of medium pressure and elastic component force, the sealing pair is further compressed to achieve complete axial face sealing.





PTFE Spiral Water Jacket: The "Intelligent Temperature Control Assistant" for Mechanical Seals

Boyee's PTFE spiral water jacket features an ingenious design. Passive Cooling: Enables natural water flow for preliminary cooling when pumps are inactiveActive Cooling: Accelerates water circulation for enhanced heat dissipation when pumps operateThe spiral structure ensures uniform cooling across the seal area, maintaining optimal temperatures to extend seal lifespan and support equipment efficiency.

Grinding Chamber Structure



Protrude Inner Lined Chamber

Regular or irregular raised features on the inner wall create multi-angle collision, compression, and shear between material and grinding media. They also disturb material flow, promote mixing and dispersion, and reduce grinding dead zones.



Smooth-Liner Chamber

A smooth inner wall uses centrifugal force and gravity to support stable rolling and sliding of material and grinding media. It reduces friction, minimizes residue, simplifies cleaning, lowers operating resistance, and saves energy.

Grinding Chamber Materials (Zirconia, Silicon Carbide, Silicon Nitride, Polyurethane, Wear-Resistant Alloy)

Zirconia Chamber
Exceptional wear resistance. Zero contamination. Low energy consumption.

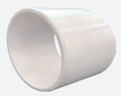
Silicon Carbide (SiC) Chamber
Extreme hardness. Superior wear resistance. Rapid heat dissipation ability.

Silicon Nitride (Si_3N_4) Chamber
Wear and corrosion resistant. Thermal shock resistant. High hardness & strength.

Polyurethane (PU) Chamber
Excellent wear resistance. High elasticity. Superior tear resistance.

Wear-Resistant Alloy Chamber
High wear resistance. Excellent mechanical strength. Corrosion & high-temperature resistance . Outstanding impact resistance.

Zirconia Chamber



Silicon Carbide Chamber



Silicon Carbide Chamber



Wear-Resistant Alloy Chamber



Grinding Media (Zirconia Beads)

Grinding media size should be selected based on material characteristics and processing requirements. Generally, smaller diameters deliver superior results. In high-speed bead mills, spherical or near-spherical beads are optimal as they maximize impact and shear forces. High-density beads further enhance these effects to improve.

Zirconia Bead Size Range(mm)

0.03-0.05	0.8-1.0
0.05-0.1	1.0-1.2
0.1-0.15	1.2-1.4
0.15-0.2	1.4-1.6
0.2-0.25	1.6-1.8
0.25-0.3	1.8-2.0
0.3-0.4	2.0-2.2
0.4-0.5	2.2-2.4
0.6-0.7	2.4-2.6
0.7-0.8	2.8-3.0

Properties of Grinding Zirconia Beads Density



Higher-density zirconia beads provide greater impact momentum and grinding efficiency, but increase wear on mill components. Proper matching of slurry viscosity and flow rate is critical:
- Low-density beads: Optimal for low-viscosity slurries
- High-density beads: Better suited for high-viscosity slurries

Properties of Grinding Zirconia Beads Density

While harder beads theoretically exhibit lower wear rates, they accelerate component wear. This can be mitigated by optimizing:
- Bead filling ratio
- Slurry viscosity
- Flow rate parameters



Zirconia Beads Sphericity



For spherical grinding media, higher angular velocity during self-rotation increases additional energy. Non-uniform bead shape can hinder self-rotation and reduce energy. From a kinetic perspective, beads of the same diameter may have similar momentum, and collisions of large beads with small beads can reduce grinding efficiency. From a geometric perspective, mixed media of different diameters can fill voids, increase contact points, and improve grinding efficiency.

Reference Guidelines for Selecting Grinding Media Sizes for Bead Mills:

Bead Size(mm)	Target Particle Size(μm)	Initial Particle Size(μm)	Slurry Viscosity(cps)	Solid Content (wt%)	Linear Velocity(m/sec)	Screen Gap(mm)
0.05	<0.05	<5	<1000	<25	⩽15	0.02
0.1	<0.08	<10	<1000	<25	⩽15	0.05
0.2	<0.1	<20	<2000	<30	⩽15	0.1
0.3-0.4	<0.1	<20	<10000	<35	⩽15	0.15-0.1
0.4-0.6	<1	<40	<10000	<60	⩽12	0.22-0.2
0.7-0.9	<2	<80	<20000	<70	⩽12	0.3-0.35
0.9- 1.1	<10	<150	<20000	<70	⩽8	0.5
1.75-2.5	<20	<150	<20000	<70	⩽8	0.6

Note: The above data is for reference only. Actual parameters may vary depending on specific process conditions. For more detailed information, please contact us.

NMM Self-Circulating Bead Mill

An efficient self-circulating bead mill specifically designed for university research and industrial pilot-scale development.

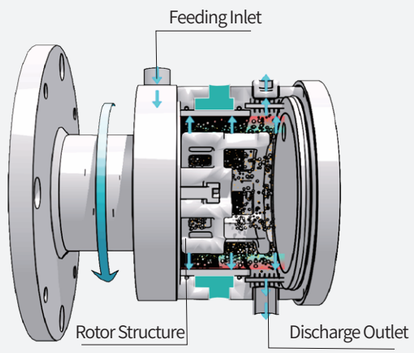


0.3L Self-Circulating Bead Mill

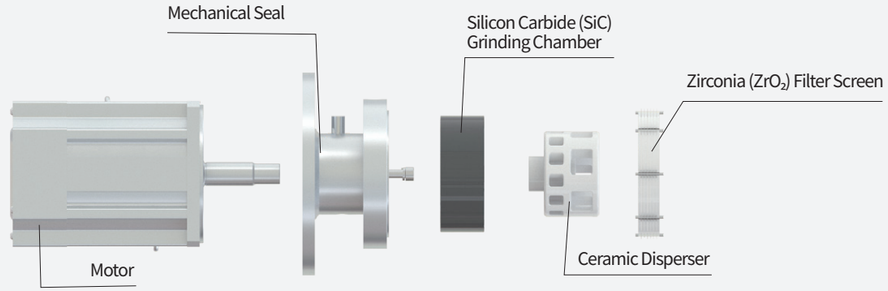
- **Patented Flow Channel Design**
  The chamber is lined with silicon carbide. Guide grooves create axial vortex flow and improve grinding efficiency.
- **Self-Circulating Operation** (No External Pump Required)
  Rotor rotation generates suction. Together with the stacked-disc screen, this creates a self-circulating flow field, reducing material residue and cross-batch contamination.
- **Stacked-Disc Static Separation**
  The zirconia screen increases flow area by 40%. Rotor centrifugal force and static separation help separate material from grinding media and reduce the risk of clogging.

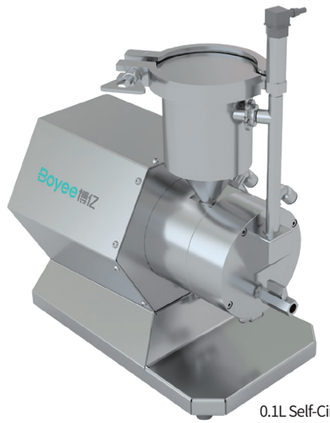
Working Principle

1. **Material Feeding:**
   Accepts powders, liquids, and solid-liquid mixtures. Compatible with multiple solvent and material systems. Loaded through the feeding inlet.
2. **Self-Circulation:**
   The rotor drives material circulation. The patented flow channel eliminates the need for an external pump and reduces residue and contamination.
3. **High-Shear Grinding:**
   The ceramic disperser rotates at high speed. Combined with the three-dimensional chamber, it strengthens shear and collision, quickly achieving nanoscale refinement and uniform particle size.
4. **Stacked-Disc Static Separation:**
   The zirconia stacked-disc screen uses centrifugal force to separate material from media. Its large flow area reduces clogging and enables efficient discharge of qualified material.
5. **Product Discharge:**
   Product discharge: Continuous and batch operation are both supported, enabling pilot-scale and batch-production use.



Internal Structure Schematic





0.1L Self-Circulating Bead Mill

Design Principles

Ceramic Disperser Design

Blade angle and spacing are designed through fluid-dynamics simulation, creating a three-dimensional grinding chamber, increasing particle-collision frequency, and promoting uniform particle-size distribution.

Disperser-Chamber System

A zirconia ceramic disperser combined with a silicon-carbide chamber provides corrosion resistance reported as ten times that of stainless steel, supports strongly acidic and alkaline solvent systems, and helps avoid metal-ion contamination.

Technical Specifications

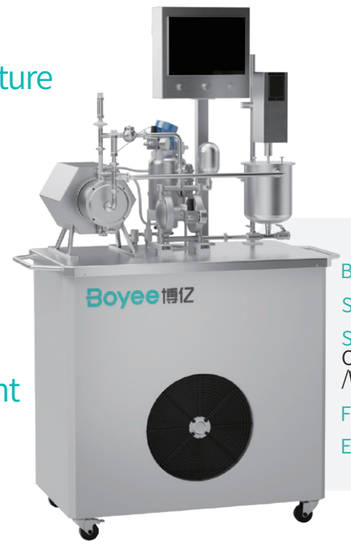
Parameter	NMM-0.1L
Cylinder Volume	0. 2L
Spindle Speed	0-4000rpm
Peripheral Speed	0-23m/s
Spindle Seal	Double Mechanical Seal
Rotor Structure	Full Ceramic Turbine
Cylinder Liner	Silicon Carbide (SiC)
Sealing Material	PTFE
Main Drive & Motor	Custom ⩾2.2kW-2P

Parameter	NMM-0.3L
Spindle Speed	0-4000 r/min
Zirconia Bead Diameter	0.1-1.2 mm
Bead Filling QTY	0.7-1.0 kg
Energy Consumption	2.1kWh per charge
Temperature Control	⩽40°C (Enhanced cooling efficiency)
Batch Capacity	0.3-0.7L slurry/batch
Flow Area	282.6/mm^2
Screen Gap	0.15mm (Adjustable)

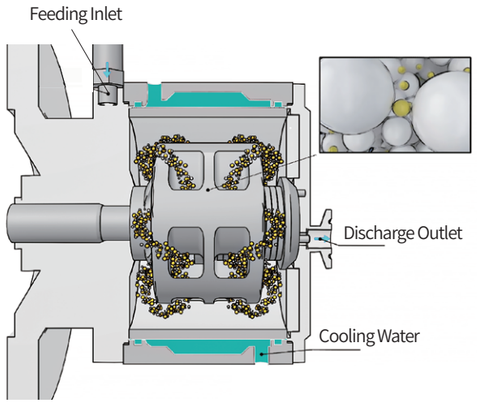
NMM Multi-Functional Laboratory Mill

An advanced device designed for small-scale R&D and production, featuring manually adjustable screen gaps.

- **Turbine + Pin Dual-Rotor Structure**
  High-frequency, high-intensity grinding for rapid particle-size reduction.
- **Three Agitator Options**
  Frame, anchor, and dispersing-disc designs for different material systems.
- **Manual Screen-Gap Adjustment**
  Meets process requirements for different materials.



Bead Filling Ratio: 70%-85%
Separation: Screen-based separation
Screen options:
Ceramic stacked-disc screen
/Wedge shape screen
Flow Area: 49cm²/65cm²
Energy consumption: 2.935/5.1025 kWh

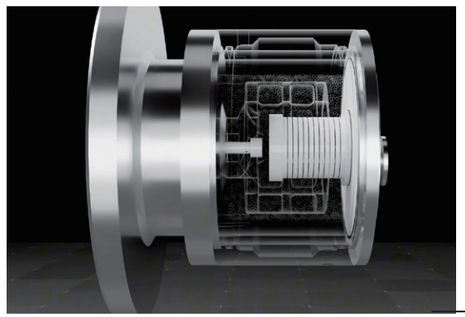


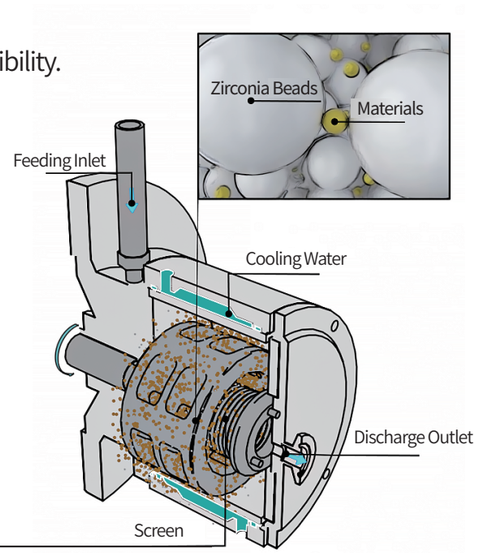
- **High-Intensity Shear Grinding**
  The grinding chamber utilizes powerful bead impact forces to create intensive particle collisions and shear, progressively reducing material particle size.
- **Dispersion Mechanism**
  Controlled-Intensity Processing: Optimized frequency prevents structural damage to particles.
  Non-Destructive Dispersion: Maintains original particle architecture while achieving uniform distribution.
- **High-Energy-Density Grinding Chamber**
  Delivers maximum crushing forcePrevents over-dispersion
  Batch Processing Capability:Consistent micronization for both small and large batch volumes.

Ceramic Stacked-Disc Filter Screen

Flexible Adaptation to Experimental Needs

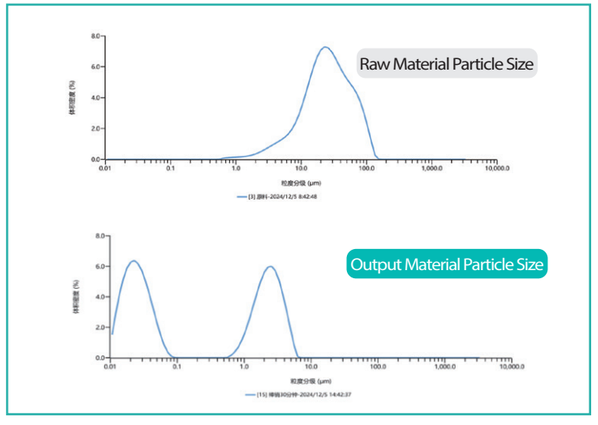
Large Flow Area: Optimized material throughput.
Adjustable Filtration: 0.1-2.0mm media diameter compatibility.
Universal Material Handling:
Single-machine adaptation for multiple materials.
Effective processing across viscosity ranges.





Specification

Model	Chamber Volume (L)	Drive Power (kW)	Bead Diameter (mm)	Screen Gap (mm)	Batch Capacity (L)	Feed Rate (L/min)	Weight (kg)	Dimensions (mm)
NMM-1L	1	2.2	0.1-2	0.05-1	1.4-10	0.5-2	120	1000x580x1750
NMM-2L	2	4	0.1-2	0.05-1	2.4-20	0.5-2	140	1150x680x1850



Processing Cases

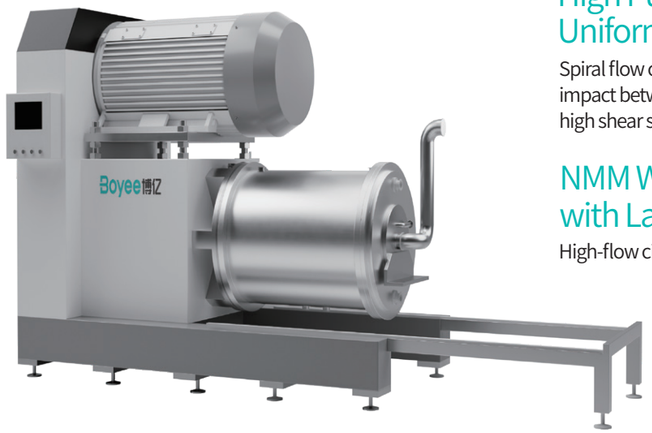
* Carbon Nanotubes (CNTs)

Particle Size	Innitial Material	Output Material
D50μm	24.9	0.0555
D90μm	71.8	3.39

NMM High-Flow Screen-Type Nano Bead Mill

Dual-function system supporting both grinding and nano-dispersion processes, achieving high-efficiency production through large-flow circulation.

Bead Filling Ratio: 70%-85%
Separation Method: Screen separation
Energy Consumption: 9.205-443.2 kWh
Flow Area: 162.7cm²-8849 cm²
Screen Types: Ceramic Laminated Screen /Wedge-Wire Screen



High Pulverization Capacity with Uniform Particle Size Distribution

Spiral flow channel design enables counter-current impact between slurry and zirconia beads, delivering high shear strength.

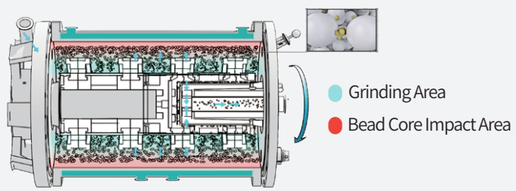
NMM Wedge-Wire Screen with Large Open Area

High-flow circulation improves grinding efficiency.

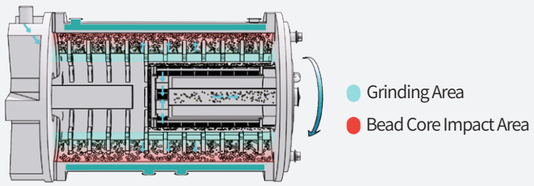
Patented Flow-Channel Design Optimized for High-Viscosity Materials

A dedicated discharge-separation system reduces the risk of conventional screen clogging.

Uniform Grinding Technology



High Energy Density Grinding Zone



- **Spiral Flow Channel Design:**
  Counter-current slurry/bead interaction
  Ultra-high shear intensity
- **Nano Precision Grinding**
  NMM Dynamic Distribution Technology Achieves:
  True nano-scale refinement
  Narrow particle size distribution (PSD)
- **High-Density Zirconia Bead**
  Nano-Impact Forces: Unmatched crushing efficiency
- **Dynamic Uniform Distribution:**
  Zero dead-zone bead distribution
  Precise particle size control (±5% variance)

Wedge Shape Screen Structure

Traditional Flat Screens

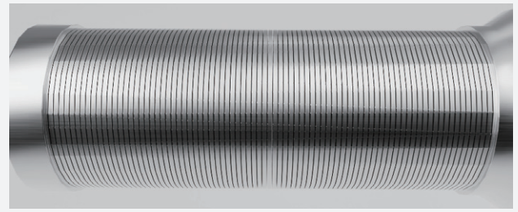
Planar Structure Limitations:
Restricted flow efficiency
Low throughput capacity

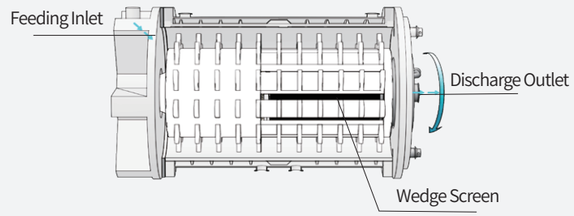
NMM Wedge Shape Screen Innovation

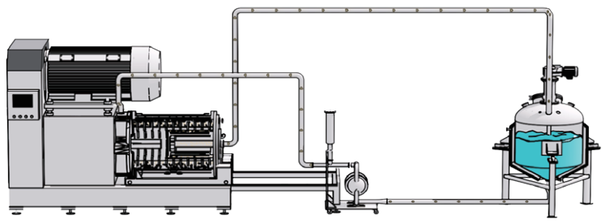
3D Expanded Design:
Increased flow area
Revolutionized processing capacity

Precision Gap Control

Accurate bead interception
Zero media leakage







High-Flow Circulation Mechanism

Continuous Operation:
High-speed slurry cycling
Full grinding media activation

Efficiency Breakthrough:
Multi-frequency crushing
Rapid dispersion
Closed-loop optimization

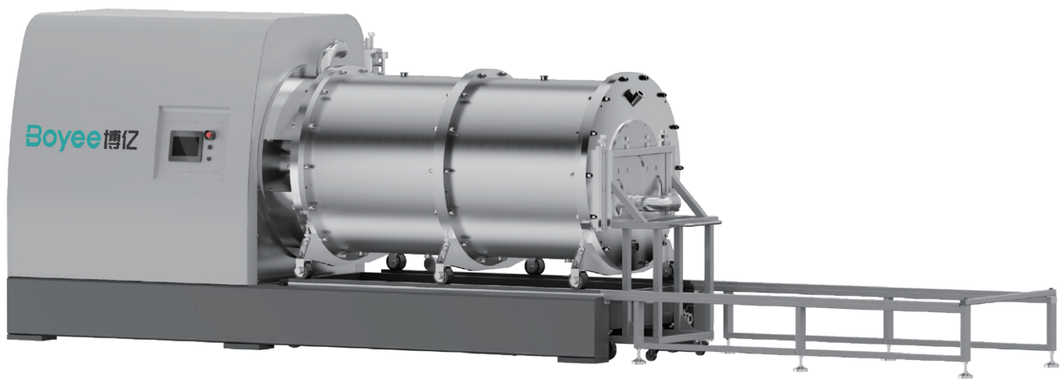
Speciafication

Model	Chamber Volume (L)	Drive Power (kW)	Bead Diameter (mm)	Screen Gap (mm)	Batch Capacity(L)	Feed Rate (L/min)	Weight (kg)	Dimensions (mm)
MMM-3L	3	7.5	0.1-2	0.05-1	7.4-35	6-42	400	910x680x900
MMM-10L	10	18.5	0.1-2	0.05-1	22.6-100	6-42	1280	2223x1367x1870
MMM-30L	30	3745	0.1-2	0.05-1	58-300	6-42	1700	2950x1220x1850
MMM-60L	60	75	0.1-2	0.05-1	126-500	25-50	2300	2985x1204x2240
MMM-90L	90	75- 90	0.1-2	0.05-1	196-1000	41-65	2500	3320x1240x2140
MMM-150L	150	160-200	0.3-1	0.15-0.5	325-3000	66-100	5200	4500x1500x2400
MMM-400L	400	315- 355	0.3-1	0.15-0.5	715-10000	100-300	8600	4900x1865x2750

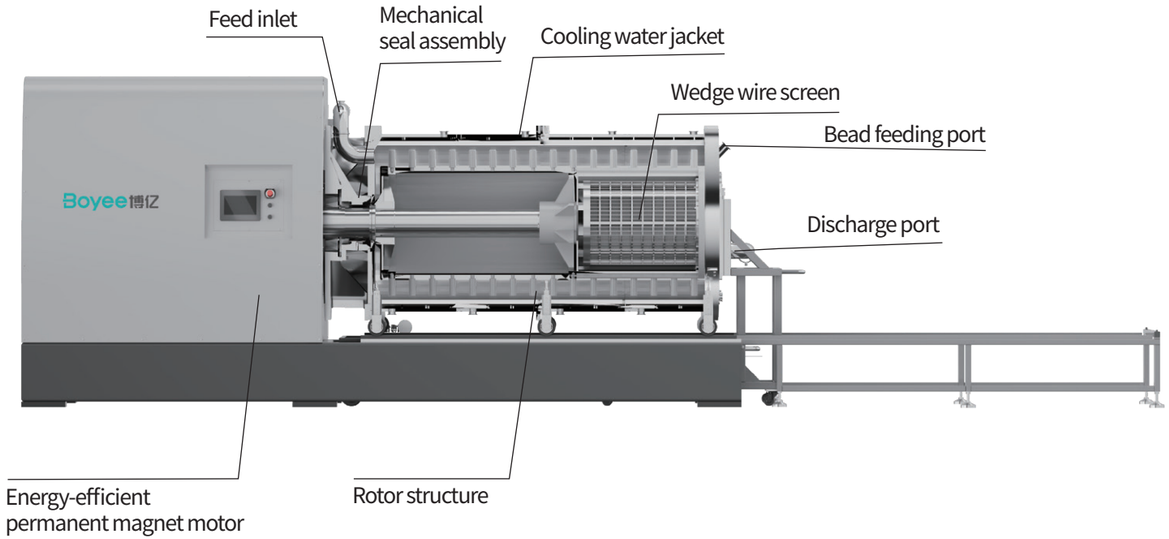
NMM Direct-Drive Nano Bead Mill

High-efficiency grinding with optimized energy consumption; wear-resistant components ensure smooth, leak-free operation.

- **Permanent Magnet Direct Drive System**
  Energy-saving with lower consumption and more stable operation.
- **High Energy Density Grinding**
  Improves nano-level grinding efficiency.
- **Excellent Thermal Conductivity of Grinding Chamber**
  Made of silicon carbide, a wear-resistant and corrosion-resistant material.
- **Unique Wedge Separation Structure**
  Large filtration area, not prone to bead jamming.
- **Zero-Leakage Operation**
  Adopts double-end mechanical seal structure for stable sealing performance.



Schematic Diagram



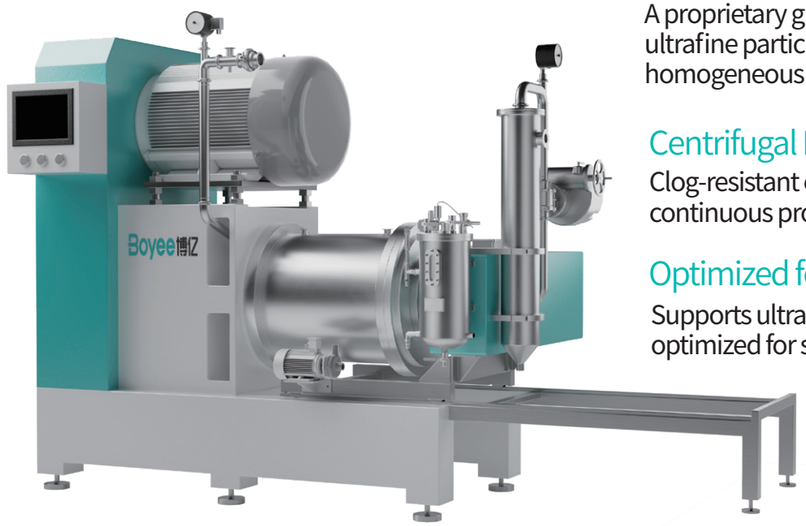
Speciafication

Model	NMM-1000L	NMM-1500L	NMM-2000L	NMM-3000L
Effective Chamber Volume (L)	1000	1500	2000	3000
Spindle Speed (r/min)	290	0-270	0-270	0-270
Feed Capacity (L/min)	200-400	300-750	400-1000	600-1500
Disperser Linear Speed (m/s)	0-15.2	0-16.5	0-16.5	0-16.5
Grinding Media Size (mm)	0.1-2.0	0.3-1.0	0.3-1.0	0.3-1.0
Zirconia Bead Capacity (kg)	2520-2880	3780-4320	5040-5760	7560-8640
Motor Power (kW)	650	950	1300	2500
Air consumption (m^3/min)	3.5(Based on specific operating conditions)	5.4(Based on specific operating conditions)	8.4(Based on specific operating conditions)	10.8(Based on specific operating conditions)
Dimensions (mm)	5000x2000x2300	5300x2200x2400	5600x2200x2400	6800x2200x2400

LMM Ultrafine Centrifugal Nano Bead Mill

Innovative Dynamic Centrifugal Separation Technology Enables nano-scale gentle grinding without structural damage.

Bead Filling Ratio: 70%-80% Separation Method: Centrifugal separation Energy Consumption: 18.675-443.2 kWh



Ultra-Precision Grinding

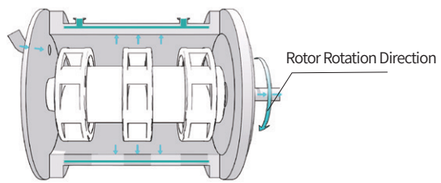
A proprietary grinding system delivers ultrafine particle-size reduction and homogeneous dispersion.

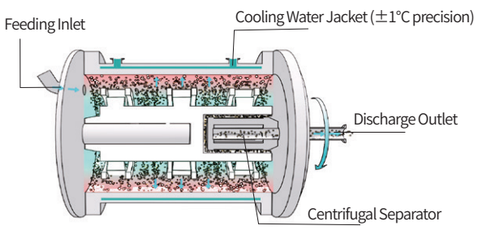
Centrifugal Discharge System

Clog-resistant operation supports continuous production.

Optimized for Low-Viscosity Materials

Supports ultrafine 0.05 mm grinding media, optimized for sensitive material systems.





Clog-Free Nano-Efficient Grinding Technology

High-Efficiency Nano-Grinding System.
High-Density Bead Loading: Maximizes impact frequency.
Patented Centrifugal Separator + Pump Synergy:
-Forces continuous media circulation.
-Prevents over-grinding while ensuring efficient dispersion.

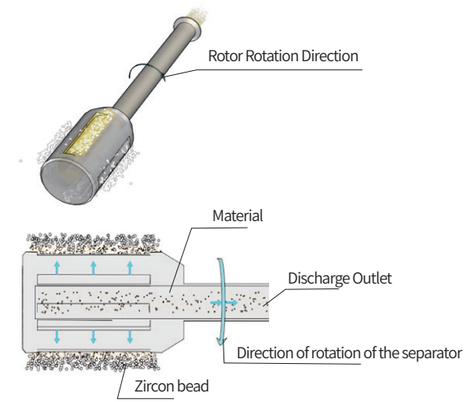
Dynamic centrifugal force for precise separation of zirconium beads and material

Centrifugal separators utilize the centrifugal force of the rotor to achieve efficient separation of microbeads for high speed, high flow circulation and small particle size media applications.

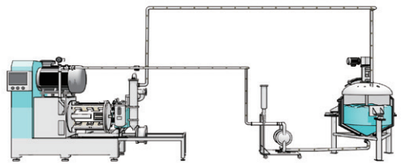
LMM Breakthrough: Eliminating screen limitations ultra-fine media applications (down to 0.05mm beads)

Screenless Centrifugal Separation:

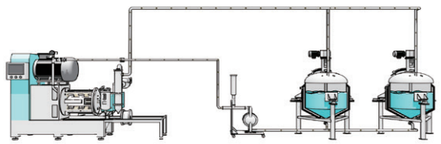
- Separates processed material from high-density beadswithout clogging
- Processes coarse particles without obstruction



Single-Tank Circulation



Dual-Tank Circulation



Single-tank circulation forms a closed loop between the bead mill and one tank. Dual-tank circulation connects the mill with two tanks and can support alternating grinding or graded grinding between tanks.

Speciafication

Model	Chamber Volume (L)	Drive Power (kW)	Bead Diameter (mm)	Batch Capacity(L)	Feed Rate (L/min)	Weight (kg)	Dimensions (mm)
LMM-3L	3	7.5/7.5	0.1-1	7.4-35	6-42	800	1427x960x1711
LMM-10L	10	18.5/7.5	0.05-1	24-100	6-42	1500	2223x1367x1870
LMM-30L	30	45/7.5	0.05-1	62-300	6-42	2300	2924x1287x1850
LMM-60L	60	75/11	0.05-1	116-500	25-50	2800	3280x1368x2240
LMM-90L	90	75- 90/11	0.1-1	173-1000	41-65	3300	3300x1730x2140
LMM-150L	150	160/15	0.1-1	300-3000	66-100	5800	4500x1700x2400
LMM-400L	400	315- 355	0.1-1	732-10000	100-300	10000	4600x1600x2400

SW Universal Nano Bead Mill

Dual-Function Innovation: Integrated Grinding & DispersionPrecision particle reduction and high-efficiency dispersion in a single processing step.



Enhanced Large-flow Screen Design

Provides approximately 30% higher flow efficiency than conventional designs.

Proprietary Axial Dynamic-discharge Technology

Helps avoid screen clogging when processing high-viscosity materials.

Triple Discharge Solutions (Industry Pain Point Resolution)

Static High-Flow Mode
Dynamic Anti-Clog Mode
Hybrid Processing: Adaptive viscosity management

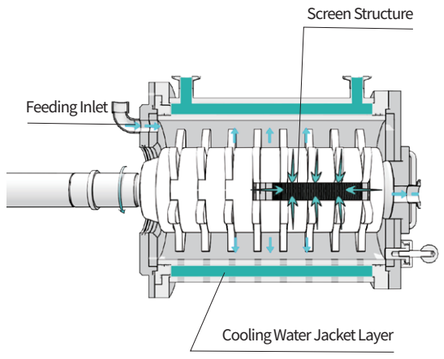
High Speed Bead&Material Interaction Dynamics

Grinding Zones

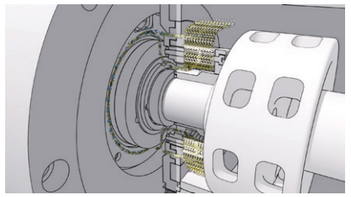
- Primary Crushing Zone:Zirconia beads perform high-frequency collisions in vortex flow.
- Secondary Refining Zone:
Precision shear forces through dynamic gaps.

Uniform Bead Distribution System

- Optimized Rotor Kinematics:
Maintains homogeneous bead dispersion.
Prevents over-crushing.
- Damage-Free Processing:
Achieves micron/nano-scale refinement.
Preserves particle structure integrity.

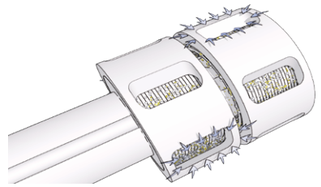


Discharge Methods Options



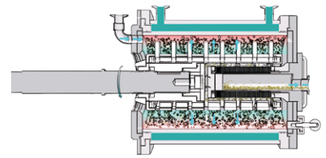
Rotating/Stationary Ring Discharge

Utilizes optimized seal ring contact pressure
Enables high-efficiency micro-gap discharge



Axial Discharge

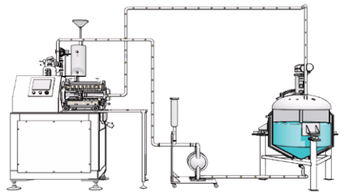
Hollow shaft design
Intelligent centrifugal force regulation
Achieves dynamic separation and axial material discharge



End Part Discharge

Static wedge-wire creen configuration
Optimized hydrodynamic flow paths
High-volume efficient discharge

Continuous Circulation Production



Pre-Dispersion: Homogenization in pre-mixing tank
Grinding Process:Coarse grinding → Precision refinement
PLC Control:Real-time parameter adjustment
Energy-efficient operationPrevents over-grinding

Beads Fill ing Rate: 70%-85%
Energy Consumption: 17.205-56.025kWh
Flow Area: 78.2cm²-1156cm²
Separation Method: Screen Type
Screen Type: Ceramic Disc/Wedge-Wire

Speciafication

Model	Chamber Volume (L)	Drive Power (kW)	Bead Diameter (mm)	Screen Gap (mm)	Batch Capacity(L)	Feed Rate (L/min)	Weight (kg)	Dimensions (mm)
SW-5L	4.5	15	0.1-1.5	0.05-0.75	10-50	6-42	550	1430x748x2000
SW-10L	10	18.5-22	0.1-1.5	0.05-0.75	25.2-100	6-42	750	1467x863x1655
SW-30L	30	37-45	0.1-2	0.05-1	58-300	16.7-41.7	1700	2950x1220x1850

BYZR Ceramic Turbine Bead Mill

Full ceramic elongated chamber and turbine structure design, achieving gentle and efficient material dispersion and crushing.



Low-speed(flexible grinding)

Efficient and gentle dispersion/crushing of materials, avoiding structural damage to the material.

Coordinated axial and radial movement

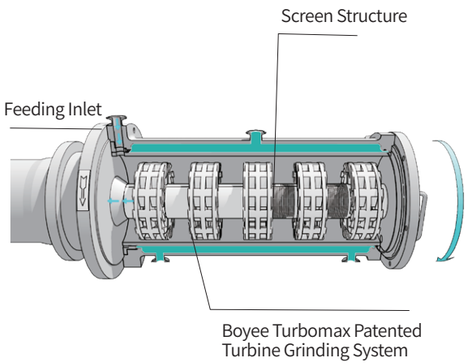
Enables highly efficient circulating grinding.

Axial discharge design

Allows precise separation of micro grinding beads.

Working Principle of Material and Grinding Beads Inside the Chamber

When the turbine structure operates, the material is axially drawn in and forms a spiral laminar flow along the curved blades. This subjects the material to repeated uniform shear and friction forces during laminar movement, achieving particle dispersion and refinement.

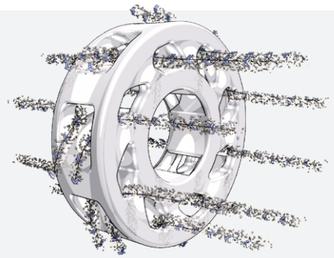


Gentle Dispersion and Grinding

1. Low-speed design: Compared to traditional high-speed grinding equipment, the turbine operates at a low rotational speed, reducing mechanical impact forces.

2. Soft contact: A cushioning material on the blade surface reduces the intensity of direct particle collision.

3. Laminar-flow dispersion: Material is subjected to gradual forces within the laminar flow, avoiding localized stress concentration, enabling gentle fragmentation and dispersion.



Axial Motion Path

Material and grinding beads follow an axial motion path within the grinding zone drawn in and ejected, achieving material refinement.

Radial Motion Path

Unqualified material and the grinding beads move along the radial path and return to the grinding zone.



Speciafication

Model	Chamber Volume (L)	Drive Power (kW)	Bead Diameter (mm)	Screen Gap (mm)	Batch Capacity(L)	Feed Rate (L/min)	Weight (kg)	Dimensions (mm)
BYZr-3L	2.8	7.5	0.2-1	0.1-0.5	5.6-30	1-10	468	1200x1050x1450
BYZr-15L	15.6	30	0.3-1	0.15-0.5	31.2-100	5-15	1205	1600x1350x1850
BYZr-30L	22.5	45	0.3-1	0.15-0.5	45-30	6-42	1425	1650x1305x2050

BY-GFM Dry Bead Mill

Integrated grinding and classification: high-efficiency ultrafine powder processing equipment.

Integrated Process
Combines grinding, classification, collection, and dust removal for continuous, efficient production.

Lower-Energy Dry Grinding
Designed to reduce the energy consumption of conventional air-jet mills.

TSD Dynamic Classification Technology
Precise control of particle-size distribution.

Low-Residue Design
Improves material utilization and reduces material waste and cross-contamination.



Classification



The material enters the classifier wheel area carried by the airflow; coarse particles are flung toward the outer wall by the classifier wheel, while fine particles pass through the classifier wheel into the next stage.

Dust Removal

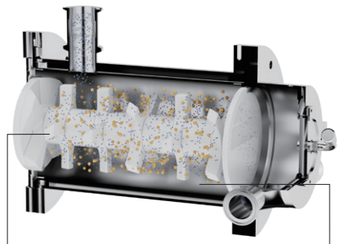
Dusty gas enters the dust collector, where the dust is filtered out, and clean gas is discharged.



Collect

The separated fine powder is collected by the collector, yielding a qualified finished product.





Inclined Alternating Pin Rotor
The pins are arranged in alternating forward and reverse directions, producing shearing, impact, and grinding effects.

Grinding Chamber
The material and grinding media undergo multiple processes within the chamber to be crushed and ground into finer particles.

Process Flow of Dry Bead Mill



Speciafication

Model	Volume(L)	Production Capacity (kg/h)	Grinding Media Size (mm)	Main Motor Power(kW)	Dimensions (mm)	Weight(kg)
BY-GFM001	1	5-10	2-3	2.2	645x600x1400	100
BY-GFM005	5	20-30	3-5	7.5	1300x600x1600	250
BY-GFM010	10	40-50	3-5	15	1360x700x1680	680
BY-GFM030	30	60-80	3-5	22	1450x800x1750	750
BY-GFM060	60	100-140	3-5	37	1800x900x1650	850
BY-GFM100	100	250-300	3-10	55	2500x1900x1200	3100
BY-GFM250	250	500-600	5-10	110	2700x2000x1580	5500
BY-GFM500	500	1000-12000	5-10	200	3000x2500x2100	8000

Inline Mixer

Integrated Powder Induction, Feeding, Dispersion, and Mixing in One Machine.

Improved Mixing Efficiency
Powder is wetted instantly and rapidly enters the liquid phase, shortening wetting time.

High-Shear Flow Field
Quickly breaks up agglomerates in powdered materials to form a uniform and stable dispersion system.

Continuous Feeding and Discharging
Reduce batch-to-batch variation and improve product consistency.

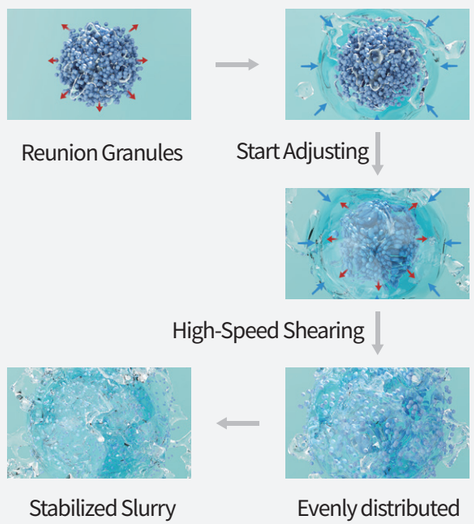
Simultaneous Processing
Powder induction, wetting, dispersion, and mixing are completed at the same time, reducing equipment configuration and process complexity.



Speciafication

Item	Description
Model	IMM -2000
Main Motor Power (kW)	37kW
Rotor Speed (rpm)	0-3700
Liquid Viscosity (cP)	⩽10000
Sealing Method	Mechanical seal
Material Temperature (℃)	0-70
Mixing Chamber Material	Stainless steel
Sealing Material	Fluorocarbon rubber
Solid Content	60%
Powder Throughput (kg/min)	300
Flow Rate (L/h)	30000
Dimensions (mm)	1403x853x1238

The Dispersion Process of Materials in Equipment



High-Speed Mixer

Powder processing equipment integrating uniform mixing, grinding, and plasticizing.

High-Shear Mixing
Achieving high-efficiency fiberization of binders

Three-Paddle Coordinated Dispersion
Improving mixing uniformity

Vacuum Inert Atmosphere
Suitable for the production of sensitive materials

Precise Temperature Control
Reduces the effect of frictional heating on material properties and fiberization



The Principle of Material Mixing in Equipment



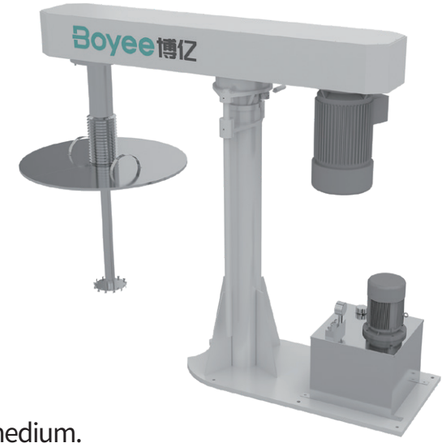
Speciafication

Model	Volume (L)	Linear Velocity (m/s)	Motor Power (kW)	Weight(kg)	Dimensions(mm)
BYHH-5L	4	15-42	2.2	500	1200x600x1300
BYHH-10L	8	15-42	4	800	1300x700x1400
BYHH-20L	16	15-42	11	1000	1400x750x1500
BYHH-50L	42	13-42	15	1500	1600x800x1700
BYHH-100L	85	13-42	18.5	1800	1800x900x1800
BYHH-200L	170	15-40	22	2000	2000x950x1900

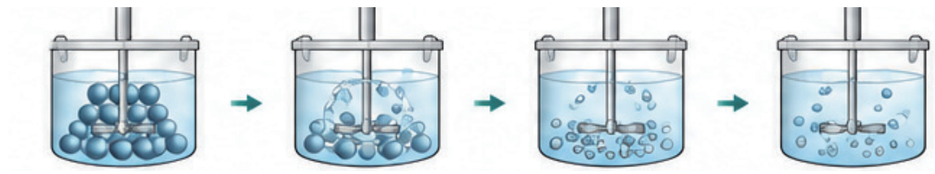
High-Speed Disperser

Efficient Dispersion, Anti-Agglomeration; Flexible for Multiple Applications.

- **High-speed Dispersing Disc**
  Creates a strong shear field, quickly wetting and dispersing powder.
- **Continuously adjustable dispersion rate**
  Suitable for different viscosities and process requirements.
- **Lifting and Mobility**
  Quickly switch between different containers.
- **Reducing Particle Agglomeration**
  To promote the uniform dispersion of powders in a liquid medium.



Schematic of the Material Dispersion Process



Agglomerated State | Shear Stress | Dispersion Process | Evenly Dispersed

Specification

Model	BY-FJ2.2	BY-FJ4	BY-FJ5.5	BY-FJ7.5	BY-FJ11	BY-FJ18.5	BY-FJ22	BY-FJ45	BY-FJ90
Main Motor Power (kW)	2.2	4	5.5	7.5	11	18.5	22	45	90
Dispersing Shaft Speed (r/min)	0-1450	0-1450	0-1450	0-1450	0-1450	0-1450	0-1450	0-1450	0-1450
Dispersing Disc Diameter (mm)	Φ150	Φ200	Φ250	Φ250	Φ250-Φ300	Φ300-Φ350	Φ350-Φ400	Φ450-Φ500	Φ600
Pump Power (kW)	0.75	0.75	0.75	0.75	1.1	1.1	1.1	2.2	2.2
Tank Capacity (L)	＜50	＜200	＜400	400-600	＜500	＜1000	＜1200	＜2000	＜5000
Lifting Stroke (mm)	800	900	1000	1100	1200	1300	1400	1600	2000
Overall Dimensions (mm)	1400x450x1450	1400x450x1450	1700x550x1700	1700x550x1700	1800x550x1750	1900x700x1800	1900x700x1800	2100x800x2000	3500x1000x2250
Weight (kg)	300	350	450	500	500	550	600	1000	1200

Dispersion Tank

Advanced dispersion technology and precise workmanship provide uniform material dispersion and highly effective mixing.



- **Features a recirculating mixing mechanism**
  Ensure the material circulates up and down to prevent localized deposition.
- **High-Speed Shear Effect**
  Promotes rapid wetting and dispersion of powders and reduces particle agglomeration.
- **Achieve uniform dispersion of solids and liquids**
  Reduces settling and stratification risk.
- **Flexible Configurations**
  Different agitation structures can be selected according to material viscosity and process requirements.

The Principle of Material Dispersion in Tanks



Mixing Stage | Agitation & Circulation | Uniform Mixing | Evenly Distributed

Specification

Volume (L)	Tank Diameter (mm)	Stirring Power (kW)	Stirring Speed (r/min)	Work Pressure (MPa)
20	300	0.55	0-1450	⩽0.2
50	450	1.1	0-1450	⩽0.2
100	500	1.1	0-1450	⩽0.2
200	700	1.5	0-1450	⩽0.2
300	900	3	0-1450	⩽0.2
500	1000	4/5.5	0-1450	⩽0.2
1000	1200	5.5-11	0-1450	⩽0.2
2000	1400	7.5-15	0-1450	⩽0.2
3000	1500	15-22	0-1450	⩽0.2
6000	2200	22-37	0-1450	⩽0.2
10000	2400	22-45	0-1450	⩽0.2

BY-MHY Dual Planetarr Mixer

Dual-planetary revolution and self-rotation provide dead-zone-free material mixing.



High-Speed Dispersion Shaft with Coordinated Agitator Blades
Quickly disperse agglomerated particles.

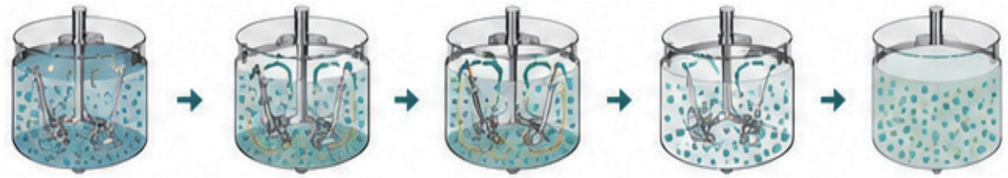
Supports Cooling and Heating Functions
Double-layer jacket for precise control of material temperature.

Wall-scraping Mechanism
Operates close to the vessel wall to remove wall deposits and dead zones.

Dual-planetary Revolution and Rotation
Achieve efficient three-dimensional mixing and improve dispersion uniformity.

Supports Vacuum Mixingand Degassing Processes
Effectively remove air bubbles from the slurry.

Schematic of the Material Mixing Process



Feeding Stage → Planetary Revolution → Rotational Shear → Intensive Mixing → Discharge Complete

Specification

Speciffcation	BY-MHY-2L	BY-MHY-6L	BY-MHY-10L	BY-MHY-15L	BY-MHY-20L	BY-MHY-30L
Design Volume	5L	10L	15L	20L	25L	40L
Disperse Speed	3000rpm	3000rpm	3000rpm	3000rpm	3000rpm	2800rpm
Mixing Speed	100rpm	100rpm	100rpm	80rpm	80rpm	80rpm
Total Power	3kW	4kW	4.5kW	5kW	6kW	8kW

Speciffcation	BY-MHY-100L	BY-MHY-150L	BY-MHY-200L	BY-MHY-300L	BY-MHY-600L	BY-MHY-800L	BY-MHY-1000L	BY-MHY-2000L
Design Volume	140L	190L	280L	380L	700L	1050L	1380L	2400L
Disperse Speed	2800rpm	2800rpm	2800rpm	2600rpm	2200rpm	1800rpm	1600rpm	1200rpm
Mixing Speed	80rpm	80rpm	80rpm	60rpm	48rpm	48rpm	40rpm	35rpm
Total Power	20kW	27kW	30kW	38kW	82kW	92kW	120kW	140kW

Mixing Tank

Gentle stirring designed to protect material structure and facilitate mixing of high-viscosity fluids.



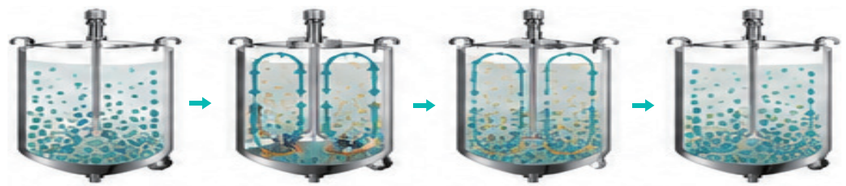
Upward and Downward Circulation of Materials
Improve overall mixing uniformity

Low-Shear Mixing Method
Minimize damage to the material structure

Achieving Stable and Efficient Blending
Optimized design for high-viscosity, high-solids-content materials

Supports Variable-Frequency Speed Control
Flexibly adjust the mixing speed based on the characteristics of different materials

Principles of Material Agitation in Tanks



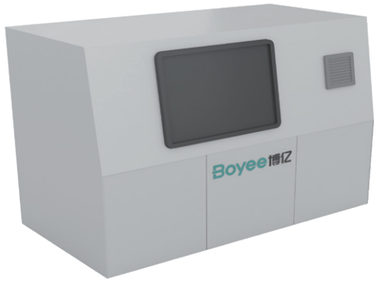
Start Stirring → Circulating Flow → Uniform Mixing → Mixing Complete

Specification

Volume (L)	Tank Diameter (mm)	Stirring Power (kW)	Stirring Speed (r/min)	Work Pressure (MPa)	Pressure in the Interlayer (MPa)
20	300	0.37	0- 130	0.08	⩽0.2
50	450	0.75	0- 130	0.08	⩽0.2
100	500	1.1	0- 130	0.08	⩽0.2
200	700	1.5	0- 130	0.08	⩽0.2
300	900	3	0- 130	0.08	⩽0.2
500	1000	4/5.5	0- 130	0.08	⩽0.2
1000	1200	5.5- 11	0- 130	0.08	⩽0.2
2000	1400	7.5- 15	0- 130	0.08	⩽0.2
3000	1500	11- 18.5	0- 130	0.08	⩽0.2
6000	2200	18.5- 37	0- 130	0.08	⩽0.2
10000	2400	22- 37	0- 130	0.08	⩽0.2

High-Pressure Homogenizer

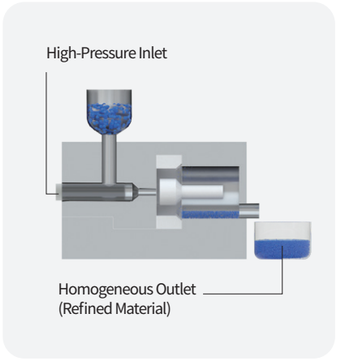
Ultra-high-pressure homogenization achieves ultra-fine particle size.



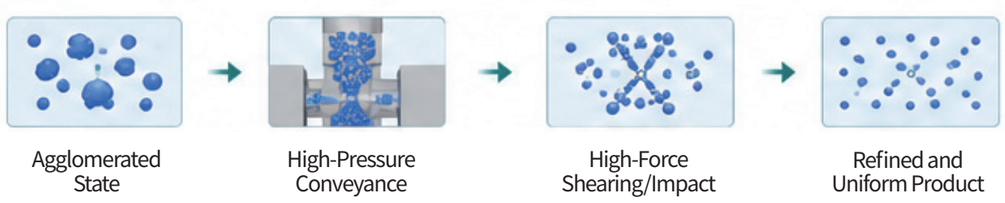
Solid–liquid and Liquid–liquid Homogenization
Rapidly achieves homogeneous dispersion, improving emulsification and product fineness.

Supports Continuous Homogenization Processes
Supports laboratory, pilot-scale, and full-scale continuous production.

Precise and Adjustable Homogenizing Pressure
Adaptable to different materials and process requirements.



Principles of the Material Homogenization Process



Specification

Model	Motor Power(kW)	Power Supply(V/Hz)	Throughput(L/h)	Work Pressure(bar)	Min. Throughput(ml)
BY-22P	18.5	380V/50Hz	500-600	1000	3000
BY-30	30	380V/50Hz	400-500	1500	3000
BY-30P	30	380V/50Hz	800-1000	1000	3000
BY-37	37	380V/50Hz	700-800	1500	5000
BY-55	55	380V/50Hz	1800-2000	1000	5000
BY-90	60	380V/50Hz	3000	1000	6000
BY-110	110	380V/50Hz	4000	1000	8000
BY-160	160	380V/50Hz	6000	1000	10000

FCCVD SWCNT Growth System

An innovative suspension-based process for the continuous, uninterrupted production of high-purity, highly ordered SWCNTs.



Multi-stage Ultrasonic Nebulization Feed
Improving growth uniformity.

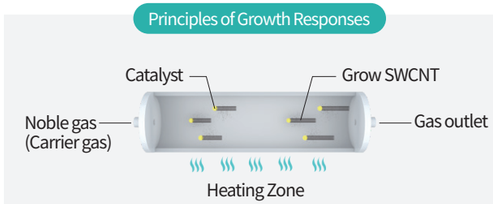
Independent Temperature Control for Multiple Zones
Ensuring stable reaction conditions to promote the continuous, oriented growth of SWCNTs.

Preheated-gas Feed System
Improving carbon source pyrolysis efficiency and growth stability.

Continuous Product-collection Mechanism
Large-diameter furnace tubes are combined with a rotating shaft to enable production without shutdowns.

Stainless Steel Explosion-Proof Furnace Housing
Combined with localized water cooling and thermal insulation design to ensure safe and stable operation.

Principles of Growth Responses



Specification

Category	Small diameter (single tube)	Large diameter (single tube)	Large diameter (double tube)	Large-bore (Twin-tube) extended-length production model
Tube material	Alundum tube	Carborundum tube	Carborundum tube	Carborundum tube
Furnace tube size (mm)	ϕ80*1800	ϕ220*2200	ϕ220*2200×2	Φ220x3500 ×2
Heating power (kW)	30	60	80	100
Heating zone	5 section. Heating section is 1600mm	5 section. Heating section is 1800mm	5 section. Heating section is 1815mm	8 section. Heating section is 3000mm
Maximum Temp. (°C)	1650	1350	1350	1350
Heating system	Resistance heating	Resistance heating	Resistance heating	Resistance heating
Temp. control mode	Type-B thermocouple	Type-S platinum rhodium thermocouple	Type-S platinum rhodium thermocouple	Type-S platinum rhodium thermocouple
Temp. control accuracy (°C)	±1	±1	±1	±1
Temp. uniformity (°C)	±5	±5	±5	±5
Growth efficiency (g/h)	~6-10	~30-40	~60-70	~100 -120
DimensionL*W*H (m)	2.3*0.8*1.5	3*1*1.8	3.5*1.2*2.1	4.5x1.6x2.3

Pre-Sales Service

Boyee provides comprehensive pre-sales technical solutions, including material-testing services and customized production-line process solutions. The professional team combines industry knowledge with practical experience to identify customer requirements accurately.

Inquiry → Test Scope Confirmation → Project Details → Submit a quotation → Conduct Tests → Experimental Results

In-Sales Service

Boyee Provides comprehensive technical support and solutions to ensure that projects proceed smoothly and meet customer needs.

- On-Site Inspection and Technical Support
- Equipment Selection and Configuration
- Solution Design and Optimization
- In-house manufacture of supporting equipment
- Comprehensive Project Management

After-Sales Service

Installation Service

Develop and Implement a Detailed Installation Plan

After purchase, Boyee' s service team provides support for installation, commissioning, and start-up. Experienced installation personnel provide installation and assembly, no-load commissioning, commissioning with material, and site acceptance testing (SAT).

Installation & Assembly → Empty Machine Debugging → Debugging with Materials → Site Acceptance Test (SAT)

Repair and Maintenance

Ensure the Stable Operation of the Equipment

Malfunction Repair

In the event of interrupted operation, production stoppage, or another equipment issue, customers may obtain professional advice through the online support system or by telephone. The service team provides comprehensive support to minimize the impact and loss caused by equipment failure.

Regular Maintenance

Regular maintenance inspections are recommended to protect equipment service life, prevent abnormal operation, and identify potential issues as early as possible.

Partners

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