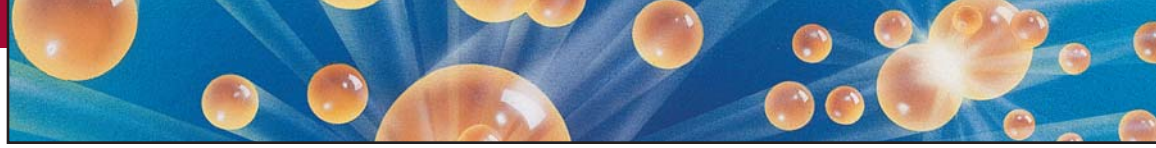
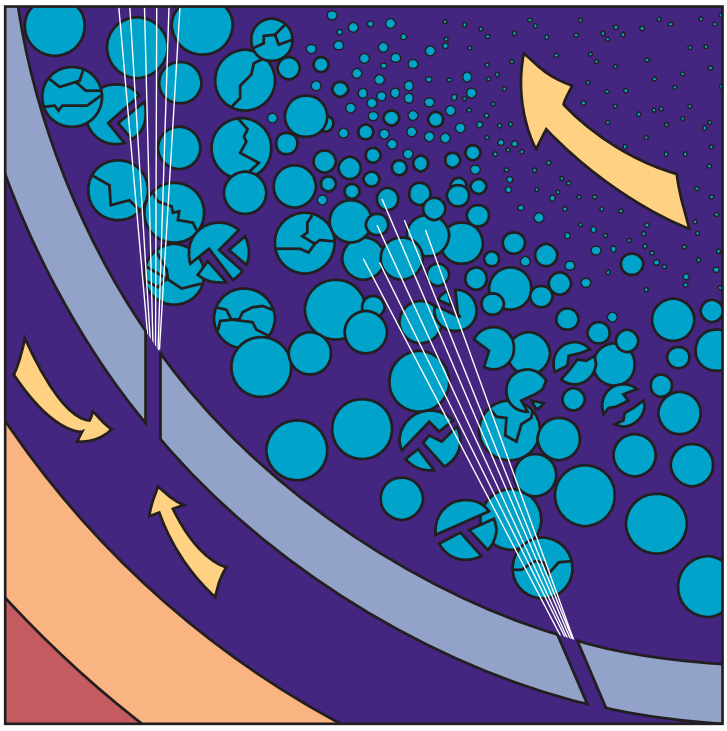


SANITARY DESIGN MICRONIZER®

USDA-Accepted Jet Mills



STURTEVANT
SINCE 1883

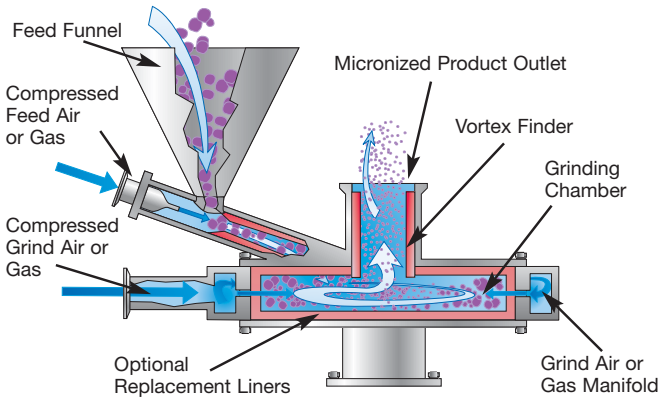
POWDER PROCESSING TECHNOLOGY: THE STURTEVANT SOLUTION.

THINK SANITARY. THINK STURTEVANT.

The Sturtevant Micronizer® utilizes a unique fluid energy grinding system to generate particle-on-particle impact. The Micronizer® grinds and classifies powders to micron and sub-micron sizes in a single operation, in a single grinding chamber using compressed air or gas.

The **Sanitary Design Micronizer®** (SDM) is the only jet mill listed by the USDA in compliance with a 29-page standard for sanitary design and accessibility. It uses quick-release clamps throughout the system and requires no tools for disassembly.

A proven performer in thousands of installations around the world, the Micronizer® processes a countless variety of materials throughout the food, chemical, ceramic, mineral, and pharmaceutical industries.



Designed for high performance below 325 mesh (44 microns) — the economical fineness limit of many mechanical grinders — the Micronizer® can consistently produce fines as small as 0.5 microns.

SANITARY FEATURES

- No moving parts, no jet nozzles
- System disassembles by hand, without tools, in minutes
- Rental systems available for in-house testing of proprietary powders
- Documentation to support FDA validation

BENEFITS

Predictable Performance

- 1000+ installations backed by Sturtevant reliability
- Sole-source responsibility with complete systems availability

Product Quality

- No heat build-up: process heat-sensitive materials
- Minimized product contamination:
  - A variety of specialty ceramic, low carbon steels, and polymeric liners available for adherent or abrasive materials
  - No media contamination
  - No lubrication contamination
- Uniformity: Produces spherical particle shape for reduced agglomeration

Safety

- Processes materials susceptible to oxidation or explosivity: easily adapts to inert gas and superheated steam operations

Engineered to meet sanitary demands with efficiency, the Micronizer® combines high performance and Sturtevant dependability with these benefits and sanitary features:

Options

- Complete with table on wheels for isolation chamber or benchtop stand for fume hood
- Fluid-filled gauges pre-calibrated for easier validation
- Sanitary product baghouse built to USDA specs for easier cleaning
- High-efficiency cyclone for less product loss to exhaust filter bags

Simple Operation

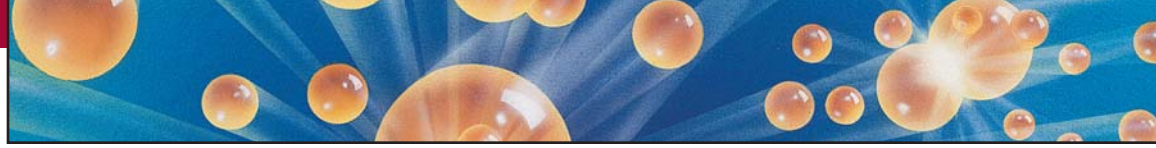
- Preassembled, with optional clamp connections available
- Grinds and sizes in one step; no additional classifier needed
- Operates in any orientation

Low Maintenance

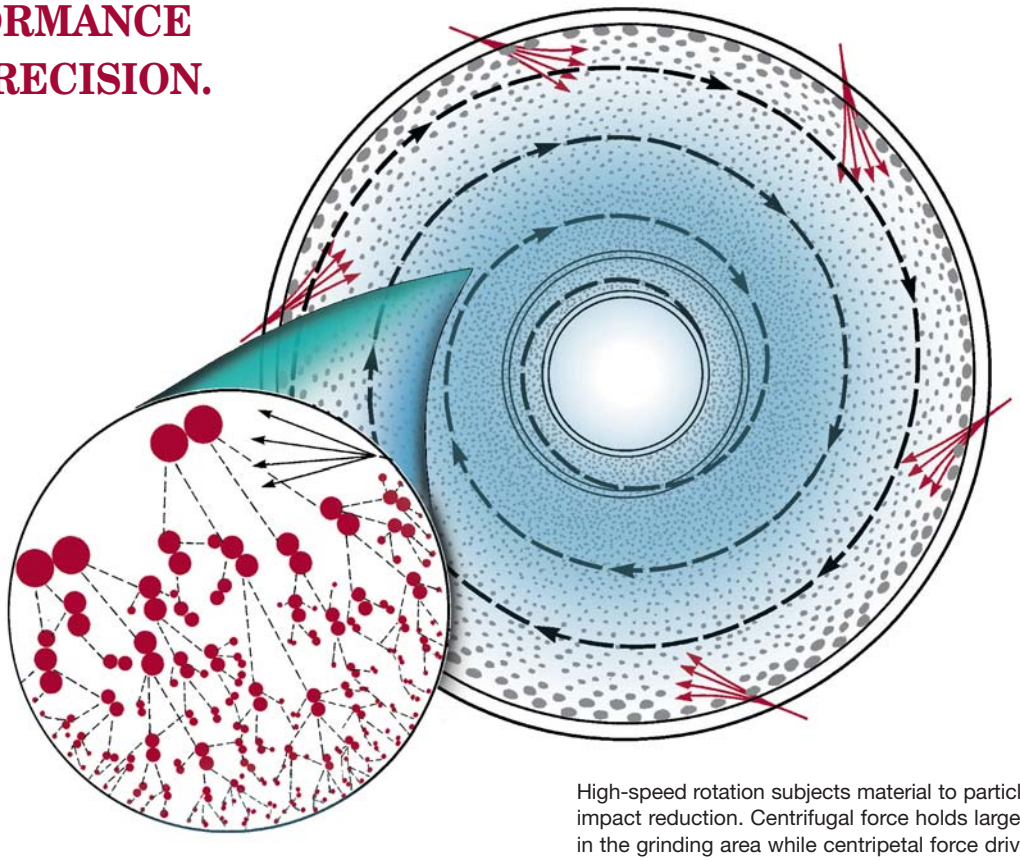
- No moving parts
- No lubrication required
- Designed for easy access and cleaning
- Robust design

Flexibility

- Variety of product collection configurations available with high-efficiency cyclone collectors, single batch bag, or continuous cleaning dust collector



STURTEVANT—
ENGINEERED FOR PERFORMANCE AND PRECISION.



High-speed rotation subjects material to particle-on-particle impact reduction. Centrifugal force holds larger particles in the grinding area while centripetal force drives preselected-sized fines toward the center for discharge.

Rotation generates high-speed particle collision, creating increasingly smaller fines through particle-on-particle impact reduction.

STURTEVANT OFFERS THREE TYPES OF SANITARY DESIGN MICRONIZERS®

Research & Development: Qualification Micronizer® is designed for R&D lab use with batches as small as 1-20 grams using a very small dust bag. It can also be used for large batches (50-500 grams per hour) by utilizing a larger dust bag and optional manual bag shaking enclosure.

Lab Sizes: 2" to 8" diameter Micronizers® are designed for lab use or for pilot plant operation. Complete systems are available that include the Micronizer®, a feeder, a feed filter with sight glass, a cyclone product collector, a stainless steel support table with built-in air controls, exhaust bags or a sanitary dust collector with fan and HEPA Filter.

Production Sizes: 12" to 42" diameter Micronizers® are designed for continuous operation with replaceable liners. Complete systems are available that include the Micronizer®, a feeder, a feed filter with sight glass, a cyclone product collector, stainless support stand and a sanitary dust collector with fan and HEPA Filter.

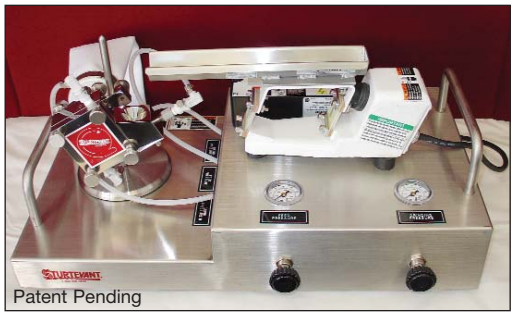
RESEARCH AND DEVELOPMENT

Designed for experimental batches of 1-20 grams, the versatile Qualification Micronizer® can mill 1-7 grams/minute (1/8-1 lbs/hr). The fines it produces have a narrow particle-size distribution, with particle diameters as small as a few microns.

QUALIFICATION MICRONIZER® FEATURES

- Simple to use, inexpensive to own
- Complete package includes mill, base, air controls, feeder & collection bag
- Customized mini dust bag ensures maximum sample recovery
- Low air consumption, can operate with bottled gas or air
- Peripheral feed design significantly reduces blow-back
- Replaceable venturi allows wide range of feed size

Qualification Micronizer®

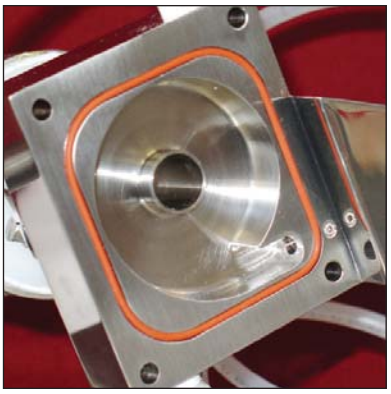


Patent Pending

- Easily fits under a fume hood or in a glove box/isolator
- Replaceable poly air hoses with quick-release connections
- Entire package weighs less than 30 lbs.

- Easy disassembly without tools
- Integral feed funnel does not need screws
- Very few parts - easy to clean or autoclave

- Exhaust bag collects product with minimal dust emissions
- Quick release air hoses



- Similar chamber profile as production Micronizers®
- Built-in jet nozzles
- Oversized outlet improves product exit

Patent Pending

Qualification Micronizer® with Volumetric Screw Feeder

SANITARY PRODUCT COLLECTOR

The Sanitary Product Collector compliments the Qualification Micronizer® by providing the following features:

- See-thru safety cover and HEPA Filter
- Sanitary container with large opening for easy product recovery
- Spring-loaded rod connected to top of dust bag for manual bag shaking
- Adjustable support stand
- Transfer hose from Micronizer® to collector with quick-release clamps
- Pressure gauge and safety pressure relief valve
- Can be added to existing R&D jet mill

LAB AND PRODUCTION SIZE SANITARY DESIGN MICRONIZERS®

With feasibility established in the Qualification Micronizer®, scale-up is simplified in Sturtevant's Lab and Production Micronizers®. Sturtevant, the company that brought you the first USDA-accepted jet mill, also offers an improved Sanitary Design Micronizer® that is more efficient than ever. We spent years developing the first generation, and with significant customer input, we have implemented many of the changes you suggested. Innovations include those pictured here.

Production Micronizer®

Micronizer® with Sight Glass and Dust Containment Filter

Single Clamp Housing is Convenient for Glove Box/Isolator

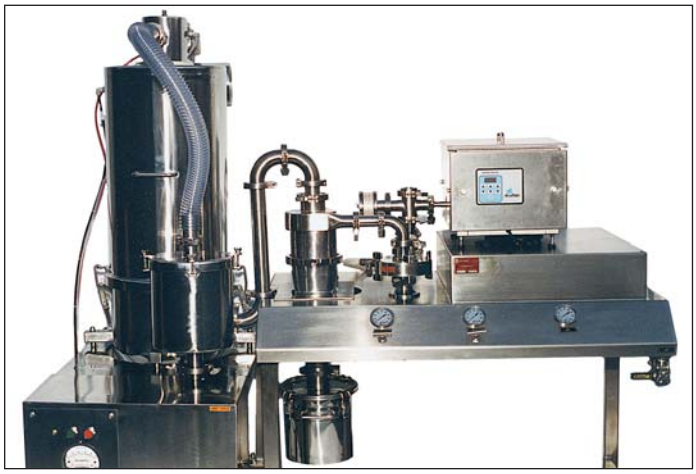
Total Accessibility, No Hidden Areas

MICRONIZERS®				
MILL SIZE/DIA.	ENERGY REQUIREMENTS [1] COMPRESSED AIR/GAS SCFM	[2]HP	CAPACITY LBS/HR	KG/HR
Qualification	8	2	1/8 - 1	.05 -.5
* 2"	20	5	1/2 - 2	.2 - .9
* 4"	55	13	2 - 40	.9 - 18
* 8"	130	31	10 - 100	4 - 45
12"	260	62	30 - 250	13 - 113
15"	350	83	50 - 300	22 - 136
20"	550	130	100 - 1000	45 - 453
24"	1000	236	250 - 1400	113 - 635
30"	1500	354	600 - 3000	272 - 1360
36"	2250	531	1000 - 6000	453 - 2721
42"	3300	779	2000 - 10,000	907 - 4536

[1] Volume of free air at 60° F, 14.7 psi compressed to 100 PSIG. Includes air consumed by feed injector nozzle.
[2] Approximate HP necessary to generate 100 PSIG compressed air.
* USDA-accepted models; larger models can be designed to USDA standards on order.

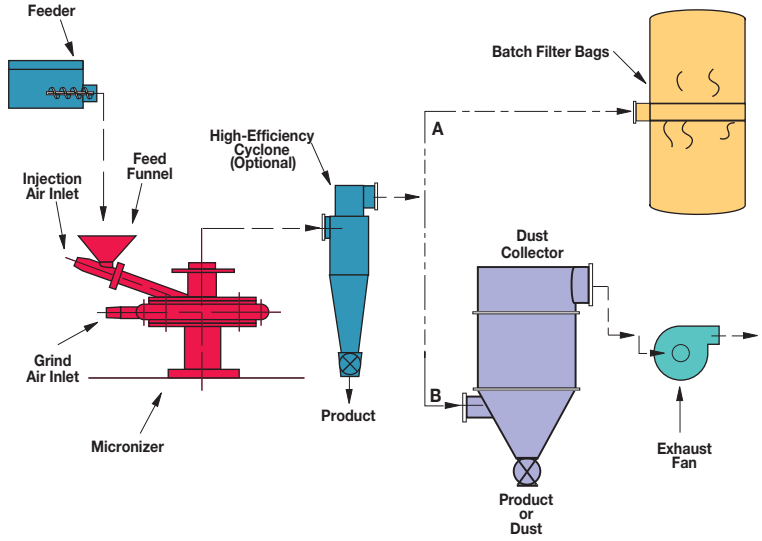
WHY USDA ACCEPTED?

- No FDA programs available to review & certify process equipment prior to installation (only cites deficiencies of an installed process).
- No need to rely on equipment manufacturers' interpretation of a design. USDA publishes 29-page guidelines based on 3-A sanitary standards and 3-A accepted practices for the sanitary design and fabrication of processing equipment.
- Recent Sturtevant SDM installation was inspected by FDA and approved for production with no "No. 483 citations or adverse findings."



SDM System with feeder and product collector

Typical Micronizer® Systems

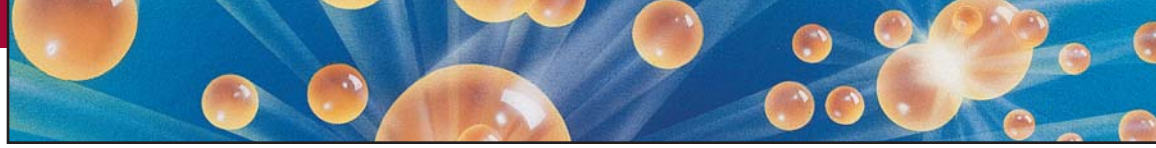


Typical Micronizer Systems
A - Laboratory Pilot or System
B - Production System

Excerpts from the USDA specifications with which the Sturtevant Sanitary Design Micronizer® complies:

- **Type of construction:** welded & finish machined
- **Construction material:** AISI 300 series stainless steel
- **Surface finishes:**
  Machined surface
  - 25-microinch finish, or better, with fillet radii machined to .03 - .13 inches

  Non-machined surfaces
  - Polished to a no. 4 finish (150 grit or better)
  - Welds are continuous, ground to a .03 - .13 inch radius and polished to a no. 4 finish (150 grit or better)
  - All surfaces are free of pits, crevices and other imperfections
  - All internal angles of 135 degrees or less have at least a 1/4 inch (6.0 mm) radius
  - All external sharp-edge angles are relieved for safety reasons
- **Fasteners:** Micronizer® is assembled with thumb nuts and bolts with wide grooved ACME threads custom-designed to meet USDA guidelines for no exposed threads in product contact parts. Standard-thread hardware is not acceptable.
- **Product discharge system:** assembled with quick-release clamps that comply with 3-A sanitary standards.
- **Seals:** O-Ring and gasket seal materials comply with applicable FDA regulations and 3-A sanitary standards.
- **Gasket junctures:** Mated accurately, internal sealing edges form a sharp 270-degree angle for tight pinch seal with gasket, minimum radii for O-Ring retaining grooves comply with USDA standards.
- **Accessibility:** All product contact surfaces are easily accessible for inspection, washing, autoclaving or swabbing in an assembled position or when removed.
- **Allen-head and slot-head style bolts or screws ARE NOT ACCEPTABLE** on product or non-product surfaces.



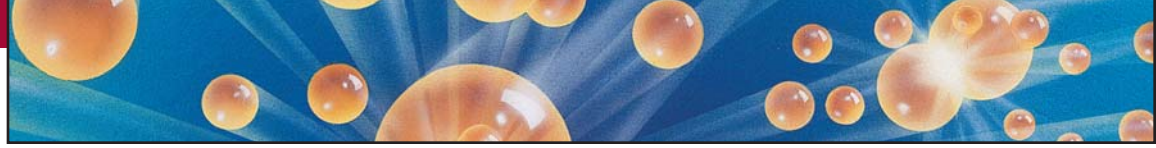
STURTEVANT - MADE TO MEET YOUR NEEDS.

The Sanitary Design Micronizer® grinds and classifies powders to 0.5 - 44 microns.

TYPICAL STURTEVANT MICRONIZER® GRINDING DATA
PHARMACEUTICAL & COSMETIC POWDERS

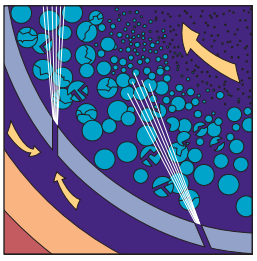
Material	Feed Size	Product Size	Feed Rate (lbs/hr)	Micronizer® Dia. (Inches)
Acetanilide	100% - 325 mesh	5 microns avg	1/2	2
Altreamine	120 microns	44 microns	n/a	8
Amino Acids	100% - 25 microns	1.5 microns avg	1	2
Amphicilin	20 microns	5-10 microns	3	4
Antibiotic	n/a	1-5 microns	6	4
Ascorbic Acid	n/a	5-15 microns	30	4
Asiaticoside	n/a	3-10 microns	3	4
Barbiturate	100 microns	2-5 microns	n/a	8
Buguenolate	48 mesh	6-20 microns	38-200	8
Caffeine	100-200 mesh	8 microns	6	4
Calcium Halophosphate	75% - 100 mesh	100% - 10 microns	30	8
Dextrose	5% - 325 mesh	96% - 325 mesh	75	8
Epinephrine	80 mesh	5-8 microns	2-3	4
Freeze Dried Protein	100-150 microns	20-30 microns	44-110	8
Fumaric Acid	200-325 mesh	5-10 microns	25-40	8
Griseofulvin	n/a	4-10 microns	10-50	8
Histidine	100% - 25 microns	1.5 microns avg	1	2
Hydroprogesterone	100 microns avg	100% - 5 microns	10 kg/hr	4
Isoxicam	n/a	5 microns	110	15
Lactose	80 mesh	10-50 microns	5	4
Metaproterenol Sulfate	n/a	8 microns	4.5 kg/hr	4
Methionine	n/a	3-6 microns	4-5	2
Napthol	200 mesh avg	100% - 325 mesh	25	8
Nitrophenide	n/a	10 microns	160	15
Nogestral	100 microns	5 microns	10 kg/hr	4
Oleaudomycin Phosphate	n/a	10 microns	n/a	4
Penicillin	75 microns	3 microns	2	2
Pigments	100% - 50 mesh	100% - 10 microns	45	8
Procaine Penicillin	n/a	5-20 microns	10	8
Providone Iodine	80 mesh	20-45 microns	6	4
Riboflavin	n/a	5 microns	45	4
Salicylamide	100-200 mesh	10 microns	n/a	4
Sandoptal Powder	100-200 mesh	10 microns	n/a	4
Selenium Disulfide	325 mesh	5-15 microns	10	4
Soap Stone	4.5 microns avg	1.0 microns avg	100	8
Sodium Sulfacetamide	50 mesh	15 microns	n/a	8
Starch	99% - 20 mesh	5.5 microns avg	15	8
Steroid	15-60 microns	5-30 microns	1	4
Sucrose	45 mesh	25 microns	60	8
Sulpharnethoxazole	100% - 325 mesh	1.3 microns avg	45	8
Talc	100% - 20 mesh	2.0 microns avg	2000	30
Uric Acid	100% - 25 microns	1.0 micron avg	1	2
Vasopressin	n/a	6-12 microns	1-2	2
Vitamin Compound	150 microns	10-60 microns	15	8
Xanthine	100% - 25 microns	2 microns avg	1	2

Chart data contains typical feed rates. For rates reflective of your specific application, contact Sturtevant.

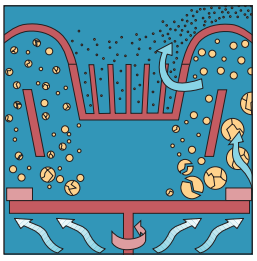


PROVEN PERFORMERS

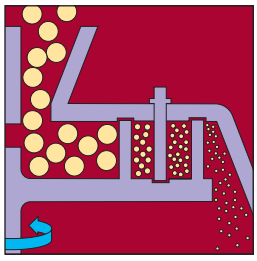
For most dry material size reduction or separation needs,
Sturtevant's extensive line of products can meet your requirements.



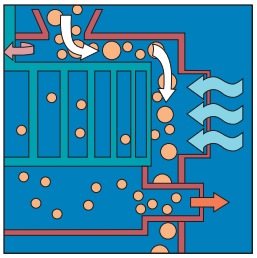
Micronizer®: Jet mills for low- to sub-micron size with tight particle size distribution. Some models USDA-accepted.



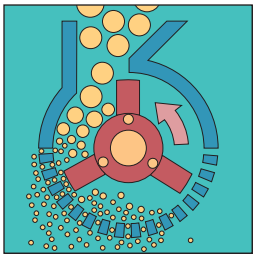
Powderizer®: Air-swept impact mill with integral classifier; grinds to low-micron range with tightest particle size distribution.



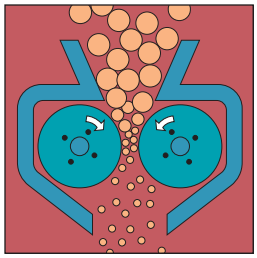
Simpactor®: Centrifugal, pin-type impact mill; reduces low- to medium-density materials to 50-200 mesh.



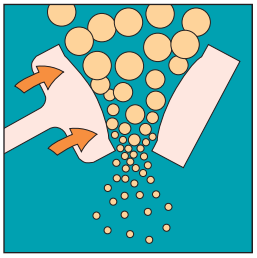
Air Classifiers: Air streams separate fine and coarse particles with mechanical rejector for product quality assurance.



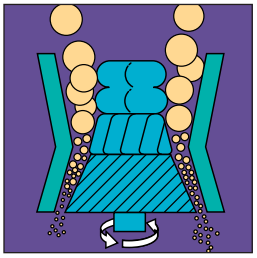
Hammermill: Versatile, perfect for friable materials; easy access for maintenance or inspection.



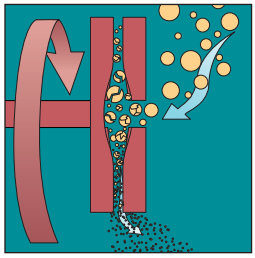
Roll Crusher: Best-suited for controlled reduction of friable materials; minimal fines.



Jaw Crusher: Ideal for coarse and intermediate crushing; minimal fines production.



Rotary Crusher: Rugged rotary action produces high reduction ratios and production rates for soft-to medium-hard materials.



Sample Grinders: Disk type grinder for very fine work at small throughput rates.

STURTEVANT®
SINCE 1883

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