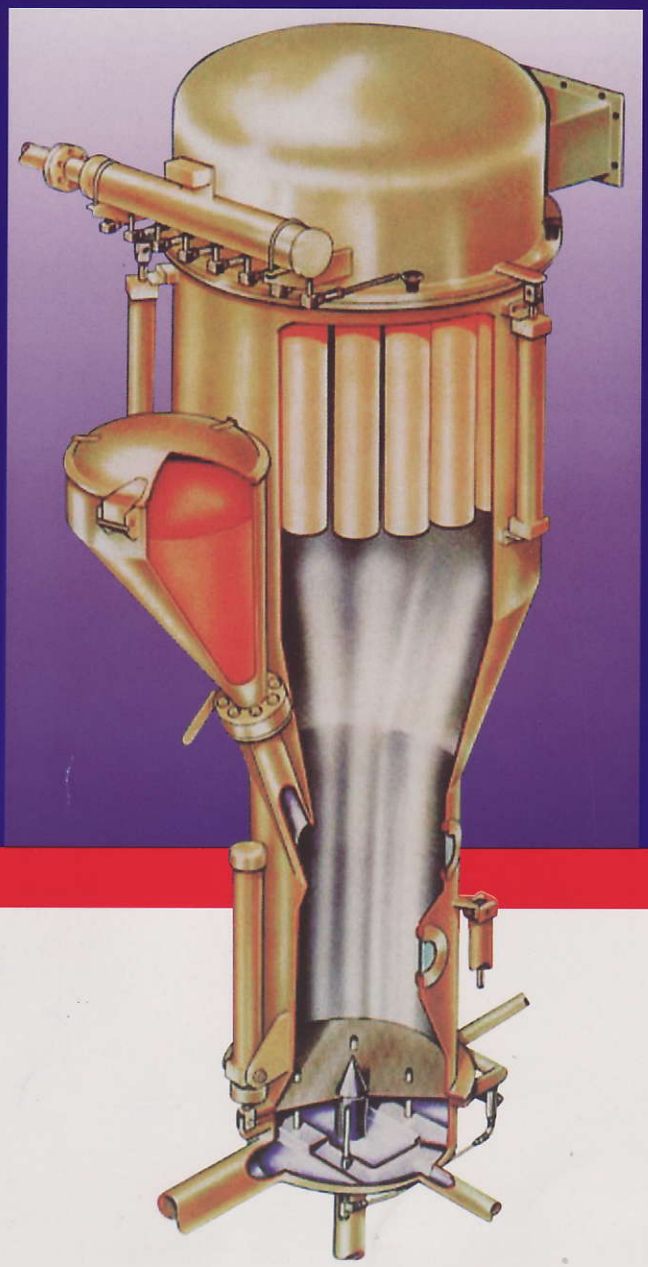
HOSOKAWA MICRON

AGGLOMASTER AGM-SD



Process Technologies for Tomorrow

HOSOKAWA MICRON CORPORATION

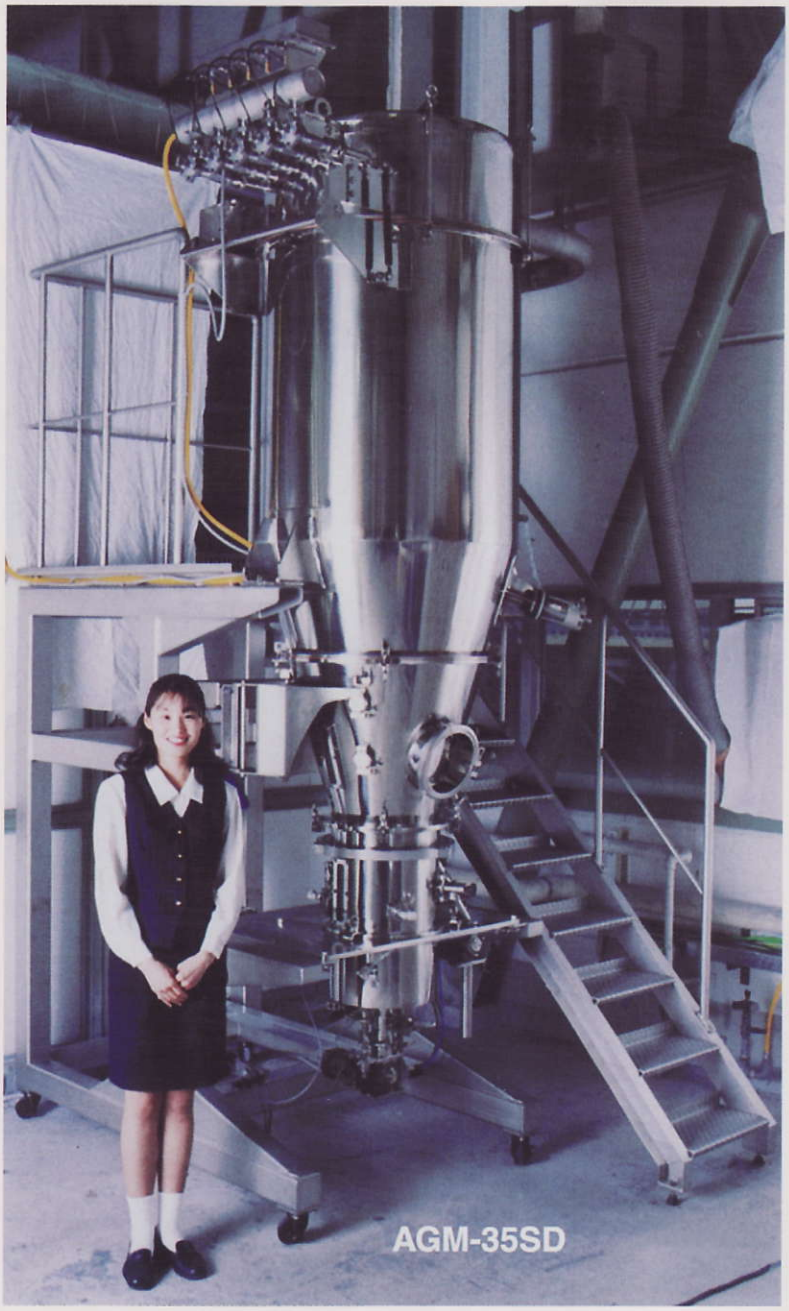
BEPEX · ALPINE · MICRON · VRIECO-NAUTA · STOTT

The material of a new generation is created with this granule manufacture equipment

HOSOKAWAMICRON AGGLOMASTER AGM-SD

It is new fluidized bed granulator. By one set, a granule can be manufactured from various kinds of liquid materials (solution and slurry).

Photo shows the appearance photograph at our Test Center System. AGM-SD is a very simple granulation system, which does not require mechanical movable unit or interior parts. As shown in Fig. 1, liquid materials (solution, slurry) are injected and fed into the fluidized bed which feeds the heat air toward the upper side of the fluidized bed with dual fluid spray nozzles provided in the lower side of the fluidized bed. The jacket, which is equipped with the outer periphery of these nozzles, enable heating feed or cooling feed of liquid materials (patent pending). This system is designed so that liquid materials are not affected temperature of heat air to stable feed to the fluidized bed at optional temperature.



Features

1) Multi-model operations can be easily conducted according to batch operations difficult to conventional spray-drying methods.

2) The bag-filter is incorporated as the product collecting partition, while neither granulation system nor finish drying system is required.
Accordingly, liquid re-addition or post-drying operations are not required in order to produce granules in the conventional manufacturing process, while wider reduction of process, feasible facility, and facility space reduction are conducted, and moreover facility cost, running cost, and other costs are widely reduced. Fig. 3 and Table 1 show the comparison with the conventional drying granulation process using the spray-drying method.

3) This system can produce large spherical granules (controlled in the range of average particle dia.: 10~3000 micro meter approx.) that have not been conducted by the spray-drying granulation method. Moreover, heavy granule with high aestheticity (controlled in the range of apparent density: 0.6~0.8g/cc approx.)

4) Generally the spray zone is enlarged, because the spray mist must increase in order to produce large particle diameter granules using the spray-dryer. On the contrary, this system feeds the liquid materials, which are much micronized as possible, and granulate them into granules by layering-granulation, and accelerates their growth, so that the solid to air contact is sharply increased, and high heat efficiency is achieved within the system, which successfully contributes to wide minimization of equipment in comparison with the spray-drying system.

5) The simple system configuration facilitates to assemble, disassemble and clean equipment.

6) In addition, AGM-SD is available to usual fluidized granulators, coating equipment.

Equipment structure and a granulation mechanism

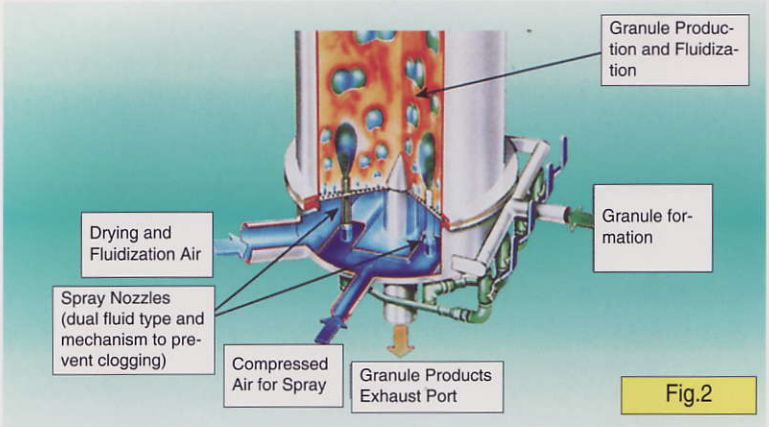


Fig.2

AGM-SD type is the fluidized bed granulation equipment which does not need internal insertion parts, such as a rotation disk used in a tumbling fluidized bed granulation dryer, and a draft tube used in flow layer coating equipment, and which carried out very simple structure.

As shown in Fig. 2, this granulation method is to inject and feed liquid materials into the fluidized bed section where nothing is first found, where sheet particles are not used (patent pending). That is, (1) the spray mist diameter of injected and fed liquid material is a fine droplet of only 10 μm approximately, therefore, liquid materials are instantly solidified into fine particles (Photo A) in the process where the fluidized bed is ascending, and collected in the filter bag on the upper side of the fluidized bed. The filter bag unit (2) filters intermittently the fine particles down to the spray zone on the bottom of the fluidized bed according the pulse jet back wash method. There, the fine particles are wetted with liquid material, and grown into granules (Photo C) through agglomerating. At the same time, liquid materials directly adhere to the granule surface, regarding the more grown granules (Photo C), where if dried and solidified, "Layering granulation" will occur. After such agglomeration/granulation and layering granulation are continued, the granule (Photo D) fluidized bed is formed. (3) almost liquid materials, which have been fed thereafter, adheres and expands to granule surface, the layering granulation to deposit and dry is developed. Therefore, as sphericalization and heavy agglomeration actions of particles are further promoted, heavy and spherical granules (Photo E) will be produced. When liquid materials with other functions are further subsequently injected and fed to granules obtained therein, marking tablet coating (Photo F: products which granules in Photo E are treated with coating for marking tablet), or multi-layer coating can be easily achieved.

In addition, Photo 2 (refer to this catalog 4 page) represents a results, where nuclear particles for coating pharmaceutical solid preparation have been reviewed. The model material is a product, where ethenzamide (average particle dia.:7 micro meter approx.) is prepared for the water-based slurry with 30% weight density [HPC-L(hydropropyl cellulose as binder) is added by 6% to ethenzamide weight]. By employing this granulation method, granules with both high sphericity and liquid density and applicable to sharp nuclear particle of particle distribution are obtained at the high yield.

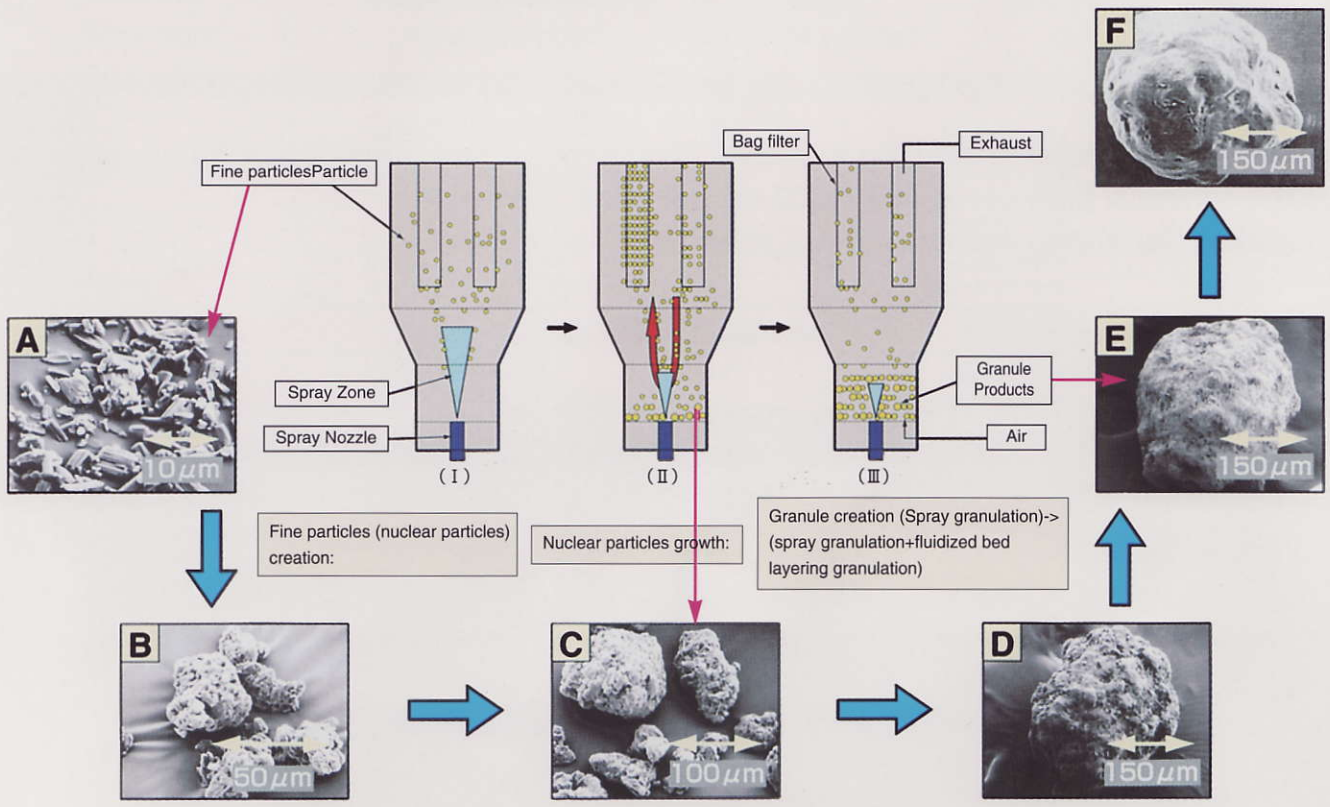
On the other hand, granule particle strength can be controlled by adjusting the addition rate of binder in the slurry.

Next, Photo 2 shows an electron microscope photograph of the granule product which has been produced from aqueous solution material of a kind of food adhesive. Observing the granule surface properties, you can find a squama-shaped adhesion layer of 10~20 micro meter approx. relevant to the spray mist diameter. This indicates the result where the liquid material adhered to the granule surface is successfully extended and dried on the surface thereof in the last half of the granulation process, as previously described in Figs. 7 (II) ~ (III). As a result where such layering has proceeded in the most stable configuration by action of the interfacial force on the liquid material, it is considered that high sphericity and heavy nature granules can be obtained. As described above, this equipment has the characteristic layering granulation mechanism.

When liquid materials are fed and granule products are created within the fluidized bed, the products are discharged from the product outlet at the center of the bleeder in case of batch operations.

Granule Growth Mechanism

Unique granulation principles of characteristics where spray/dry granulation and fluidized layering granulation are compounded



●Slurry constituent: ethenzamide powders (average particle dia.: 7 μm 30%), binder(1.8%), water (68.2%)

Fig.2

Agglomaster contributes to the simplification and the cost reduction of drying & granulation

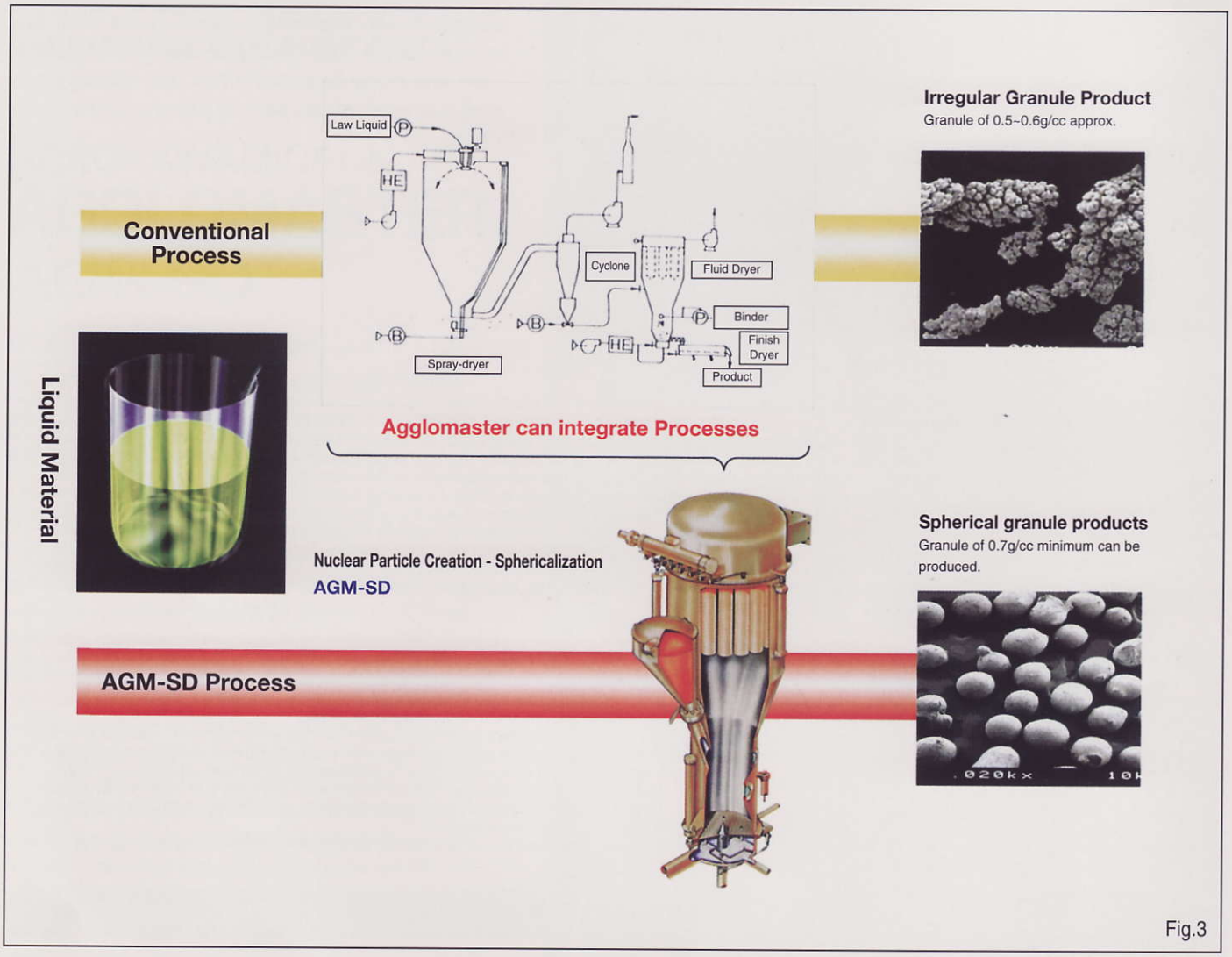


Fig.3

Comparison Condisions: Solution materials (moisture concentration 50%W.B.) are granulized into the spherical granules of about 500 micrometers .
Processing Capability: 400kg/h

	The conventional process	AGM-SD
Initial Cost (set)	100 Spray-dryer + cyclone + granulator + granule sphericalization machine + finish dryer + piping work etc.	70 AGM-SD + piping, work, etc.
Running Cost (annual)	100	50
	Pump + heat generator, blower and other utility costs+ operator expense etc. × operating time	
Maintenance Cost (annual)	100	80
	Operator expense × operating time	
(Annual total amount)	100	70
Expected depreciation term	100	70

Value of AGM-SD indicates the comparative value (%) counting the conventional process as 100.

Table.1

Samples of Application

Granule product sample according to AGM-SD

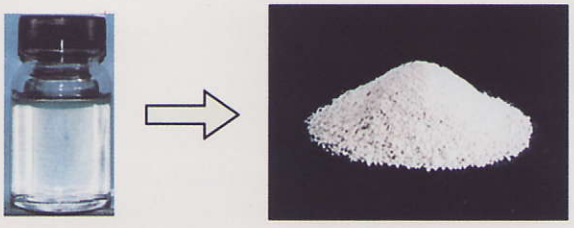
Material : Aqueous liquid of food adhesive

Up : Granule product (average particle dia.: 1000 μm)

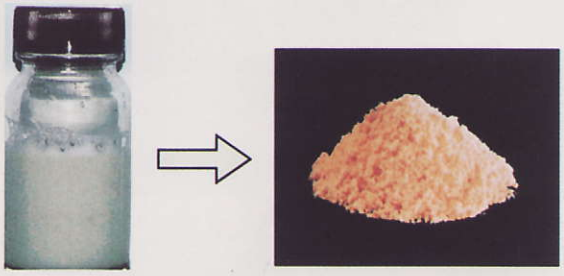
Right up : Granules on electron microscope

Left under : Granule surface observed on electron microscope photograph

Dissolved substance with largeness of 10 μm approx. is extended, where deposited and solidified (layering granulation) aspect is observed.



Edulcorant Granule product



Fruit juice product Granule product

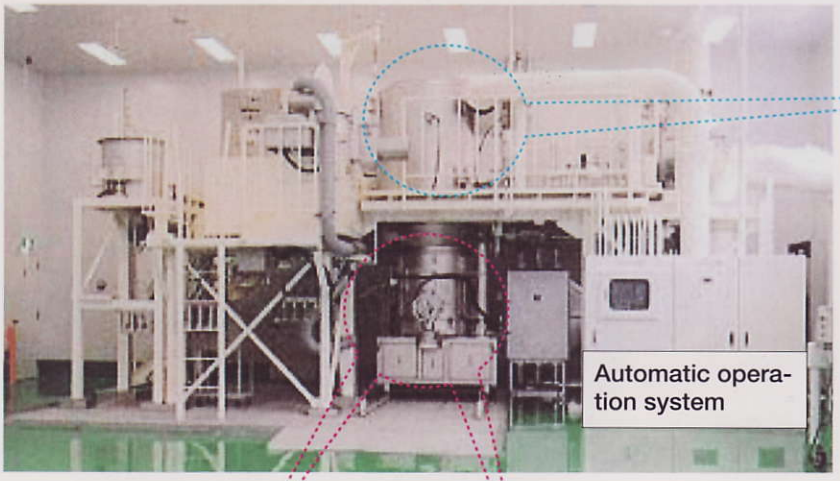
Material Name	Purpose of Granulation	Feed Condition	Product Granule size (μm)
Food relations			
Perfume liquid	apparent density enhancement	aqueous slurry	150-500
Sugar solution	apparent density enhancement	aqueous liquid	150-500
Tea condense liquid	apparent density enhancement	aqueous liquid	150-500
Soy sauce	apparent density enhancement	aqueous liquid	150-500
Synthetic edulcorant	transport cost reduction	aqueous liquid	75-710
Apple aceta	apparent density enhancement & transport cost reduction	aqueous liquid	75-1000
Fruit juices	transport cost reduction	aqueous liquid	75-1000
Food preservatives	apparent density & fusibility enhancement	aqueous liquid	350-2000
Flavoring material (soy sauce base)	transport cost reduction	aqueous liquid	75-500
Natural pigment	transport cost reduction	aqueous liquid	100-900
Synthetic pigment	transport cost reduction	aqueous liquid	100-900
Milk serum condense liquid	marking tablet granule	aqueous liquid	45-500
Starch	apparent density & fusibility enhancement	aqueous liquid	75-500
Pharmaceutical relations			
Ethenzamide	Spherical nuclear particle	aqueous slurry	150-350
Probenecid	base pharmaceutical for direct marking tablet	aqueous slurry	75-150
Herb medicine	marking tablet granule	aqueous liquid	150-350
Enzyme	apparent density enhancement	aqueous liquid	75-500
Vitamins	apparent density & fusibility enhancement	aqueous liquid	150-350
Inorganic chemicals	apparent density enhancement	aqueous liquid	150-350
Fertilizer	transport cost reduction	aqueous liquid	45-500
Chemical synthetic product relations			
Boundary actives	apparent density enhancement & transport cost reduction	aqueous liquid	300-700
Detergent	apparent density enhancement & transport cost reduction	aqueous liquid	150-1000
Compound dye	apparent density & fusibility enhancement	aqueous liquid	150-710
Water-solubility	apparent density enhancement & transport cost reduction	aqueous liquid	75-350
Aryl resin	drying (primary particle collected)	aqueous slurry	-1
Alumina	apparent density enhancement & formability	alcohol slurry	75-350
Zirconia	apparent density enhancement & formability	alcohol slurry	75-350
Ferrite	apparent density enhancement & formability	alcohol slurry	150-350
Silicon nitride	apparent density enhancement & formability	alcohol slurry	150-350
Titanium oxide	Surface deformation	methanol slurry	-1
Kaolin	apparent density enhancement	aqueous slurry	45-500
Cray	apparent density enhancement	aqueous slurry	150-710

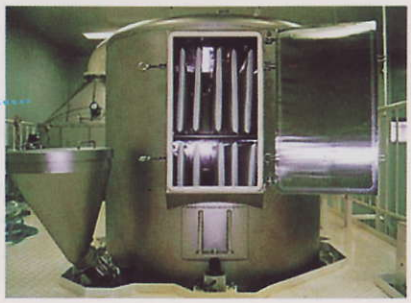
Table.2

AGGLOMASTER Multi-type

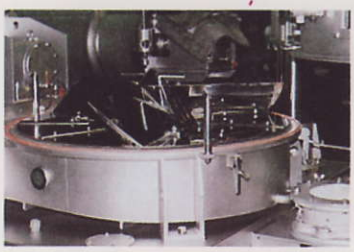
By the multi-type, by exchanging the granulation unit of the flow layer lower part, the use as a SD type and the use as various functions type particle processing equipment (refer to AGM-PJ and a separate volume catalog) are attained, and various granulation processings can be realized efficiently at one set.

The example of a production system (Processing Capacity : 500L/Batch)



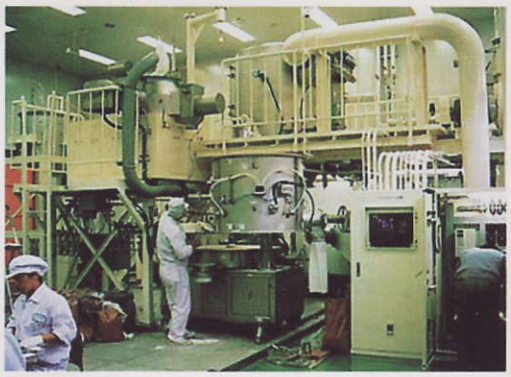


One example of the dust catcher for AGGLOMASTER excellent in decomposition washing nature



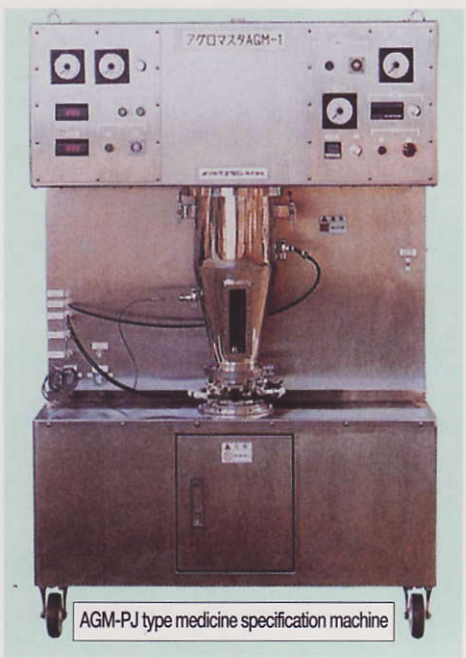
At the time of chamber wearing of an AGM-PJ type It corresponds to tumbling fluidized granulation of particle materials.

At the time of chamber wearing of the AGM-SD type to roll It corresponds to granulization of liquid materials.



Exchange work scenery of a ventilation board
Working-hours : 15 minute (operator : 1 person)

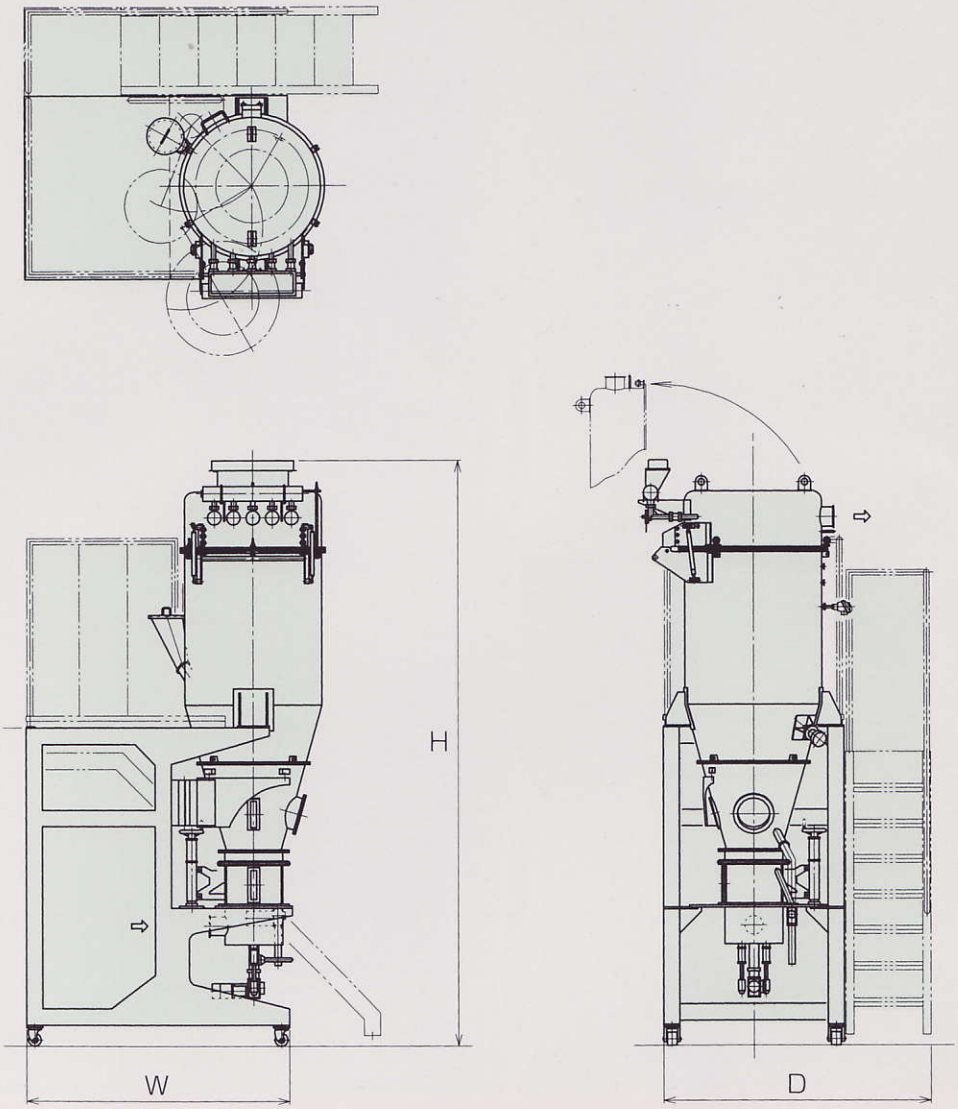
The example of a lab machine



It is lineup about the abundant sizes to which even the large-sized production machine was based on needs from the lab machine.

AGM-SD type

Standard outline size



仕様

Type		AGM-2SD	AGM-35SD	AGM-75SD	AGM-100SD	AGM-125SD	AGM-170SD
Height	[mm]	1660	3600	5100	5610	6280	9250
Length	[mm]	800	2000	2000	2500	2500	3200
Width	[mm]	1000	1600	2600	3000	3000	3400
Granulation chamber dia (fluid board dia.)	[mm]	156	350	750	1000	1250	1700
Fluid Air Flow	[m³/min]	1.2	7~12	30~50	55~90	100~170	160~220
Bottom Spray Nozzles	[number of pieces]	1	1~2	4	6	8~10	8~12
Maximum Inlet Heat Air Temperature	[℃]	120	200	200	200	200	200
Moisture Content	[kg/h]	~1.2	8~17	33~75	70~135	110~210	200~360
Scale up rate		—	1	4.5	8	13	24

This specification and a size may be changed without a preliminary announcement for improvement and the improvement in a performance.

Hosokawa Micron Corporation is a member of the Hosokawa Micron Group, responding to global needs through emphasis on materials science and engineering. The Group is an international provider of equipment and technology for powder and particle processing, product recovery, plastics research, engineering, manufacturing and service in each of the world's major industrial markerts

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