



FLUID ENERGY MILL

Low and Sub-Micron Size Grinding



Fluid Energy Mills are compact, versatile machines used for a number of operations such as size reduction, drying, blending, coating and chemical reactions involving at least one solid material.

Fluid Energy Mills eliminate the limitations of conventional grinding machines. With a Fluid Energy Mill there are no moving parts and no grinding media. A source of compressed air, gas or high pressure super heated steam is used to run the Mill.

The Fluid Energy Process

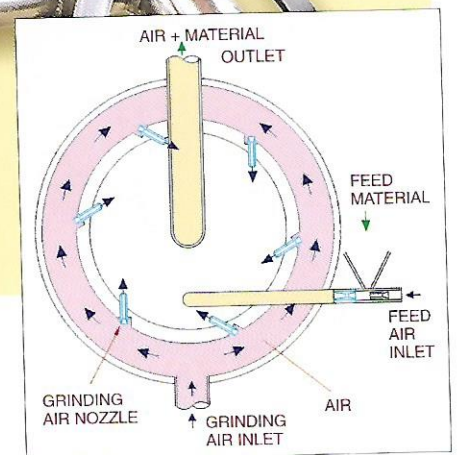
Fluid Energy Mills consist of a shallow cylindrical grinding chamber into which a high pressure compressible fluid is discharged through specially designed nozzles spaced around the circumference of the chamber. The fluid enters the grinding chamber in the form of high energy jets to create a high velocity vortex. The fluid is withdrawn from a central opening either at the top or bottom of the grinding chamber.



Size 750 Fluid Energy Mill



Size 200 Mill
Quick Opening Design





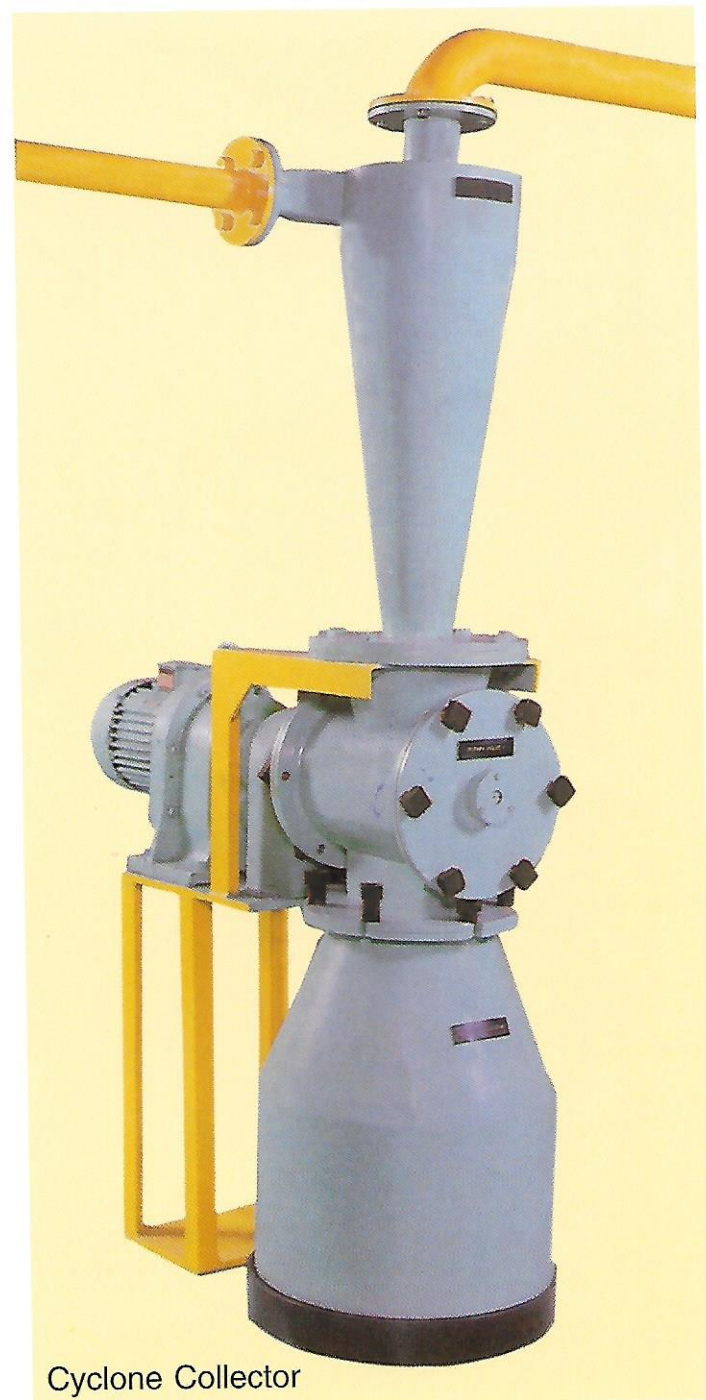
The material to be processed is introduced through a separate venturi system which creates a partial vacuum to suck the material into this high velocity vortex.

The particles of the material being reduced take a spiral path from the periphery of the grinding chamber to the central outlet. The particles get reduced in size due to a process of attrition and collision with each other.

This process enables the material to be ground out of contact with any external grinding media which could otherwise contaminate the material. The grinding chamber also performs the function of classification in view of the principle of operation. Oversize particles are prevented from going towards the central outlet due to their inherent centrifugal force. It is therefore possible to control the precise cut-point necessary in the grinding process so that only those particles which have been ground to less than the cut size will be allowed to leave the grinding chamber.

There is a continuous grinding action occurring due to the collision of the particles with each other combined with an automatic recycling of those particles which have not reached the desired fineness. It is possible to vary the cut size by varying the feed rate of the powders and the pressure of the fluid.

The fluid energy process enables simultaneous drying, mixing, coating along with the grinding thereby achieving multiple processes in a single operation.



Cyclone Collector



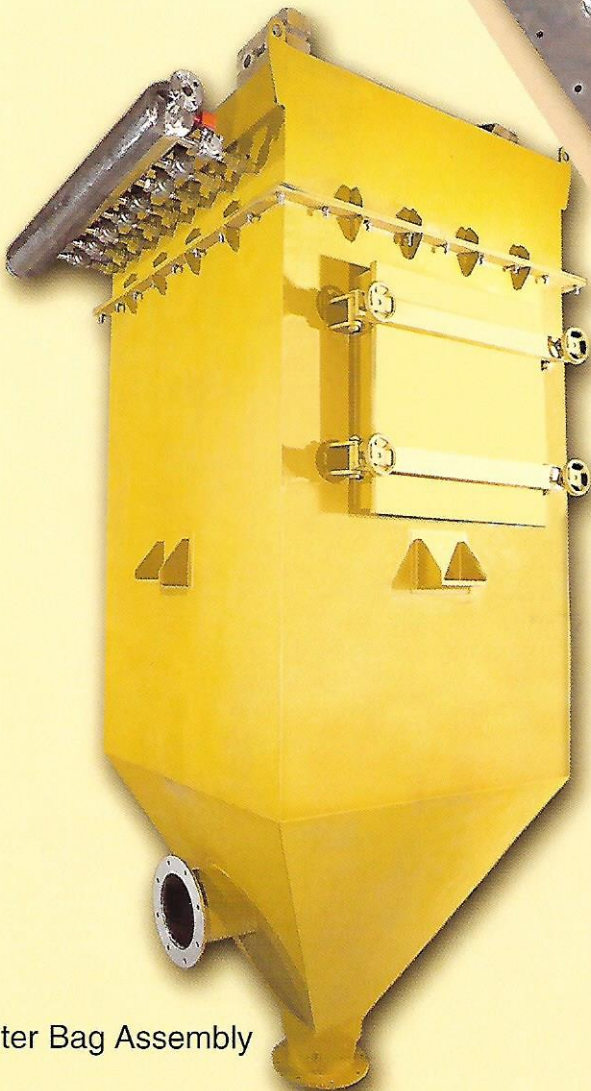
The only alternative with many advantages

The Fluid Energy Mills can be used to grind a variety of materials which are otherwise impossible to grind. As the process takes place without attritional heat, most heat sensitive materials

can be successfully reduced. It is possible to use cold compressed air or gas in order to preserve the solid structure of low melting point materials. It can handle highly abrasive particles, fibrous materials and waxy substances.

Fluid Energy Mills are cost effective and have introduced product improvement in a variety of industries. Even conventional materials used in paints, pharmaceuticals, powder metallurgy, pesticides etc. behave differently when micronised resulting in tremendous cost reduction and product improvement.

- ❖ Grinding hard abrasive materials, low melting point and heat sensitive materials, waxy substances, fibrous materials, hygroscopic compounds etc.
- ❖ Drying and grinding in one operation.
- ❖ Blending and grinding in one operation.
- ❖ Coating and grinding in one operation.
- ❖ Controlled chemical reactions and grinding in one operation.
- ❖ High speed minimum loss operation.
- ❖ Operation under sterile conditions for pharmaceuticals etc.



Filter Bag Assembly





- ❖ Contamination free processing for high purity materials, food stuffs etc.
- ❖ Can be easily cleaned and converted from one function to another.
- ❖ Specially developed abrasion resistant linings may be fitted to reduce wear to an absolute minimum when grinding abrasive materials.
- ❖ Any compressed gas can be used to provide the energy for grinding.
- ❖ Degree of grinding can be easily controlled.

Operating characteristics maximised

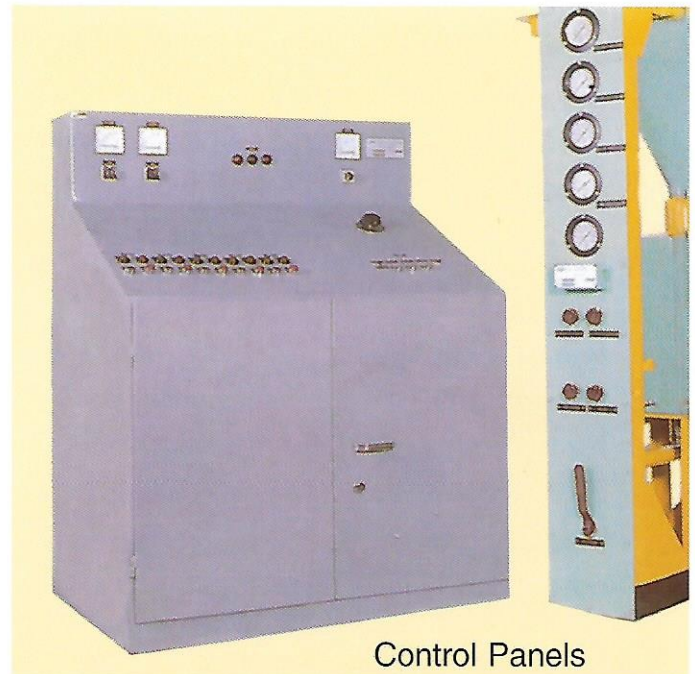
Over a period of time, INCON has been able to maximise the operating characteristics of its machines by correlating the mathematical models with actual performance characteristics.

Special care is taken in the choice of materials of construction, and the internal coating of the grinding chamber to withstand abrasion during the grinding process.

Wide range of Models

INCON manufactures a wide range of models to handle small requirements of laboratories to the bulk requirements of upto a few tonnes per hour.

The normal Fluid Energy Mill can handle powders having an initial size ranging from about 3mm and can grind materials up to less than one micron. It is usual practice to use powders obtained from conventional pulverisers as the



Control Panels

feed material, so that the output of the micronised product is maximised at the fluid energy grinding stage. The tables indicating the grinding capacity are only approximate indications and the actual capacity is determined by the initial feed size, hardness and other surface properties of the material and the ultimate particle size desired.



Ancillary Equipment

INCON can supply the whole range of ancillary equipment required by the customer starting from pre-crushing, pre-grinding, conveying, classification, feeding to product collection equipment.

- ❖ INCON designs and manufactures a range of Vibro-feeders and Screw-feeders to ensure regulated feed to the Fluid Energy Mill. Continuously variable systems allow maximising of out-puts and subtle variation in the quality of out put required in today's powder processing technologies.
- ❖ Specially designed primary cyclones and secondary dust filtration assemblies ensure minimum pressure drops to optimise energy utilisation for the grinding process. High product recovery minimises wastage and ensures environmental protection.

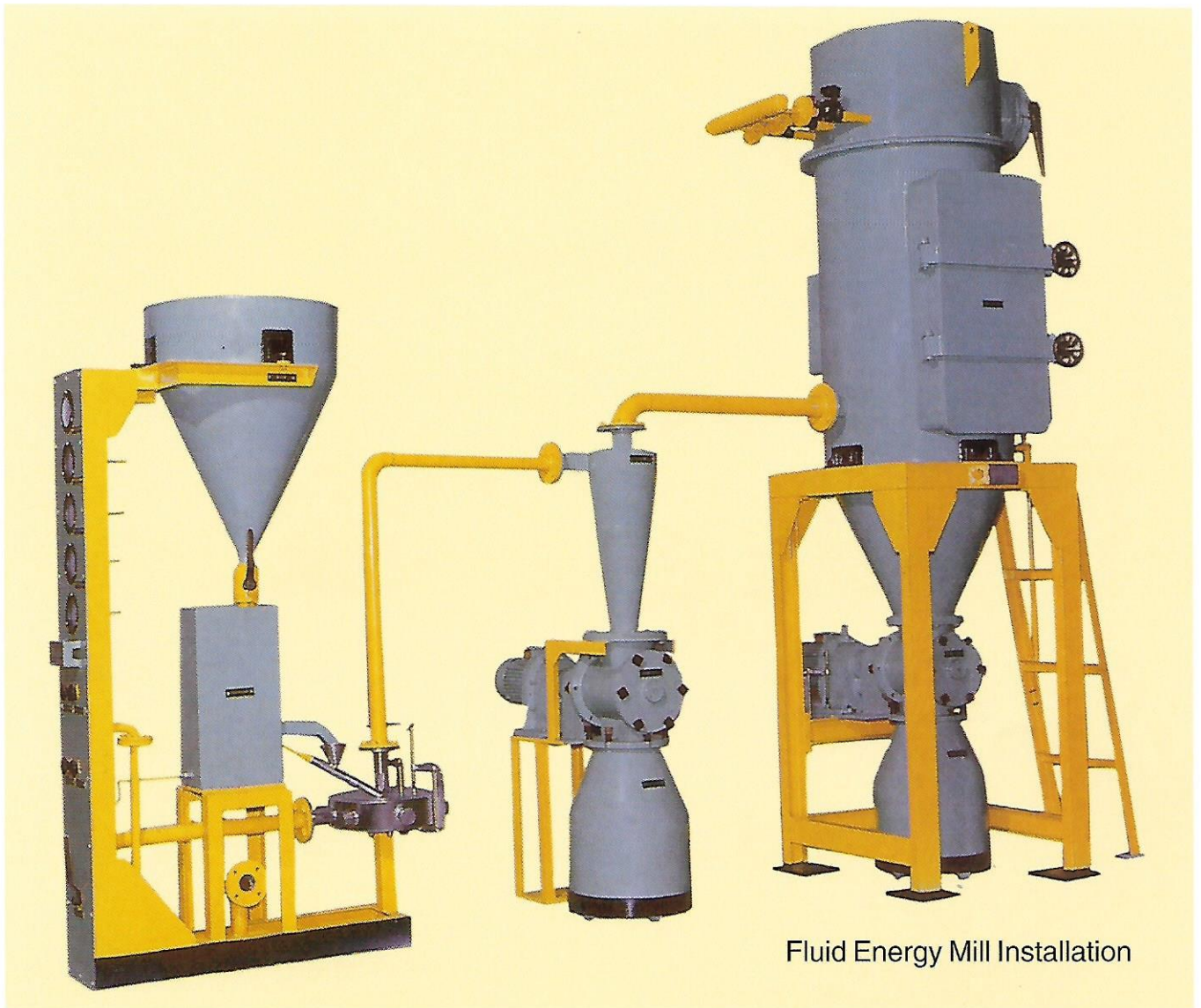


Lab Model



Technical Services

- ❖ Facilities for test production using large and small Fluid Energy Mills.
- ❖ Consultancy, Research Development and Design in all aspects of powder technology involving ultra fine grinding and handling of powders.
- ❖ Can undertake design, supply, installation and commissioning of entire size reduction plants on a turnkey basis.
- ❖ Contract grinding services for small batches of high purity chemicals and also tonnage grinding of bulk powders.



SIZES & CAPACITIES OF FLUID ENERGY MILLS

Mill Size mm	Compressed Air		Steam at 350°C		Throughput	
	100 psi cfm	7kg/cm ² cmm	220 psig lbs/hr	15.5 kg/cm ² kg/hr	lbs/hr	kg/hr
100	40	1.1	—	—	12	6
200	140	4.0	300	135	110	50
300	230	6.6	700	315	330	150
400	420	11.7	1200	540	660	300
500	650	18.3	1900	855	1300	600
600	930	26.2	2800	1260	1800	850
750	1450	41.2	4400	1980	2600	1200
900	—	—	6300	2835	4400	2000

Some of the materials that can be ground in Fluid Energy Mills

A

Adipic Acid
Agar Agar
Albumen, Press Cake,
Crystals
Aldrin
Alum
Alumina
Aluminium Alloy
Aluminium Hydrate
Aluminium Hydroxide
Aluminium Metallic
Aluminium Oxide
Aluminium Compounds
Aluminium Chlorite
Antimony Metallic
Antimony Oxide
Antimony Sulphide
Antibiotics
Anti-Oxidants
Antipyrine Salicylate
Arabic Gum
Argyrol
Arsenic
Asbestos
Aspirin

B

Barium Compounds
Barytes
Bauxite
Beta Naphthol
Bismuth Compounds
Blanc Fixe
Bleach
Blood, Dried
Bones Crushed, Dried
Char Ash, Meal,
Shavings, Chips,
Calcined
Borax Dust
Botanicals
Bronze Agglomerates
Bulk Drugs

C

Cadmium Sulphide
Caffeine
Calcium Carbonate
Calcium Chloride
Calcium Compounds
Calcium Phosphate
Calcium Stearate
Cane Sugar
Carbon
Carbon Black
Carboxy Methyl
cellulose
Carnauba Wax
Casein
Catalysts
Cement
Cement Paints
Ceramic Powders
Chocolate Mixtures
Chrome Green
Clay Various
Coal
Coke
Copper and Graphite
Copper Powder
Copper Oxide Red
Copper Compounds
Cosmetics

D

D.D.T.
Dental Powder
Detergents
Dextrine
Diatomaceous Earth
Dispersions : Dry
Dolomite
Dry Colours
Drugs
Dyes : All Types

E

Endosulphan
Epsom Salt
Extenders

F

Face Powder
Ferrite
Ferro Alloys
Fertilizers
Fillers
Fungicides
Flour
Flourspar
Fly Ash
Fullers Earch

G

Garnet
Graphite
Gypsum

H

Hydrated Lime

I

Inks ; Printing,
Typewriter, Carbon
Paper
Insecticides
Insulating Materials
Iron Oxide
Iron Powder

K

Kaolin

L

Lactose
Limestone
Luminescent Pigments

M

Magnesium
Magnesium Compounds
Metal Powders
Moulding Compounds
Mica
Minerals All Types

N

Nickel Catalyst Powder
Nickel Ore Dust
Nuclear Compounds

O

Ochres
Oxalic Acid

P

Paint, Cement
Penicillin : Procaine,
Sodium, Calcium
Pesticides
Pharmaceuticals
Phenol Formaldehyde
Resins
Phenolic Resin
Pigments, Organic,
Inorganic
Plaster
Plastic Compounds
Polishes : Various
Polyethylene Resins
Polystyrene Resins
Porcelain Clay Body
Potassium Compounds

R

Rare Earths
Red Lead
Resins : Various

S

Salt
Saw Dust
Shellac
Sienna
Silica Gel
Silikatas alkali
Silicon Carbide
Soaps Powders
Sodium Compounds
Starches
Sugar
Sulphur

T

Talc
Talcum Powder
Tin
Tin Oxide
Titanium Carbide
Titanium Dioxide

U

Uranium Oxide
Urea

V

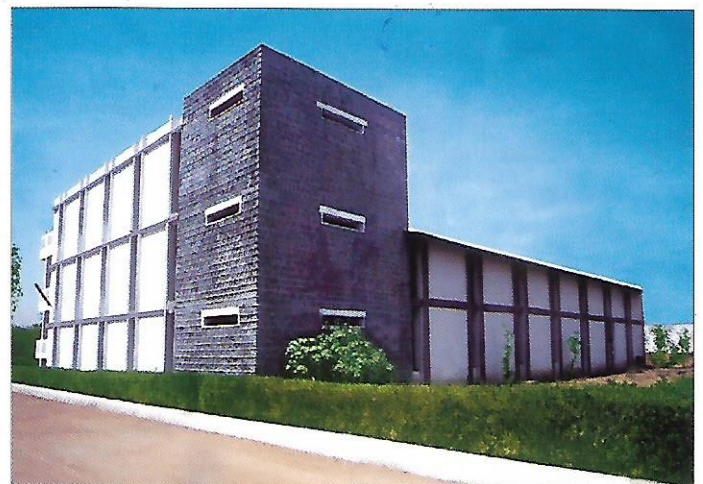
Vermiculite
Vinyl Chloride Resins

W

Water Colour Mixtures
Wax : Various Types
Weedicides
Whiting
Whole Wheat Flour

Z

Zinc and Compounds
Zirconium Silicate



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