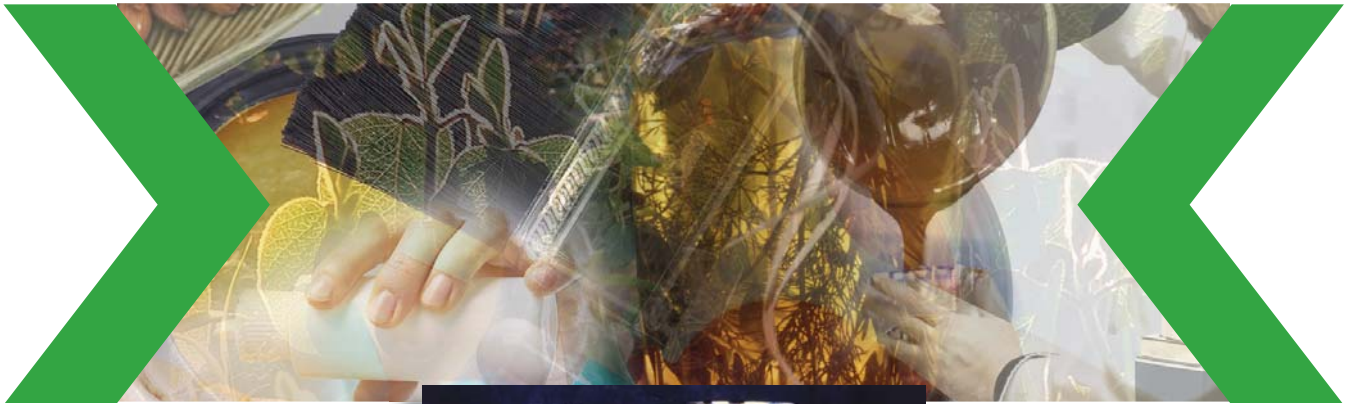




Colloid Mill

Dispersing and Emulsifying



Premier Colloid Mills - The Ultimate In Dispersing and Emulsifying

An almost limitless variety of materials can be processed. Viscosities can run from water thin to paste thick. As long as the product will flow (either by gravity or pressure) a Premier Colloid Mill can handle it.

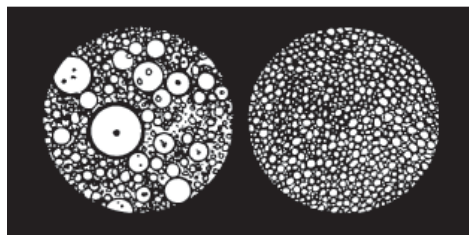
What Does A Colloid Mill Do?

A colloid mill does its work by hydraulic shear, bringing to bear a tremendous amount of energy on a small portion of material in the form of a thick film.

This action overcomes the strong polar forces which bind together small clumps of solids or which hold together drops of liquid. A colloid mill will not break down hard crystalline particles by fracturing them across the crystal planes as an impact type mill would do. It will, however, reduce these particles down to their ultimate crystal size by breaking up the agglomerates into which they form.

In the case of emulsions, the same principle holds. As the particles of the dispersed phase of the emulsion get smaller and it requires progressively more energy to overcome the surface tension holding them together. Enormous hydraulic shear is needed to do the job and a colloid mill is an ideal means of accomplishing it. (See Fig. 1)

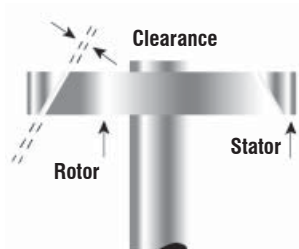
Fig. 1 - Left: Ordinary oil-in-water emulsion made with propeller mixer, magnified 1000 times. Note disproportionate size of particles. Right: Same emulsion process through a colloid mill. Note smaller and more uniform size of particles.



(Fig. 1)

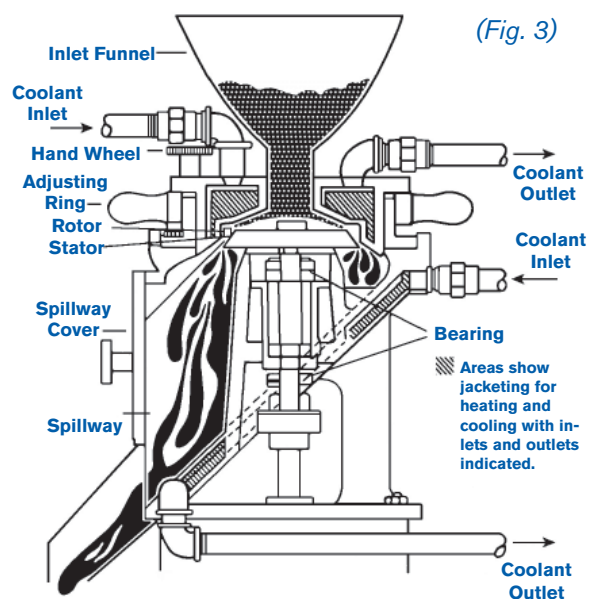
How Does The Colloid Mill Work?

The product to be dispersed or emulsified is fed by gravity or under pressure to a rapidly spinning rotor. This is set very closely and precisely to a matching stationary part called a stator. The distance between them is adjusted from 0.001 to 0.125". Generally distances of not more than 0.020" are needed. This distance is commonly called the grinding gap. (See Fig. 2)



(Fig. 2)

As the material comes in contact with the rotor it is flung out to the edge by centrifugal force. This force pushes the material down through the narrow gap between the rotor and stator. A particle material, while it is whirling around in this film, is subjected to a great many eddy currents of tremendous force. This imparts high shear to the product which overcomes the surface forces tending to hold the particles together. The product makes its way through the shear zone and finally is flung out into an open area. At this point it passes out of the colloid mill through a suitable opening.



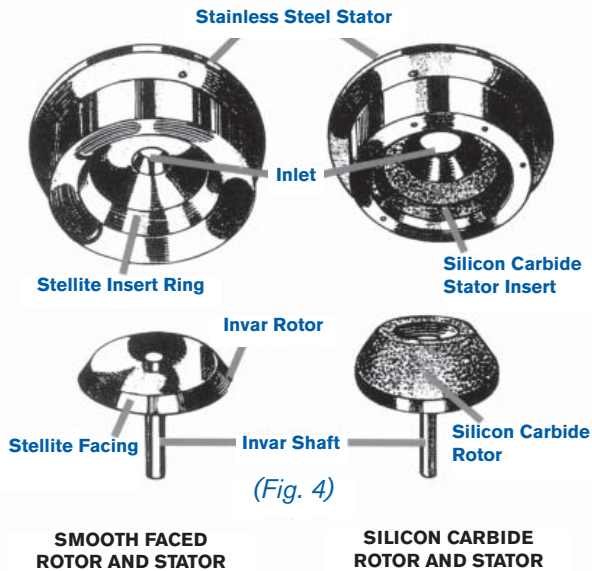
(Fig. 3)

All Premier Colloid Mills have securely held vertical shafts in a heavy duty housing called the Spillway. This permits products contained in the inlet funnel to immediately enter the high shear zone. (See Fig. 3)

The Rotor and Stator

The heart of a colloid mill is the rotor and stator. The best design is a rotor and a stator with smooth, ground and lapped faces. With this design, found in the Premier Colloid Mill, the thin film of material between them will be of uniform cross section and will be subjected to the maximum amount of shear as it whirls around. To ensure fast entry of product into the grinding gap all Colloid Mills are provided with impellers (two pins for low viscosity products and a special blade for thick material). The rapidly turning impeller creates centrifugal force to pull the material into the grinding zone.

The speed at which a colloid mill runs is extremely important. The linear speed at the rotor face, where the work is done, must be high enough to develop sufficient hydraulic shear. To obtain superior peripheral speeds, the two small scale Premier Colloid Mills (3" and 4") have high speed belt drives. The larger mills (6" to 10") have large diameter rotors which provide high linear speed at the edges when directly coupled to 3600 rpm motors.



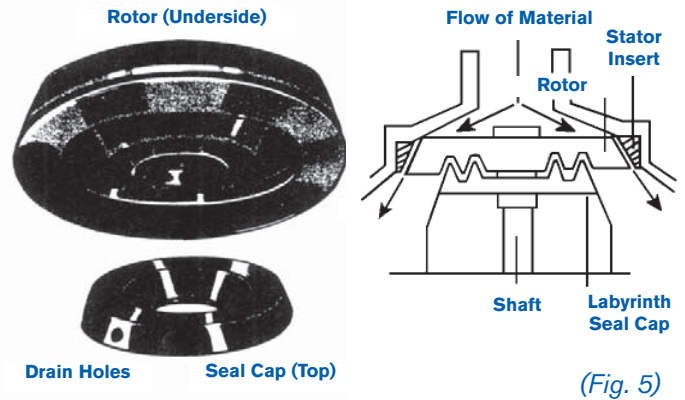
(Fig. 4)

Both rotor and shaft are made of "Invar", an alloy with the lowest coefficient of expansion of any commercially available material. If the product heats up during the grinding operation, the mill temperature change does not affect the grinding gap, which stays constant. Rotors are faced with a thick layer of Stellite, harder than most abrasive materials. A matching, Stellite-faced, Invar ring is set into the stainless steel stator, (See Fig. 4)

When the product contains fibers, crystals or similar hard agglomerates - rough, abrasive surfaces are required. Premier uses the preferred material, silicon carbide. The stator has a specially made silicon carbide insert and the rotor a similar matching part. (See Fig. 4)

In addition to the standard silicon carbide components, fine grain and wide faced rotors and stators are available.

GAP ADJUSTMENT: The clearance between the rotor and stator can be increased, decreased, or locked in seconds - even while the mill is operating. No tools are needed. Loosen the hand wheels which allow the non-galling magnesium bronze calibrated adjusting ring to be easily rotated from 0.125" down to 0.001".



(Fig. 5)

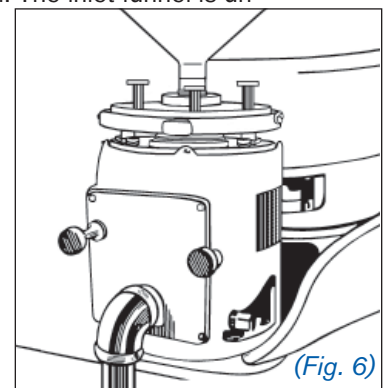
LABYRINTH SEAL: The triple heavy-duty bearings are protected by the easy-to-maintain Labyrinth Seal. (See Fig.5). Product is prevented from entering the upper bearings by a tortuous flow path of two concentric rings in the rotor and seal cap. Material entering the outer ring is ejected by centrifugal force through the drain holes. Product cannot get into the bearings under normal use.

HEATING AND COOLING: All mills have the stator and spillway (main housing) jacketed for use with steam, hot or cold water. Fittings for these connectors are an integral part of the mill. Materials which have to be kept in a molten state can be easily handled. Heat build-up can be minimized by using a cooling fluid in the jacket. The colloid mill can be operated at temperatures up to 350° F.

CLEANING: Product contact parts are stainless steel. A quick flush is sufficient to clean the mill after use. For more difficult products or for more thorough cleaning, every bit of surface touched by the product can be exposed in less than one minute. No tools are needed. The adjusting ring is backed off. The stator is lifted out. The interior is now completely accessible.

Closed Continuous Operation

Any Premier Colloid Mill may be easily converted to closed continuous operation. The inlet funnel is unscrewed and appropriate inlet piping screwed into the stator. The standard partial spillway cover is replaced with a full spillway cover having appropriate pipe fitting. A pump may feed the mill or the mill may be mounted underneath a tank for gravity feeding.

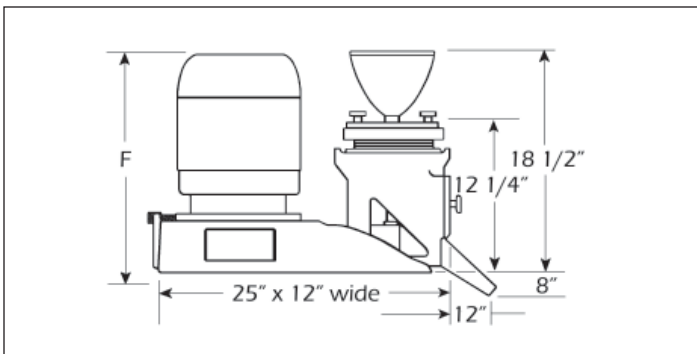


(Fig. 6)

Belt - Driven Mill

MILL SIZE	NET WEIGHT** Pounds	Dimensions
3"	250	24"
4"	300	26"

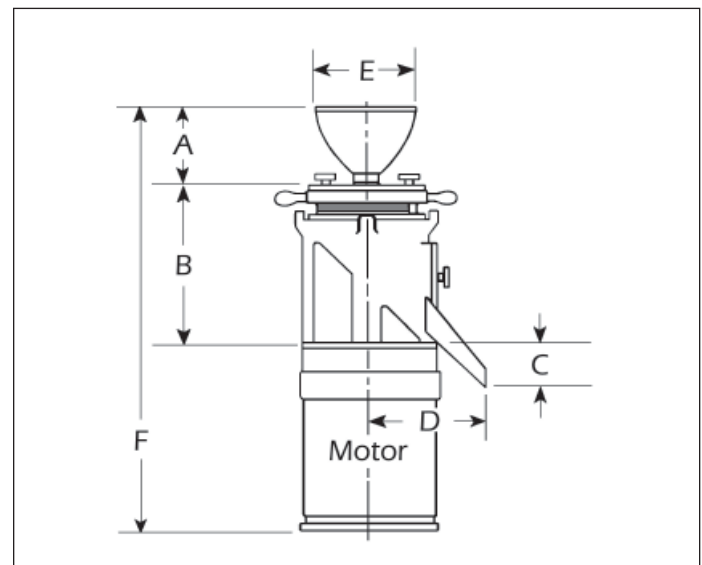
MILL SIZE Rotor/Dia.	CAPACITY* Gal./Hour	MOTOR HP	THREE ROTOR SPEEDS - RPM
3"	30	5	7,200/10,000/17,000
4"	50	7.5	5,500/7,500/12,800



Directly - Driven Mill

Mill Size	NET WEIGHT* Pounds	Dimensions Inches
6"	450	10 15 1/2 5 11 11 1/2 50
8"	800	11 17 1/2 7 15 11 1/2 55
10"	1300	14 22 1/2 7 16 15 62

MILL SIZE Rotor/Dia.	CAPACITY* Gal./Hour	MOTOR HP	THREE ROTOR SPEEDS - RPM
6"	100	5-10	3,600
8"	300	10-30	3,600
10"	500	20-40	3,600



* Average rate of flow. Maybe higher or lower depending on product handled.

** Average. Varies according to motor size.

Units available in sanitary design for Food, Pharmaceutical and Cosmetic applications. In addition, units can be prepared with mechanical seals for pressurized operations.

Typical Applications:

Industrial: Adhesives, Asphalt Emulsion, Ceramic Glazes, Ceramic Slips, Coatings, Colorants, Dispersions, Dyes, Emulsions, Essential Oils, Finishes, Greases, Herbicides, Insecticides, Inks, Latex, Leather Coatings, Paints, Paper Coatings, Pastes, Pigments, Plastic Coatings, Polishes, Resins, Rocket Fuel, Sealants, Soy Beans, Suspensions, Textile Coatings, Waxes, Welding Fluxes.

Sanitary: Antacids, Chocolate, Cosmetics, Creams, Dairy Products, Deodorants, Fish Pastes, Flavors, Fruits, Injectables, Lipsticks, Lotions, Makeup, Mascara, Mayonnaise, Medicine, Mustard, Nut Pastes, Oils, Ointments, Pharmaceuticals, Salad Dressings, Sauces, Spices, Syrups, Toothpastes, Vegetables.

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For more information about our worldwide locations, approvals, certifications, and local representatives, please visit www.premiermill.com.

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