



Food & Pharmaceutical Technology

Other Equipment in the Atritor Range



"A" & "B" Series Atritor Dryer-Pulverisers for Chemicals & Minerals.



Atritor-Scott AST Dryer for Chemical, Minerals and Environmental Waste.



Atritor-Scott Turbo Separator Separates Product from Packaging for Recycling or Disposal.

Website

For more information about the company visit our website www.atritor.com or send us your enquiry Email: sales@atritor.com



BS EN ISO 9001:2000 CERTIFICATE No FM 11960

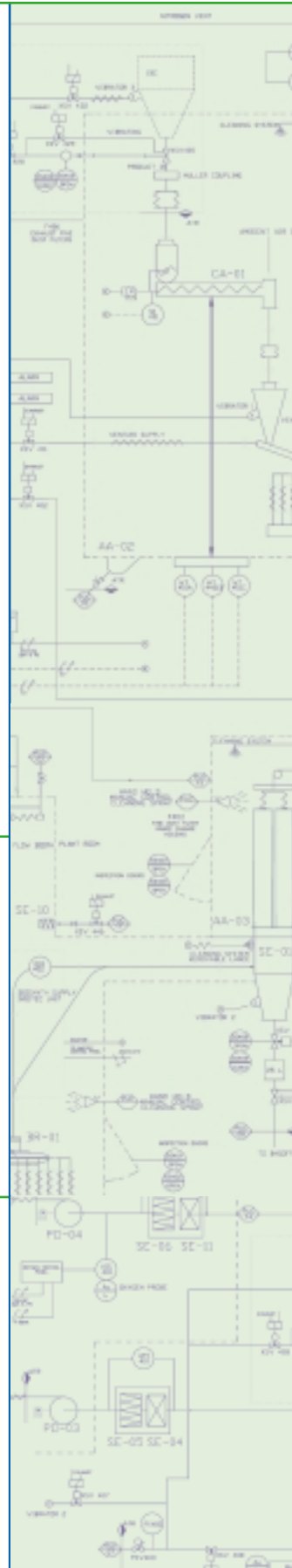
Atritor Limited

PO BOX 101
Edgwick Park
Coventry
CV6 5RD
U.K.

Tel: +44 (0) 2476 662266
Fax: +44 (0) 2476 665751



Food & Pharmaceutical Technology



Milling

Micronising

Classification

Containment



Introduction to Atritor Ltd

Atritor Ltd, is a UK company located in Coventry, England, and is a market leader in the global powder processing industry. By continuous development of Atritor technology, associations with companies offering complimentary process solutions and by strategic joint venture partnerships, Atritor aims to meet customer demands for ever-increasing sophistication in powder products and related process plant. Equipment is shipped from Coventry to all parts of the world.

Diversification into Food & Pharmaceuticals

Atritor has a long established history in powder processing which started in 1920 at the other end of the spectrum from food and pharmaceuticals - the milling and drying of coal. The machine, shown opposite, was called the 'Atritor', capable of taking lump coal, simultaneously drying and pulverising it to a fine powder of less than 100 microns and firing it directly into kilns, boilers and furnaces. The 'Atritor' was marketed worldwide for over 50 years during which time the technology of simultaneous milling and drying was expanded into the chemical, mineral and waste product sectors. The modern 'Atritor' remains a core product of the company.



The transition into Food and Pharmaceuticals began in 1980, when Atritor Ltd was formed and proceeded to extend its product range and expertise.

Cell Mill – CM

The Cell Mill, with optional integral classifier, is suitable for finer grinding and drying applications than the Atritor. The introduction of this mill/dryer increased the range of applications in minerals and chemicals and also proved to be particularly suited to food ingredients, wheat gluten, cocoa, starch, soymeal, carageen being a few examples.



CM 1250 - IC Cell Mill - Dryer - with Internal Classifier

Test Facilities

To ensure customer confidence in the capabilities of Atritor equipment and processes, we operate a comprehensive pilot plant in Coventry where all of our equipment can be fully evaluated. The plant is predominantly full size, so all scaling is done within the range of production equipment.

Our laboratory includes laser particle size analysis and air jet sieve to compare our pilot plant products with reference samples. The results achieved in the pilot trials provide the basis for system design and process guarantees.

Our test facilities has three distinct processing areas:

Area 1 -Atritor Dryer-Pulveriser, Cell Mill, & AST Tubular Dryer installation.



Area 2 - DCM Air Classifier Mill installation.



Area 3 - Microniser Mill Room.

Pharmaceutical trials can only be conducted for non toxic materials, or when personnel protection equipment and containment of waste materials is feasible, which will be advised after receipt of MSDS documentation. For API's, equipment can be made available for trials at the clients works or at pharmaceutical contract processing facilities.



Ancillary Equipment & Spare Parts

Atritor Ltd has extensive in-house manufacturing facilities at its works in Coventry, England. The Atritor and Cell Mill are manufactured in Coventry where we also have a foundry for consumable mill internals. The Microniser and DCM Classifier Mill are manufactured at reputable sub-contractors in the UK and Germany, which specialises in food and pharmaceutical grade products.



DCM grinding track insert and rotor bearing assembly



Atritor offers a comprehensive spare parts service for various mills including hammer mills, air classifier mills and jet mills, rotary valves and other process plant and equipment.



Atritor can provide food & pharmaceutical standard rotary valves.

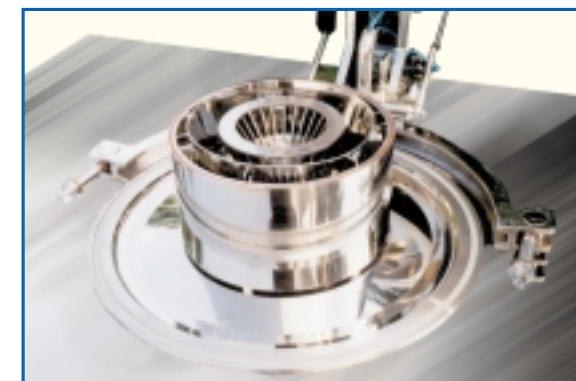


After Sales Service

Atritor is very conscious of its duties and obligations to its clients. To ensure customer satisfaction we provide a full range of services:

- Skilled service engineers for routine maintenance and breakdown visits.
- Strategically located for motorway and air travel, we can provide a full and efficient spare parts service.
- Technical support for powder processing problems.
- Machine reconditioning service.
- Manufacturing/fabrication services.

Dynamic Classifier Mill – DCM



The introduction of the DCM air classifier mill has proved equally successful in many industries. It is used extensively for the grinding of bulk pharmaceuticals. The pharmaceutical DCM 300 as shown, is manufactured to appropriate GMP requirements: in this case Ra 0.4µm, mirror finish, and CIP design.

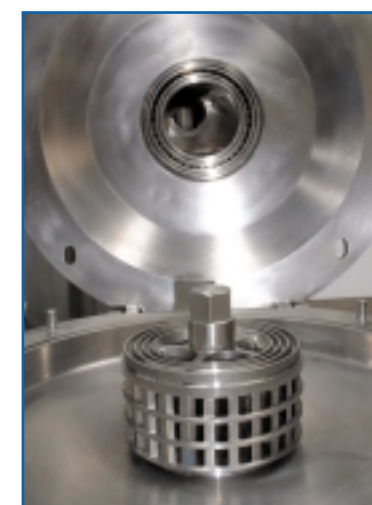
Spiral Jet Mill

In 1990 Atritor purchased the intellectual rights for a range of spiral jet micronising mills. These have been supplied in many industries, especially food and pharmaceuticals and are custom designed to suit specific client requirements. These range from a simple stand alone microniser and collection sock, to special design micronisers as shown, for locating inside an isolator for active pharmaceutical ingredients.



Pharmill – Classifier Spiral Jet Mill

Pharmill Technology Ltd is a joint venture company of Atritor and PMT Jetmill GmbH, Austria, specifically targeted at the pharmaceutical industry.



PMT Jetmill and Atritor have worked together for several years on chemical and mineral applications. PMT Jetmill micronising and classification equipment is established globally in this field. Recognising the potential of this equipment in the pharmaceutical sector, Pharmill Technology has developed a unique spiral jet mill with internal classifier, for the three stages of drug development; R&D, Pilot Scale, and Small Scale Production.

Classifier wheel arrangement for small scale production plant.

Mill Selection Chart

The selection chart shows the types of mills most commonly used for food and pharmaceuticals, at the various stages of the manufacturing process, with their typical range of application in terms of product PSD (Particle Size Distribution).

P.S.D.	1µm	10µm	25µm	45µm	75µm	150µm	425µm	850µm	1700µm	4750µm	+
Pre-sizers Hammer Mills							Ideal for lump/crystalline 'hard' material producing coarse gritty product. For de-agglomeration applications, capable of finer products.				
Cone Mills						Lump / de-agglomeration applications, typically after dryer or pre-sizing before jet mill. Hard crystalline materials may damage mesh basket.					
DCM Dynamic Classifier Mills			Universal mill capable of a wide range of PSD's. Inverter driven Integral classifier allows instant adjustment of product PSD.								
Spiral Jet Mills	Widely used in pharmaceuticals, no moving parts and easy to clean. Typical PSD of d97 8-10 µm, d50 2-3µm.										
Pharmill (Classifier Spiral Jet Mill)	Similar size range to spiral jet mills - much finer with SSA's > 3m ² /g & 'tighter' size distribution compared to spiral jet mills.										

Integrated System Design

We provide:

- Full plant design using the latest CAD software.
- Process control systems with custom programmed PLC's.
- Design to GMP and GAMP.
- BS-EN-ISO9001: 2000 Quality System.



Containment Solutions

The processing of API's (Active Pharmaceutical Ingredients) or aseptically manufactured products requires containment technology to protect the operator from the product or the product from the environment. OEL's of less than 1µg/m³/8h TWA are frequently requested, and to achieve this the solution is to integrate the mill inside an isolator. Atritor has the experience of working with several leading isolator manufacturers and providing integrated mill isolator processes.

Close co-operation is required between the mill supplier and Isolator manufacturer to make sure the equipment layout and operator interfaces are compatible. A wooden mock-up is a fundamental requirement for ergonomic assessment of operator tasks, working within the constraints of gloveports or half-suits. The wooden mock-up opposite contains an Atritor M4 micronising system inside an Extract Technology isolator.



Flexible solutions are an alternative to rigid stainless steel isolators. Opposite is an Atritor M2 and M4 microniser R&D combination in a La Calhene flexible isolator and half-suit.



Atritor M8 micronising mill for low OEL steroids inside an ACE (Applied Containment Engineering) isolator.

Technical Specification



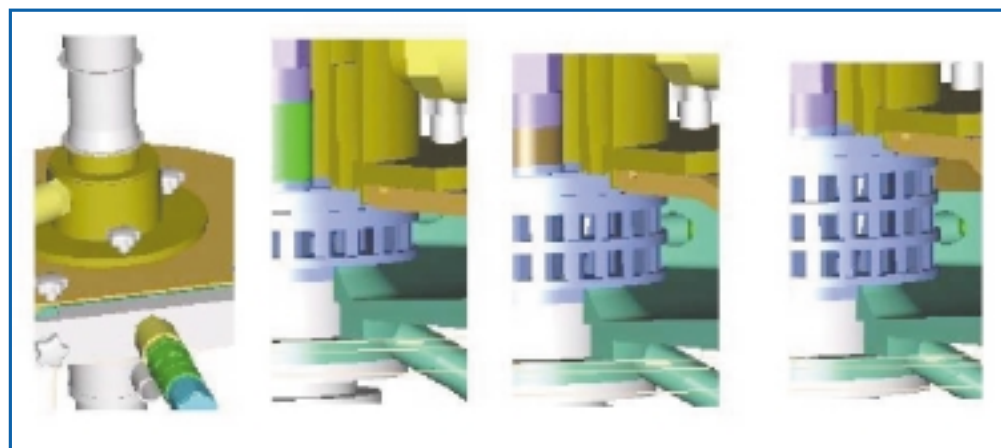
The Pharmill Classifier Spiral Jet Mill

Pharmill Technology Ltd. is a joint venture company of Atritor Ltd & PMT Jetmill GmbH. Together we have developed a new concept in pharmaceutical micronising, the Pharmill CSJ1-2-3, a spiral jet mill with internal classifier wheel. The unique feature is that, by changing the mill top cover, 1, 2 or 3 classifier wheel modules can be mounted in the same mill body as shown below, doubling the mill capacity factor each time. With 1 classifier wheel module the Pharmill will produce typically 4kg/h, suitable for R&D work, with 2 classifier wheel modules, 8kg/h suitable for pilot scale work, and with 3 modules, 16kg/h, ideal for small scale production.



CSJ1-2-3 Classifier Spiral Jet Mill.

3 module classifier assembly for R&D, pilot scale and small scale production i.e. capacity 4, 8, & 16 kg/h.



Atritor can provide a totally integrated process plant design service for the food and pharmaceutical industry. This includes design, manufacture, supply, installation, commissioning and validation, for milling, micronising, classification, containment and ancillary equipment.

Single machines or complete turnkey systems can be provided. For explosion protection typical options are nitrogen inerting, either straight through or recycle, 10bar pressure resistant design, or suppression. For non-toxic materials venting is an option.

For process control/quality assurance, Atritor can offer real time process monitoring by on-line measurement of product PSD. Opposite is the Malvern Insitac on-line optical laser analyser located in the mill discharge pipe and sampling milled product giving instant readout of PSD.



Mill System Cleaning

Mill system cleaning is always an important issue in pharmaceuticals and the method is usually influenced by:

- Mill geometry
- Type of deposits (light powder or hard build-up)
- Material solubility.

The common regimes for cleaning mill systems are:

- Manual disassembly and cleaning
- WIP (wash in place) followed by manual intervention for finish cleaning
- Full CIP (cleaning in place) or CIP & SIP (sterilising in place)

Atritor can design process systems to include these options. Product contact gaskets and seals are FDA compliant materials. Bearing seals can be gas purged to satisfy containment and contamination issues.

When processing pharmaceuticals, product toxicity, the resultant OEL (operator exposure level) figure and room classification will determine the level of operator protection required during plant operation, cleaning and maintenance. Where containment of our equipment is necessary for either product or personnel protection, we can provide a variety of solutions, including downflow booths, gloveboxes and isolators.

Technical Specification

DCM Dynamic Classifier Mill

The Atritor DCM air classifier mill with independently driven mill rotor and classifier wheel allows instant adjustment of particle size distribution from within the control room. By simple adjustment of the inverter driven classifier wheel, cut points of 20 -120µm are typically achieved. The high airflow compared to impact mills has the advantage of rapid heat dissipation, which is useful for heat sensitive materials. The DCM is made in a range of sizes from 1 to 450kW mill rotor drive. For pharmaceutical applications the common mill sizes are the DCM 100, 200, 250 & 300.



DCM 300 pharmaceutical, GMP, CIP design with drive motors and pneumatics located in the stainless steel enclosure



DCM 800 classifier mill is one of a pair processing pharmaceuticals and food ingredients. Special design larger mills are available

DCM Model	100	200	250	300	400	500	600	800	1000	1200	1400	1700
Mill kW	1.1	3	5.5	11	22	37	55	90	160	250	315	450
Classifier kW	0.37	0.55	1.1	1.5	2.2	4	5.5	7.5	11	30	37	90
Mill Speed rpm	18000	10800	9400	6200	5000	4300	3300	2600	2100	1850	1650	1400
Classifier Speed rpm	10000	5400	4600	4000	3250	2920	2850	2650	2400	2200	2000	1860
Air Flow m ³ /h	100	320	600	1300	2600	4450	6500	10500	18000	28000	36000	52000
Output Factor	Lab Mill	0.25	0.5	1	2	3.4	5	8	14	22	28	40

Motor sizes and airflows stated are typical and can vary for each DCM model depending upon application.

Technical Specification

Spiral Jet Mill

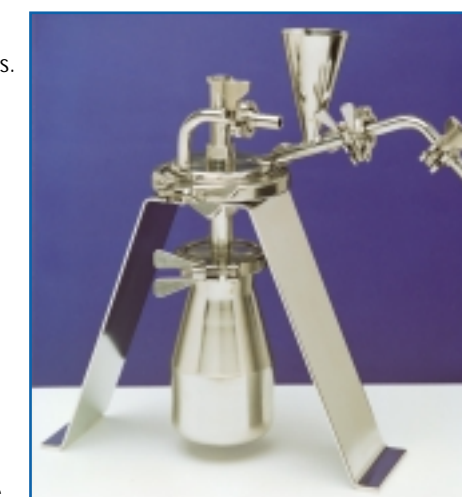
The Spiral Jet Micronising Mill is available in eleven sizes with capacities ranging from 0.5kg/h to 2000kg/h. Mill diameters range from 50 to 900mm.

The output of each mill depends on a number of factors including feed particle size, material friability, injection & grinding pressures and product PSD requirements.

Micronising mill systems are custom designed to suit specific client needs.

Operating Principle

Material is fed at a controlled rate into the venturi feed cone. Compressed gas is injected into the venturi to convey the material into the mill chamber. Compressed gas for micronising expands into the mill chamber through jet nozzles arranged tangentially around the micronising chamber. Intense velocity gradients occur in the turbulent zone close to the chamber wall, causing inter-particle collisions and size reduction. Larger particles are retained within the outer circulating mass by centrifugal forces, while fine particles spiral towards the centre in the outgoing gas stream. The combination of centrifugal and drag forces within the micronising chamber provides an efficient 'free vortex' classifying mechanism. Fine particles exiting the mill can then be collected in a filter, or a cyclone/filter collector, depending on the process requirements.



MICRONISER MODEL SIZE		APPROXIMATE OUTPUT		AIR OPERATION	
No.	mm	lb/h	kg/h	Free air at 7 bar	
				cfm	m ³ /h
2	50	2	1	20	40
3	75	2 - 4	1 - 2	35	60
4	100	4 - 10	2 - 5	50	90
6	150	10 - 40	5 - 20	75	120
8	200	35 - 100	15 - 50	100	180
12	300	100 - 300	50 - 150	225	400
15	400	150 - 500	75 - 250	375	630
20	500	250 - 750	100 - 350	550	930
24	600	500 - 1200	250 - 550	1000	1680
30	750	1000 - 3000	450 - 1500	1500	2500
36	900	2000 - 5000	900 - 2300	2500	4200