



TOKUJU
SPECIALIST & MANUFACTURER
POWDER PROCESSING
MACHINERY & SYSTEMS DESIGN

MULTISTAGE VIBRO-FLUIDIZED BED DRYER

KOTOBUKI BRAND

GYRO-DRYER ^{MODEL} GD

TOTAL RELIABILITY BASED ON EXPERIENCE



KOTOBUKI GYRO-DRYER
Model: GD-120 (4 stage type)

This dryer, a new type of multi-stage vibro-fluidized bed dryer, generates gyratory motion throughout the whole drying unit. Materials are advanced by special baffles and perforated plates. Effective agitation and dispersion force of the dryer are best for materials which are characterized by strong adhesivity, cohesion and high water content in the initial stage of drying.

FEATURES

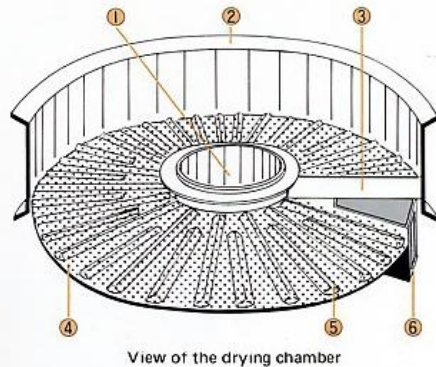
- E**asy Cleaning — The drying unit is easily disassembled for thorough cleaning.
- E**nergy Saver — Advanced combination of baffle, gyratory motion and multistage system bring forth ideal heat efficiency which saves operating costs.
- E**conomy of Hot Air — Minimum hot air is needed for drying because the gyratory motion agitates and moves the materials.
- E**qual Drying — Materials, both even and uneven sized ones, are effectively and equally dried by the hot air and dispersion, regardless of the size of the particles.
- E**ffective even for lumps — Drying by dispersion and hot air is very effective even for lumped materials with no spoilage resulting.
- E**conomy of space — The multistage formation of the dryer saves floor space.

GYRO-DRYER MODEL GD

CONSTRUCTION

Drying Unit

The drying section consists of a hot air chamber, drying chamber and upper side chamber held together by a band. The frame and hot air tube and perforated plates are welded into one unit. Baffles which have been machine pressed at angles from 5° to 10° are attached to the perforated plate in a radial design.



- ① Hot air tube
- ② Frame
- ③ Material outlet plate
- ④ Perforated plate
- ⑤ Baffle
- ⑥ Material outlet

Entire Unit

This equipment is composed of a drying unit consisting of an upper side cover, a drying chamber and a hot air chamber, and a drive unit consisting of bed, motor and eccentric shaft set.



- ① Upper side cover
- ② Drying Chamber
- ③ Hot air chamber
- ④ Motor
- ⑤ Bed

Drive Unit

In the center of the bed unit, there is the driving eccentric shaft set and connected to this are four driven eccentric shaft sets found in four locations. The eccentric shaft set drives the driven eccentric shaft sets. In type GD-70, there are support rods in place of the driven eccentric shaft sets. The motor drives the shaft sets which in turn cause the upper chambers to move in gyratory motions.



- ① Hot air chamber
- ② Driving eccentric shaft set
- ③ Driven eccentric shaft set
- ④ Motor
- ⑤ Bed

View of the drive unit

PRINCIPLE OF OPERATION

Movement of materials on baffles

Fig. 1 (a) shows a plate without baffles on which the materials would move in a circular direction and build up a force of momentum but are not moved in a fixed direction on the perforated plate. Fig. 1 (b) shows the case of the plate with baffles attached; the particles will strike against this baffle and generate an upward force, resulting in its three-dimensional motion. This powerful stirring and dispersion effect will be exerted on the particle.

If the baffle was further given a cross-sectional shape of an irregular triangle, the particles will be transferred by crossing over from the leniently sloped side to the steeply sloped side.

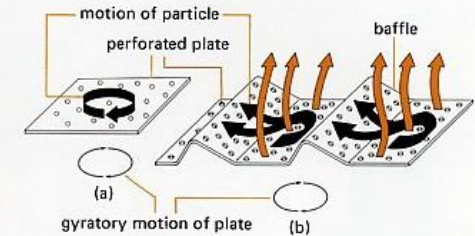


Fig. 1 The motion of the particle undergoing gyratory motion of the plate

Flow of particles and hot air in drying unit

The construction of the drying unit is shown in Fig. 2. Hot air is fed into the center part of the upper side cover downwards where it flows into the respective drying chambers and through the perforated plates. The moist material is fed into the uppermost stage and is dried by the dispersion effect of the gyratory motions. The material makes one revolution on each plate before passing to the next stage. The counter-flow system is used so that the material comes in contact with hot air of increasingly higher temperature, resulting in thorough drying. Economy is maintained by a simple plate seal that prevents blow-by and loss of hot air.

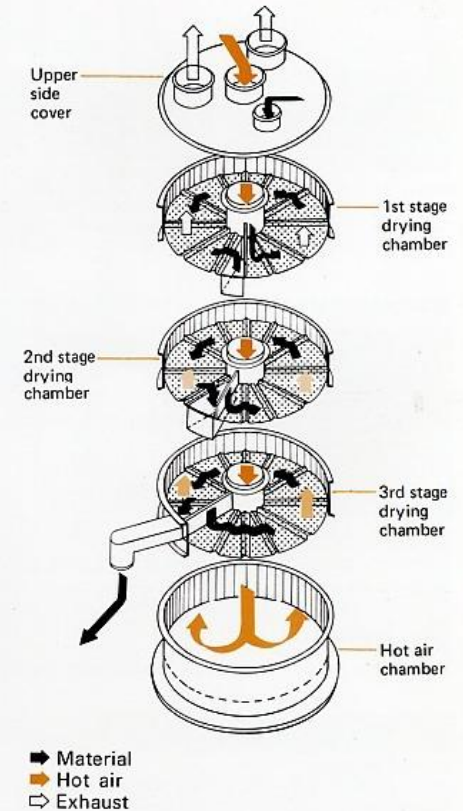
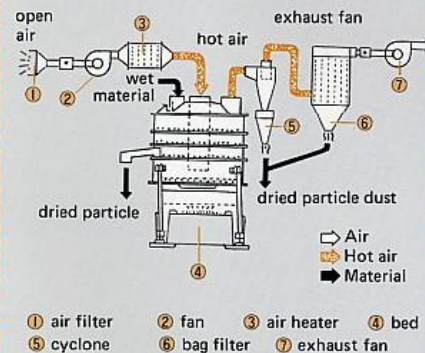


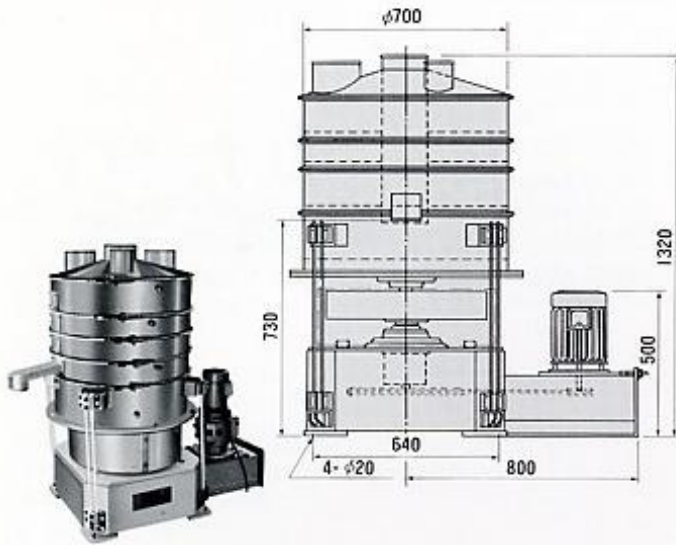
Fig. 2 The view of the drying unit

Flow Chart

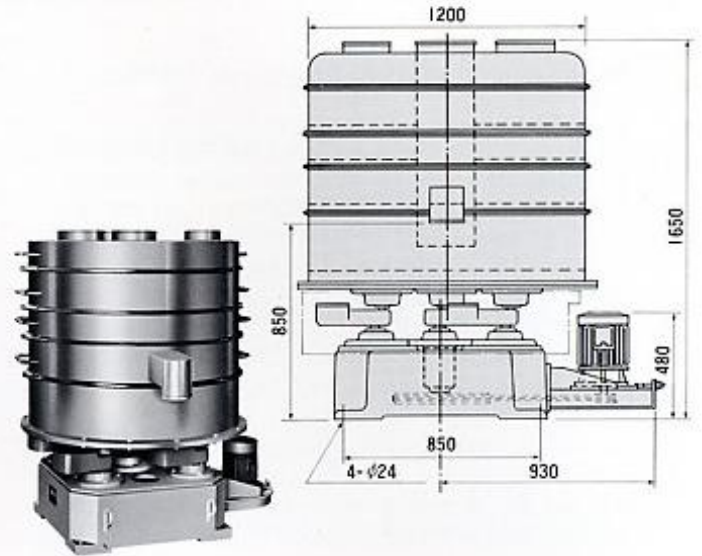


- ① air filter
- ② fan
- ③ air heater
- ④ bed
- ⑤ cyclone
- ⑥ bag filter
- ⑦ exhaust fan

■ Type GD-70 (Three stages)



■ Type GD-120 (Three stages)



■ Standard dimensions and specifications

TYPE	Diameter of perforated plate	Area of perforated plate	Maximum No. of Stages	Revolution Amplitude	Revolutions	Power	Net weight
GD-70	φ700mm.	0.33m ² /stage	5 stages	25 mm.	180-220r.p.m.	0.75kw	500kg
GD-120	φ1200mm.	1.0m ² /stage	5 stages	30mm.	180-220r.p.m.	2.2kw	1200kg

- NOTE: 1. All dimensions are in mm.
 2. Contact parts with feed materials are made of Stainless Steel.
 * TOKUJU reserves the right to change or alter specifications, dimensions and designs without prior notice.

■ Drying data including the falling-rate drying period (Type GD-70)

		Granulated Seasoning	Soft Salt crystals	Granulated Egg powder	Granulated Germicide	Crushed Dried Bonito
Particle size	mm	1.2-2	1	2.5-5	1-2	1-2
Feed rate (wet-basis)	kg/h	300	98	48	45	93
Initial moisture content (dry-basis)	%	2.9	4.3	27	20	20
Product moisture content (dry-basis)	%	0.4	0.02	3.0	0.3	3.0
Rotation speed	rpm	224	200	192	210	200
Inlet air temperature	deg. C	103	134	104	72	120
Air flow rate	kg-air/sec	0.178	0.121	0.114	0.143	0.153
Number of stages	—	3	3	4	3	3
Drying rate	kg H ₂ O/h, m ²	7.2	4.0	7.0	7.6	13.5
Heat efficiency	%	76	62	76	57	68

NOTE: The capacity of GD-120 is approximately 3 times that of GD-70.

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