INTEGRATED POWDER PROCESSING AND CONTAINMENT SYSTEMS

HOSOKAWA MICRON LTD

PROCESS TECHNOLOGIES FOR TOMORROW™
Here in the United Kingdom, Hosokawa Micron Ltd is your single source for integrated powder processing systems and component machinery. Bringing together the very best in machinery brands such as Alpine, Hosokawa BepeX, Hosokawa Rietz, Micron, Mikro, Schugi, Stott, Vrieco Nauta, and Vitalair with associated engineering expertise to develop individual processing solutions.

Whether you are seeking a single piece of equipment or a complete process line, Hosokawa Micron engineers work in partnership with your own engineering and production teams to design the most appropriate equipment, to meet your specification needs ensuring complete satisfaction.

Hosokawa’s dedicated R & D programme, combined with extensive practical experience has led to a unique range of products and the development of innovative process technologies for the future, to give customers valuable production advantages.

With over 500 machines available, Hosokawa Micron have the ability to offer equipment and engineered solutions to meet a range of powder and particle processing, hygienic filling and weighing, containment and nano technology requirements.

INDUSTRIAL EXPERIENCE
Pharmaceutical
Chemical
Agrochemical
Cosmetics
Food
Confectionery
Pigments
Powder Coatings
Plastics
Toners
Minerals
Detergents
Metal Powders
Ceramics

Extensive resources and in-house test facilities in the UK and globally with the Hosokawa Group enables Hosokawa to offer a full testing, design, build, installation and commissioning service. From small R & D packages to full turnkey installations, Hosokawa Micron continue to set new standards in powder processing technology.

CONTENTS
Nano Technology 3
Size Reduction 5
Air Classification 7
Agglomeration/Compaction 8
Mixing and Blending 9
Drying 10
Containment Technology 11
Contract Processing/Technical Centre 13
Laboratory & Pilot Plant 14
For decades powder and particle engineering has been developed successfully in many industry sectors. With diverse demands for product fineness, pristine end product, process efficiency and increased product functionality, Hosokawa Micron have pioneered new technologies, new equipment and new integrated processing systems to meet those demands.

**Design Technology**

Whilst many established units of Hosokawa equipment have, over the years, become industry standards, at the time of their development many technologies revolutionised material processing. It is this desire to develop process technologies for tomorrow that remains at the core of Hosokawa Micron’s philosophy today.

The global Hosokawa Micron Group continues to extend the boundaries of powder and particle technology, leading the way in the very science of the materials themselves.

**Particle Design**

Significant investment in the UK, USA and Japan has resulted in the development, manufacture and commercialisation of high value nano-particles, through a range of particle modification technologies. Advanced material development permits a range of industries, including electronics, medical/biotechnology, ceramics, defence, cosmetics, healthcare and pharmaceuticals, to produce goods that offer the manufacturer a more competitive advantage, and provide the consumer with greater performance.

**Mechanical Particle Design**

**Composing** - Combining different particles into one particle to enhance chemical reaction, flowability, heat resistance, performance and solubility.

**Dispersion** - To improve colour tone, reactivity, calcination ability and mechanical intensity.

**Sphericalization** - Improves flowability and packing density.

**Agglomeration** - Creates easier handling properties with controlled agglomeration size; coating with other particles can control solubility.

With more than 85 years experience in powder sciences and technology, the Hosokawa Micron Group offer a unique combination of pioneering development resources and practical solutions and equipment to their customers, worldwide.
Nanoparticles have huge potential across a range of industries. Not only do they offer the potential of more effect for much less mass, but in many cases the product effect can be quite different from that achievable with micron sized particles, for example, their optical, mechanical, thermal and electrical properties show step changes at particular sub-micron particle thresholds.

Improvements in particle functionality
- enhanced flowability and packing density
- increased solubility
- controlled dissolution rates
- combination of multi functions on individual particles
- improved chemical reaction rate

Hosokawa Micron has developed a new nanotechnology product portfolio to develop particle modification technologies which will improve powder characteristics and/or create new powder characteristics without changing any chemical properties. This will lead to an increase in customers product values by improving and adding functionality.

NANOCREATER
A continuous production system for nanosize metal oxide. The particle is created in a build up method that allows particle size to be adjusted from a few nm to a few hundred nm. Single component or multi-component particles can be created.

NOBILITA
- Particle Production
Designed for high speed powder mixing, combining particles into composites in a dry process without binders, by applying mechanical force. Also used for particle surface modification and shape enhancement.

Top-Down/Bottom-Up Technologies
These two generic approaches to the manufacture of nanoparticles are currently being pursued. Among the most promising ‘top-down’ methods are ultrafine comminution, aerosol routes and very rapid precipitation. In the longer term, ‘bottom-up’ molecular self-assembly routes are likely to become important commercially.

These technologies not only produce added value materials, but can also lead to process improvements by reducing process steps and energy costs.
Hybrid Isolator

With the advancement of Nano Technology and the perceived hazards associated with handling Nano Powders, Hosokawa has developed a new range of Containment equipment designed specifically to contain these ultra fine powders.

A high visibility, cost effective, mid-range option for the containment of products and processes with containment levels below 1µg/m³. Suitable for applications that require the containment of larger pieces of equipment or a larger processing area. A mobile, wheeled isolator with short production lead times.

- acrylic canopy for full visibility without dark spots and shadows, to give full operational visibility.
- location of glove ports in any position on all four sides of canopy for all round access.
- includes HEPA filtration and a continuous liner bag out port.

Submicron and nanoparticles can be obtained in a “top to bottom” process by wet milling. Agitated media mills such as the Alpine AHM Mill are used to grind such particles to a fineness down to 10nm. The process requires a high specific energy input, very small grinding beads and a high performance wear protection material. Particles have to be stabilised against re-agglomeration by use of chemical additives or an electrostatic or steric mechanism.
With one of the largest ranges of size reduction equipment, Hosokawa Micron are able to offer equipment for both wet and dry applications. From ultrafine milling to coarse milling, the Hosokawa milling range can meet the most stringent particle size requirements. A pioneer in new size reduction technologies, including nanotechnology, Hosokawa Micron have equipment suitable for the production of submicron particles down to 10 nm.

Machines are available in a range of wear resistant materials, surface finishes and easy clean designs, adding further versatility to the Hosokawa Micron range. Cryogenic or high heat variants, low noise and explosion protection designs can also be offered.

Hosokawa Micron also specialise in the development of fully contained milling systems, where equipment is completely re-designed, to become part of a fully integrated contained system with certified dust containment levels.

**WET MILLING**

**HOSOKAWA RIETZ IN-LINE DISINTEGRATOR**

For continuous in-line size reduction, mixing and de-lumping or dispersion of liquids, slurries and suspensions. A centrifugal grinding action passes particles through a perforated 360˚ screen whilst mixing takes place due to the intense turbulence and high shear rate created by the machine. Compact and robust, easy clean design.

*Applications:*
- Detergents
- Dispersing colour pigments
- Size reduction of suspended solids

**DRY PROCESSING**

**AIR CLASSIFIER MILLS**

An integral classifier enables accurate control of particle size, distribution and cut point.
- Cool, smooth grinding
- Steep particle size distribution
- Sharp classifier cut point, instantly adjustable
- Easy clean, CIP, split body and special designs available

**ALPINE FLUIDISED BED OPPOSED JET MILLS AFG**

AFG systems produce ultrafine powders with narrow particle size distributions and sharp topsize limitations. Size reduction through particle to particle attrition in the centre of a fluidised bed of material allows grinding of even hard materials to Mohs hardness of 10.

- Consumes up to 50% less energy than any other conventional jet mill
- Operates with a minimum of wear
- Can produce iron free ultrafine powders
Pre-crushing, pulverising and grinding before further processing, size reduction of large volume units or difficult to handle resins and rubber can be achieved by using Hosokawa Micron’s range of heavy duty granulators and mills. Characteristically robust in construction and achieving high torque size reduction, this range of equipment operate as single pass units for efficient controlled particle size processing.

**HOSOKAWA RIETZ ANGLE DISINTEGRATOR**

For hygienic grinding, delumping and separation, offering uniform particle size reduction with inbuilt primary and secondary discharge outlets.

- Compact design, small footprint
- Variable screen sizes
- Fluid injection system for bending and mixing.
- Easy clean design

**HOSOKAWA RIETZ PREBREAKER**

For continuous crushing and pre-crushing applications. This machine is robust, low wear, low maintenance and low power consumption.

- Withstands shock loads
- Available in Stainless and Carbon steel

**FINE IMPACT MILLS UPZ**

UPZ fine impact mills can be equipped with a variety of exchangeable, rotating or stationary grinding elements making them suitable for many different tasks.

- Wide range of fineness from 20 to 700μm
- Cryogenic or inert gas operation designs
- 10 bar psr designs

**HOSOKAWA RIETZ RUBBER CHOPPER**

Size reduction of material or synthetic rubber bales/blocks and polymers. Can handle most bales easily and speedily with a series of adjustable hammers and anvils, orifice plate and cut off knives. Standard sized bales can be processed in a single pass.

- Rugged construction
- Low noise, low temperature rise
- Controlled particle size

**HOSOKAWA RIETZ EXTRACTOR**

Similar operation to Prebreaker but produces less product bruising due to the reduced number of hammers/anvils.

Hygienic, robust, low maintenance construction.

- No need for band sawing, thawing of blocks; consequently no fluid loss
- Minimum product temperature rise
- No knives to sharpen
When material particle size is important for end product performance or further processing, air classification offers separation by particle density and diameter into the required fractions. In mechanical air classifiers, centrifugal force is added to gravity to separate the particles by size and density within the air stream.

With their range of Alpine air classifiers, Hosokawa Micron are considered market leaders in air classification.

**ALPINE TSP AND TTSP CLASSIFIERS**

Type TSP and TTSP Classifiers are specially designed to produce a dust free coarse product, for example pigments, silicic acid and chemical additives. Used extensively for de-dusting of toner and powder coatings where customers demand a narrow particle size distribution. The TSP and TTSP sifters are able to separate out fine dust in the <3-5µm range.

The tandem classifier wheel design of the TTSP is ideally suited to the low melting point colour toners because of the low energy concentration inside the machine.

Easy dismantling for rapid cleaning between products.

**ALPINE ATP TURBOPLEX CLASSIFIER**

A single or multi wheel classifier for ultra fine separations. Superfine powders in the fineness range of d97 3 - 10µm and in NG design, fineness down to d97 2µm are possible. Spatter grain free operation over the entire separation range. Suitable for sticky products or hard agglomerates.

- High fines yield
- Sharp topsize limitation
- Wear protected options
- Modest space requirement
- Low maintenance

**MULTI-PLEX ZIGZAG CLASSIFIERS**

These cost effective, continuous operation classifiers offer separation in the range d97 = 0.3 -10mm with throughputs from lab scale up to 2000/h. Available in single or multi-tube variants, classification takes place at every change in the direction of the zigzag tube and permits a high steplessly adjustable precision of cut.

Applications:
- Separation of materials which are difficult to sieve or cannot be sieved at all
- Separation of pieces with the same size but different specific gravity
- Oleaginous fruits, valuable metals, dedusting of granules, particle board chips
Fine bulk powders present a number of problems including generation of airborne dust, low bulk density resulting in unnecessarily large containers, high freight costs and poor metering properties. Agglomeration by either compaction forces or through the addition of binders can counter these handling difficulties, transforming powders to granules and giving shape to powders.

BEPEX COMPACTOR
A press agglomerator where material is forced through counter rotating rollers. The shape of the discharged product is determined by the roll surface, smooth surfaces producing flakes, fluted ones, granules. Controlable compaction rate delivers variable end product hardness.
- easy to clean
- interchangeable rollers
- Pharma design available

SCHUGI FLEXOMIX
A unique continuous mixer agglomerator where liquids are injected into dry powders to form readily dispersable, dust free granules with free flowing properties. Single or multiple powders and several liquids of varying viscosities can be mixed together.
- Homogenous product
- Easy clean design
- Consistent quality end products

The Agglomerator is an innovative, modular, multi purpose batch fluid bed processor for drying, agglomeration, coating, layering, micro-granulation and spray agglomeration. Its unique design produces flexibility in particle size, shape and density. Single stage spray drying and granulation with the Agglomerator reduces the need for multi-step processing and uses a single machine.

Producing accurately sized and spherically shaped free flowing final agglomerates it is ideal for:
- sweeteners, natural colourings, fragrances, extracts, vitamins, speciality chemicals, pharmaceuticals.
Manufacturing a range of mixers suitable for batch or continuous operation, Hosokawa Micron are able to offer single mixer supply or development of complete mixing systems with ancillary product handling equipment. Following analysis of your products and details of your end material requirements, Hosokawa Micron are able to advise on the most suitable machine type and model for individual applications. Hosokawa offer a complete range of low to high shear mixers.

**MIXING AND BLENDING**

**HOSOKAWA MICRON TECHNOLOGY**

**VRIECO-NAUTA CONICAL MIXER**

For the mixing and homogenation of powders, pastes and slurries as well as agglomeration, crystallisation, aeration, and densifying applications.

The Vrieco-Nauta has become the industry standard mixer across a range of industries.

- Gentle action on product
- Fast, accurate mixing
- Minimum heat generation
- Self emptying, minimum product retention
- De-mixing effect impossible when emptying vessel

**CYCLOMIX**

The Cyclomix is suitable for a range of applications including the mixing of cohesive powders, moistening, plastifying and granulating. It is ideal for a variety of product types with powdery, fibrous or pasty consistencies.

- Fast and intensive mixing (mixing times from 30 seconds to 5 minutes)
- No bearings or seals in the product zone
- Efficient control of product temperature for product consistency

**HOSOKAWA RIETZ EXTRUD-O-MIX**

The Extrud-O-Mix is designed to continuously mix solids, solids/liquids, pastes, doughs and plastic masses. It can also be used for agglomeration with the addition of liquid.

- Unique continuous kneading and mixing action
- Jacketed for cooling/heating.

Applications:

- Extrusion and forming of fresh yeast, preceding fluid bed drying
- Production of readily dispersible food ingredient granules
- Dispersion of pigment agents for uniform blend

**MIXING SENSOR**

A light-emitting sensor, flush fitted into mixer walls enables operators to continuously monitor the homogeneity and quality of a powder mix, without sample taking. Saves time, cost and improves overall product consistency. Avoids over and under mixing.

**INTENSOMIX**

A compact, intensive mixer for blending powders with liquids without formation of lumps or agglomerates. Two high speed lump breakers fitted to the mixer walls effectively disperse and blend in viscous liquids.
Hosokawa Micron can supply a range of batch or continuous drying equipment and systems to suit most materials in paste, slurry, granule or powder form. With specialist experience of various drying applications Hosokawa Micron are able to offer drying of even difficult to handle materials.

**VRIECO-NAUTA VACUUM DRYER**

Vrieco-Nauta vacuum drying technology has become an industry standard for final drying of intermediate or end products in the Pharmaceutical, Cosmetic, Chemical and Food Industries. The Vrieco-Nauta vacuum dryer is a contact dryer, transferring heat energy through a jacketed vessel wall, causing solvents or moisture residues to evaporate.

Suitable for final drying of powders, granules, pastes and slurries, particularly when they are of brittle or temperature sensitive products, Vrieco-Nauta vacuum dryers offer fast and gentle drying. Available in a range of sizes and materials of construction. This consistently developed and proven drying technology can be incorporated into a full drying system to suit individual requirements.

**STIRRED FREEZE DRYING**

Removes liquids using a single step solid to gas stage without a change in product structure. Ideal for drying applications in probiotic, pharmaceutical and nano material products where pristine, undamaged product is essential. Lump free, free flowing freeze dried products are produced speedily in a single vessel with no need for a additional crushing. Products display good shelf stability and remain unchanged after reconstitution.

**HOSOKAWA DRYMEISTER**

The Hosokawa Drymeister provides a single source for drying, grinding and classifying for slurries and liquids with significant cost saving implications in many cases.

A uniquely designed flash dryer. Ideal for use on pigments, minerals, agro chemicals, food additives, wheat flour and cellulose, the Drymeister achieves single step production of powders.
The pharmaceutical industry is an important business sector for the Hosokawa Group, and over the years significant investment has been made to develop our technology, expertise and service from lab and pilot plant up to full production systems.

Recognising the need for greater levels of containment due to the increasing potency of pharmaceutical compounds, Hosokawa offers a wide range of solutions including isolator gloveboxes, downflow booths, laminar flow booths and pack-off systems, and our technology is currently being utilised by all major pharmaceutical companies throughout the world.

Containment systems may be required for one of the following reasons:

- Operator / person protection
- Environmental protection
- Product protection
- To maintain area classification
- Reduction/removal of air-bourne dust for ATEX compliance.

Changes in legislation mean that there is an increased responsibility on the employer to ensure that operators are adequately protected from potentially hazardous materials and it is no longer acceptable to rely on the use of Personal Protective Equipment (PPE) as the primary form of operator protection – engineering controls and safe systems of work to remove the risk should always be considered first.

Hosokawa Micron provides a full design, build, validation, installation and commissioning service for projects ranging from small R&D systems to full turnkey installations, backed by the global resources of the Hosokawa Group.

Hosokawa Containment equipment can be designed to contain third party pharmaceutical processing equipment such as micronisers, tray dryers, granulators etc.

Hosokawa containment equipment is used for many different pharmaceutical applications such as reactor charging, powder or liquid dispensing, filter discharge, drum filling/emptying etc.

Containment performance has been independently verified down to <10µg/m³ for downflow booths through to nano-gramme levels of containment when using isolator / glovebox technology.

As well as integrating Hosokawa’s own range of processing equipment which has been specifically designed for installation inside an isolator. Product contact parts of the equipment are designed with ergonomics, GMP, easy cleaning and maintenance in mind with drive systems mounted externally to the processing chamber.
CONTAINMENT TECHNOLOGY

FLEXIBLE COMPACT ISOLATOR (FCI)
A cost effective barrier containment solution for scientific research, biotechnology or pharmaceutical applications. Ideal for laboratory analysis, micronising, drying, product transfer and sampling of high potency compounds.

With a stainless steel, mobile or table mounted base, the FCI can be fitted with a PVC flexible or rigid acrylic canopy. Lab scale equipment can be integrated into the FCI for bespoke applications.

- Modular design
- Portable
- Plug and play
- Upgradeable to production standard

ENGINEERING AND DESIGN
All containment systems are designed by Hosokawa’s dedicated team of engineers using the latest CAD software.

KEY DESIGN CONSIDERATIONS
Good ergonomics, safe operation, easy cleaning and maintenance as well as operator or product protection are key considerations when designing containment equipment.

ISOLATORS
Where ultra high containment levels are required for the handling of highly active or toxic chemicals, the Hosokawa range of isolators offers complete operator safety and product integrity. Available for both manual and automatic handling procedures, Hosokawa isolators are available as single units or multiple cell variants where defined barriers separate individual processes. Ideal for critical processes such as milling, drying, dispensing and product pack off.

- Shirt sleeve operation
- Ergonomically designed for user friendly operation
- CIP/SIP options
- Explosion protected

FLEXIBLE COMPACT ISOLATOR (FCI)
A cost effective barrier containment solution for scientific research, biotechnology or pharmaceutical applications. Ideal for laboratory analysis, micronising, drying, product transfer and sampling of high potency compounds.

With a stainless steel, mobile or table mounted base, the FCI can be fitted with a PVC flexible or rigid acrylic canopy. Lab scale equipment can be integrated into the FCI for bespoke applications.

- Modular design
- Portable
- Plug and play
- Upgradeable to production standard
Hosokawa Micron’s pilot plant equipment range extends across their entire product range with most machine types available in a test size variant.

With a range of analysis equipment including the industry standard Air Jet Sieve and the Powder Characteristics Tester to produce accurate, rapid, reliable and repeatable results, Hosokawa Micron continue their ongoing commitment to providing uncompromising transfer of technologies from R & D to optimum production, seamlessly and with minimal processing changes.

Capable of accurately measuring the seven powder characteristics used in the planning, designing and quality control of powder handling and processing systems. Touch screen interface. ISO and JIS compliant.

The seven characteristics are; Angle of Repose, Compressibility, Angle of Spatula, Cohesion, Angle of Fall, Dispersibility and Angle of Difference. Three auxiliary values, Aerated Bulk Density, Packed Bulked Density and Uniformity can also be evaluated using the Hosokawa Powder Characteristics Tester.

A purpose built Test Centre is equipped with over 40 complete systems and machines from the Hosokawa range of equipment to meet the diversity of testing demands and to find the optimum solution to processing problems. Customers are encouraged to carry out trials to replicate site conditions to minimise risk and engender confident decision making.

Technical Centre process capabilities include, size reduction, air classification, sieving, drying, mixing, laboratory technology and powder and particle analysis. Tests can be conducted as a unit operation or as a combination of processes. Every trial is supervised by a professional engineer and is designed to give the customer the most economical solution to his processing problem.

Rental units of many of the technologies are available for customers to use on their own premises, either for use in substantive trials or when waiting for production equipment to be manufactured.
CONTRACT PROCESSING/AFTER SALES

CONTRACT PROCESSING

- Material processed for R&D purposes
- To process material before installation of your own plant
- To process small batches for market testing
- To process materials that can not be done in your own factory

Hosokawa Micron are able to offer contract processing services from single process requirements to complete line services including milling, mixing, classification, agglomeration and drying.

- 3 separate modular processing suites
- over 100 different pieces of equipment available
- separate food standard, processing suite
- amounts from a few kilograms to multi-tonne lots

SENSITISING AND TOXIC MATERIALS

With in-suite containment facilities and specialist barrier containment equipment, Hosokawa Micron are able to maintain product integrity and handle even sensitising and toxic materials.

FOOD PROCESSING SUITE

A separate food processing suite, certified to BRC Food:2005 standard for the milling/size reduction and packaging of dry powders for the food industry, is available.

Technical and processing expertise is available to assist you in ensuring the most efficient and effective system is selected for processing your materials.

AFTER SALES SERVICE

Hosokawa Micron Ltd is committed to providing continual customer support long after a plant has been delivered, installed and commissioned. Our skilled Service Engineers can attend to machinery breakdowns, routine inspections and scheduled services. For process and maintenance advice and optimisation, Hosokawa Micron Ltd Technical Engineers are there to offer advice and help protect your investment.

SPARE PARTS

A genuine spare parts listing and retrieval system for each plant supplied ensures rapid response and minimum downtime.

INSPECTION AND MAINTENANCE

Inspection visit status reports with recommendations on improvements and essential spare parts inventory are designed to ensure optimum performance of equipment.

SERVICING

Annual service contracts to cover one machine to full systems, designed to suit production schedules and statutory compliance can be offered.

SUPPORT AND TRAINING

Customers have access to the resources of the global Hosokawa Group. Full hands-on or service manual style training available.
The Hosokawa Micron Group will always be the leading global company covering the mountain range of Powder Technologies. The Group will achieve peaks of excellence in the development and commercialisation of advanced materials, process equipment and systems engineering.