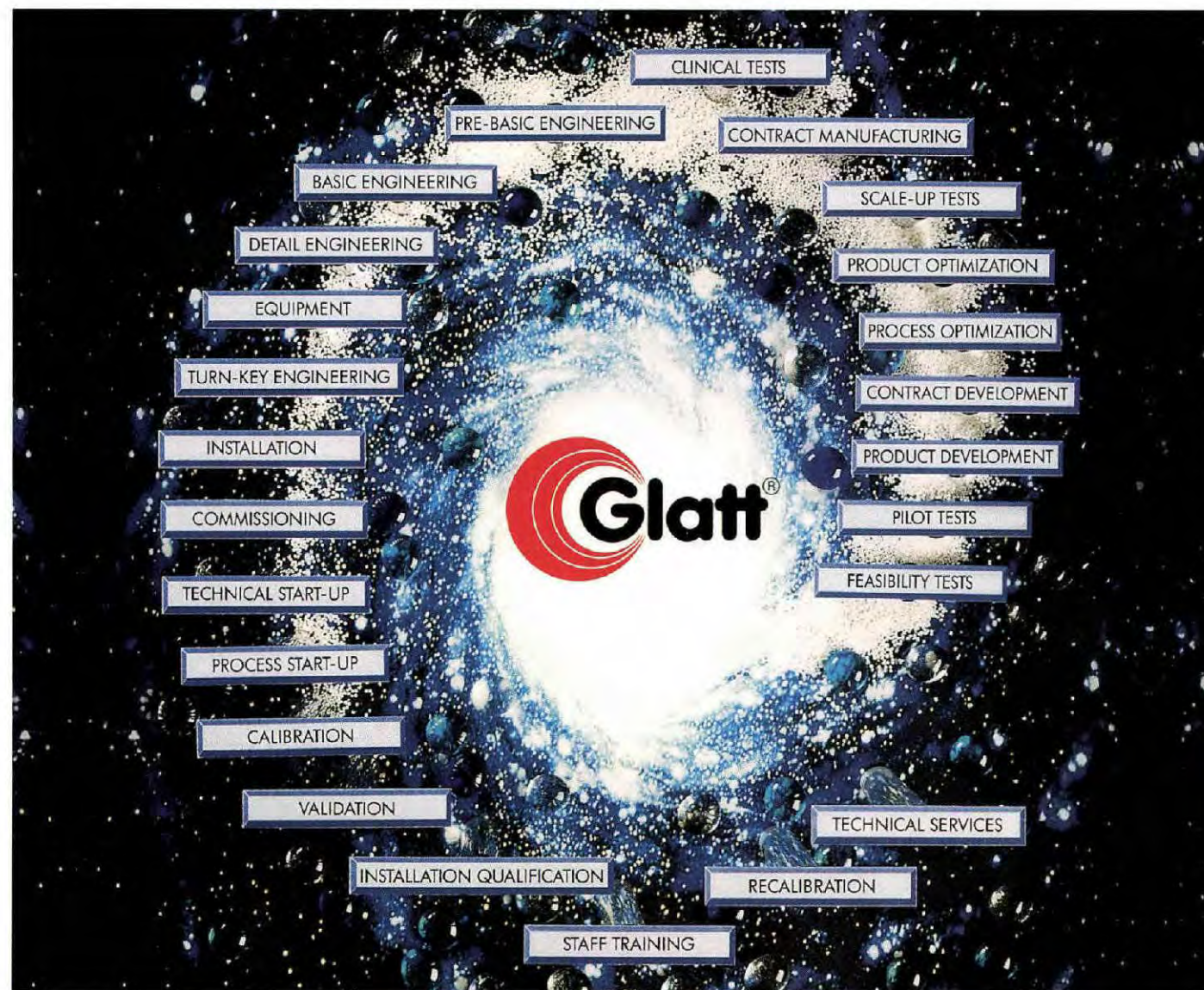


## Worldwide Service to the Industry



### Glatt® GmbH Process Technology

Bühlstraße  
79589 Binzen/Germany  
Phone: (+49) (7621) 6 64 0  
Fax: (+49) (7621) 6 47 23  
E-mail: mail@glatt.de

### Glatt® Ingenieurtechnik GmbH

Nordstraße 12  
99427 Weimar/Germany  
Phone: (+49) (3643) 47 0  
Fax: (+49) (3643) 47 12 31  
E-mail: gi@glatt.de

### Glatt® Systemtechnik GmbH

Gründer Weg 26  
01277 Dresden/Germany  
Phone: (+49) (351) 25 84 0  
Fax: (+49) (351) 25 84 328  
E-mail: glatt.dresden@online.de

### Glatt® Norden ApS.

Højrevang 24  
3450 Allerød/Denmark  
Phone: (+45) (48) 14 22 44  
Fax: (+45) (48) 14 22 55  
E-mail: info@glattnorden.dk

### Glatt® Maschinen- & Apparatebau AG

Kraftwerkstraße 6  
4133 Pratteln 1/Switzerland  
Phone: (+41) (61) 8 26 47 47  
Fax: (+41) (61) 8 26 48 48  
E-mail: glatt-ag@glatt-ag.ch

### Glatt® INOX AG

Wöschnerstraße 38  
5012 Schönenwerd/Switzerland  
Phone: (+41) (62) 8 58 40 00  
Fax: (+41) (62) 8 58 40 10  
E-mail: salesoffice@inox-glatt.ch

### Glatt® INOX Inc.

8701 Mallard Creek Road  
Charlotte, NC 28262 USA  
Phone: (+1) (704) 548 1400  
Fax: (+1) (704) 548 9196  
E-mail: brianwarren@glattinoxinc.com

### Glatt® Labortecnic SA

Paseo Guayaquil, No. 19  
08030 Barcelona/Spain  
Phone: (+34) (93) 3 45 67 00  
Fax: (+34) (93) 3 46 13 04  
E-mail: glatt\_labortecnic@combrabs.es

### Glatt® Pharmatech S.à.r.l.

Parc Technologique  
6, rue Louis Née  
21000 Dijon/France  
Phone: (+33) (3) 80 74 32 64  
Fax: (+33) (3) 80 74 43 95  
E-mail: glatt-pharmatech@wanadoo.fr

### Glatt® Protech Ltd.

Swantonington Rd. Cottage Lane Ind. Est.  
Broughton Astley  
Leicester LE9 6TU/Great Britain  
Phone: (+44) (1455) 28 58 58  
Fax: (+44) (1455) 28 55 10  
E-mail: glatt-protech@glatt-protech.co.uk

### Glatt® Air Techniques Inc.

20 Spear Road  
Rumsey, NJ 07446 USA  
Phone: (+1) (201) 8 25 87 00  
Fax: (+1) (201) 8 25 03 89  
E-mail: info@glattair.com

### Glatt® China

Representative Office  
Ou Yang Mansion 16 A  
Ou Yang Road 561#  
Shanghai 200081/P.R. China  
Phone: (+86) (21) 650 705 46  
Fax: (+86) (21) 650 705 46  
E-mail: glatt@public8.sta.net.cn

www.glatt.de

## Glatt® Fluid Bed Processors for Research and Development

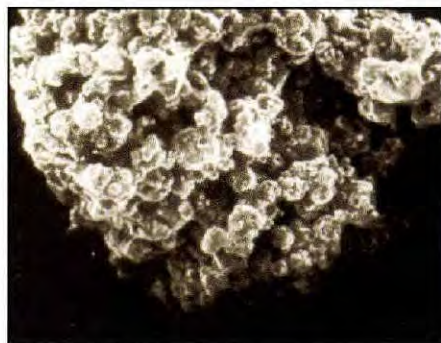


**Your Tool for the Development of Innovative Products  
for the pharmaceutical, chemical and food industries**





## Process Technology: Top Spray



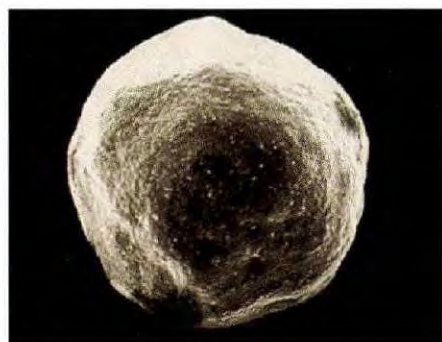
Instantized flavor granule



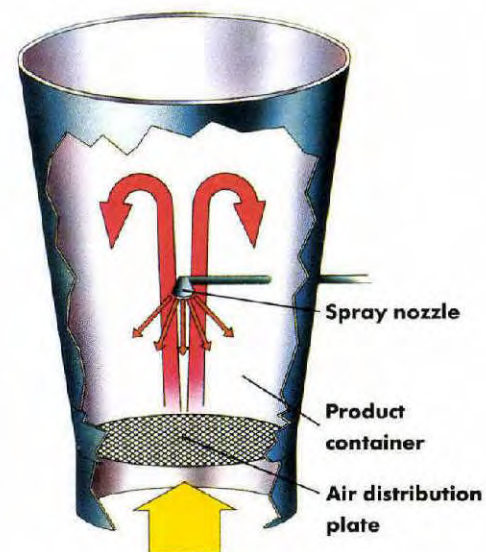
Granulated pharmaceutical



Granulated pharmaceutical



Top spray enteric coated pharmaceutical



Top Spray

### Agglomeration/ Granulation

- Reduce fines / dust
- Enhance flowability
- Eliminate segregation
- Homogeneous mixture of all ingredients
- Improve compressibility
- Alter bulk density
- Improve disintegration and dissolution

### Coating

- Hot melts
- Taste masking
- Moisture and oxygen barrier coatings
- Enteric coatings
- Aesthetic coatings

### Instantizing

- Improve dispersibility
- Increase porosity
- Disperse surfactants uniformly



## New: Dry Powder Layering

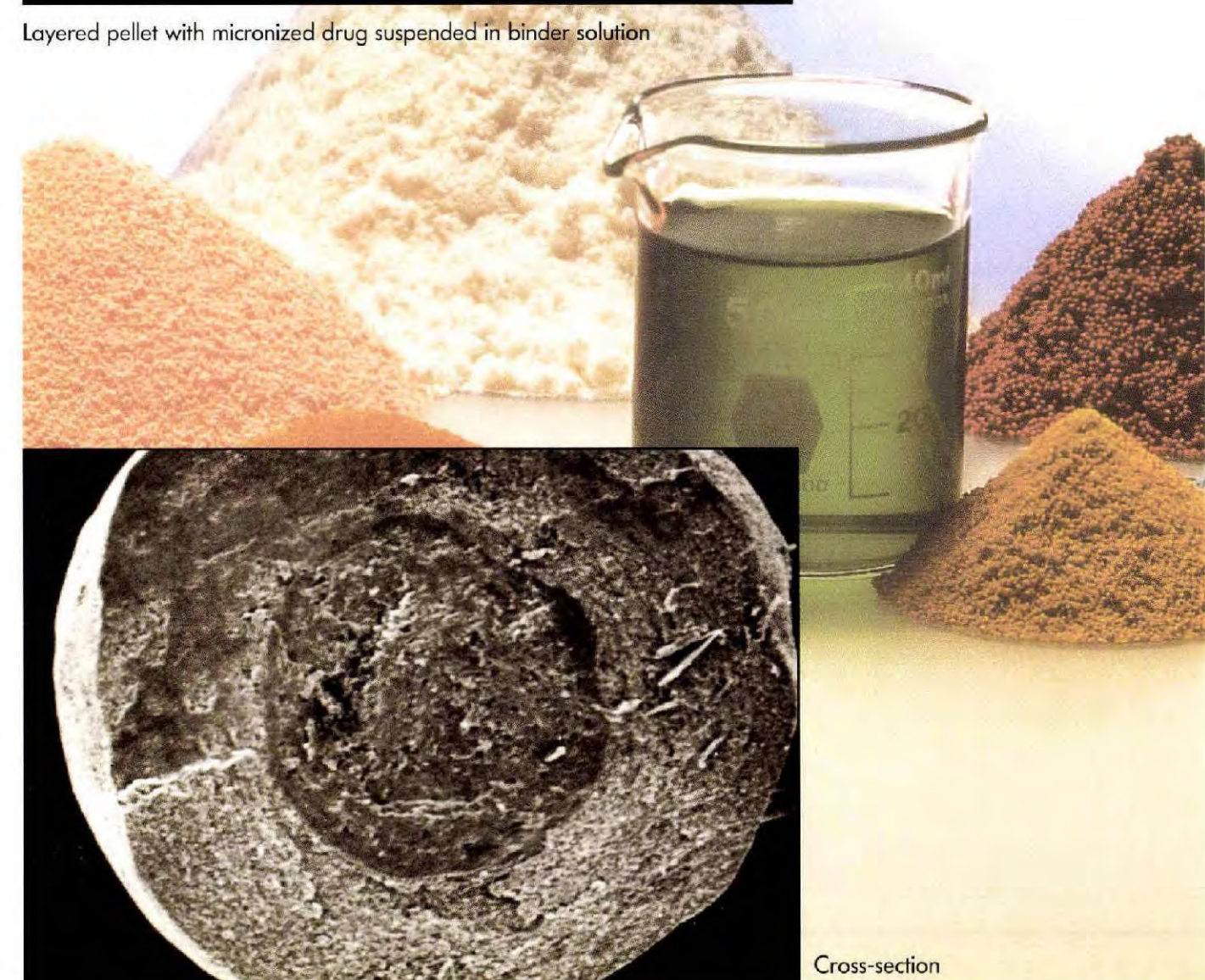


Layered pellet with micronized drug suspended in binder solution

Dry powder layering is achieved by depositing powder on a neutral nucleus.

### Special Features

- Extremely short processing time with a weight gain of up to 300 %/h (800 % totally)
- High yield (up to 98 %) of essentially spherical pellets with extremely smooth surface
- Energy savings due to reduced air and liquid consumption



Cross-section



## Process Technology: Rotor



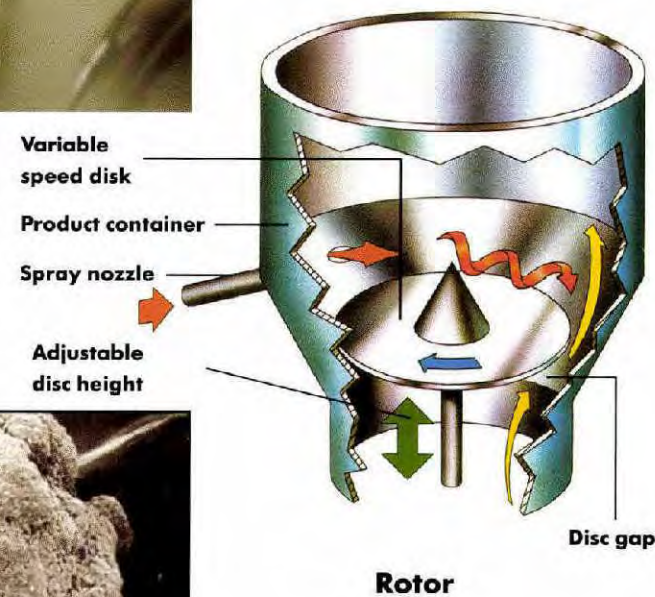
Rotor insert  
Easy handling with swivel device

### Granulation

- enhance disintegration
- improve compressibility
- increase density
- spherical morphology

### Spheronization

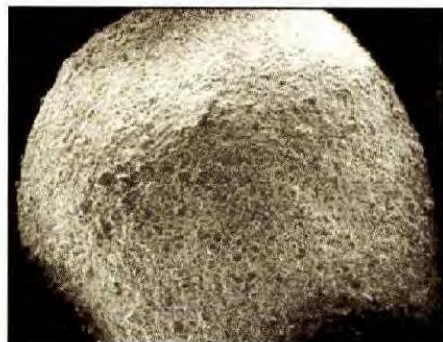
- increase density
- produce spherical particles
- high potency spheres
- smooth surface properties



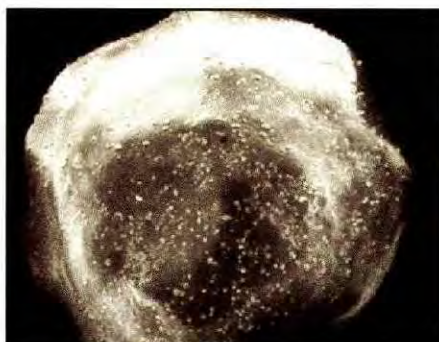
Rotor spheronized  
pharmaceutical (population)



Rotor spheronized pharmaceutical



Rotor pelletized pharmaceutical



Rotor solution layered pharmaceutical

### Layering

- solution / suspension layering
- powder layering
- high potency pellets
- narrow particle size distribution
- increase density

### Coating

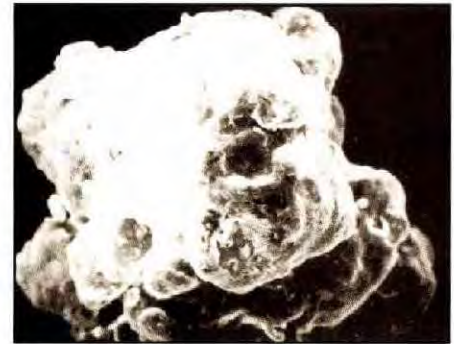
- film coatings
- enteric coatings
- sustained release coatings
- hot melt coatings

## New: Hot Melt Coating

Among the various top spray coatings special attention should be given to hot melt coating. Instead of diluting or suspending the solids in water or organic solvents, a molten lipid or wax is sprayed onto the substrate.

### Special Features

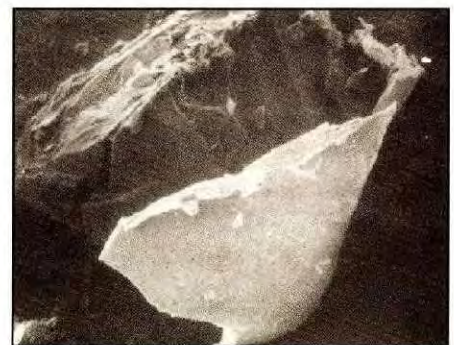
- Very economical and operator-friendly process as no solvent has to be evaporated (spray liquid = 100 % coating agent)
- Inexpensive coating materials taken from the food industry
- Capable of temperature release of active ingredients
- Wide application within the food & feed industries (particularly taste masking)



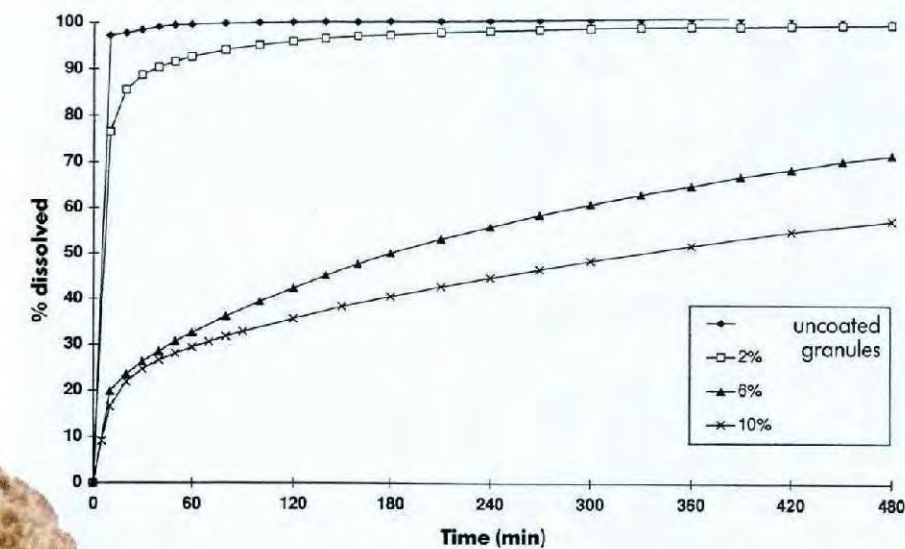
Wax-coated granule



Lipid coated citric acid, surface



Lipid coated citric acid, cross-section



Dissolution of theophylline from coated  
granules with Compritol® 888 Ato





# Process Technology: Bottom Spray / HS Wurster Coating



## Coating

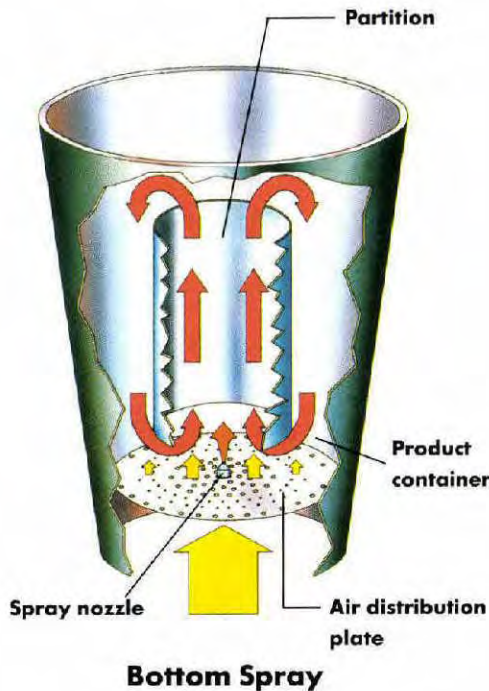
- Aqueous or solvent based solutions or suspensions
- Controlled release coatings
- Enteric release coatings
- Fine particle coating
- Active layering



Wurster HS latex coated pharmaceutical (particle size < 150 μm)

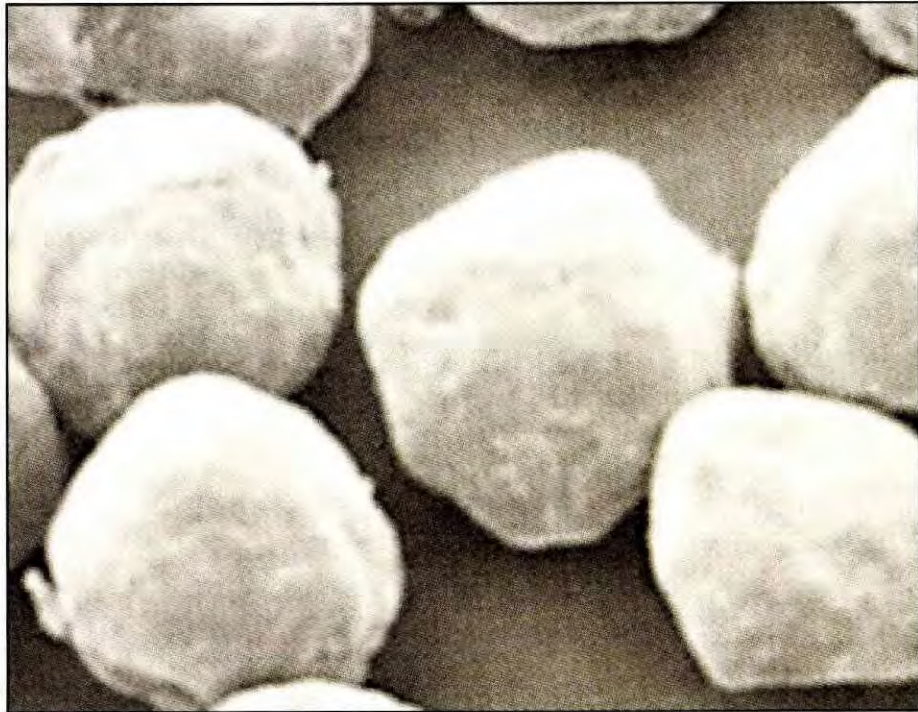


Wurster HS controlled release nutritional



## New: HS Wurster (High Speed)

A modification of the conventional bottom spray technology permits the coating of particles down to **10 μm** and there-with the development of oral controlled release suspensions.



Coated micro granules (~100 μm)

## Special Features

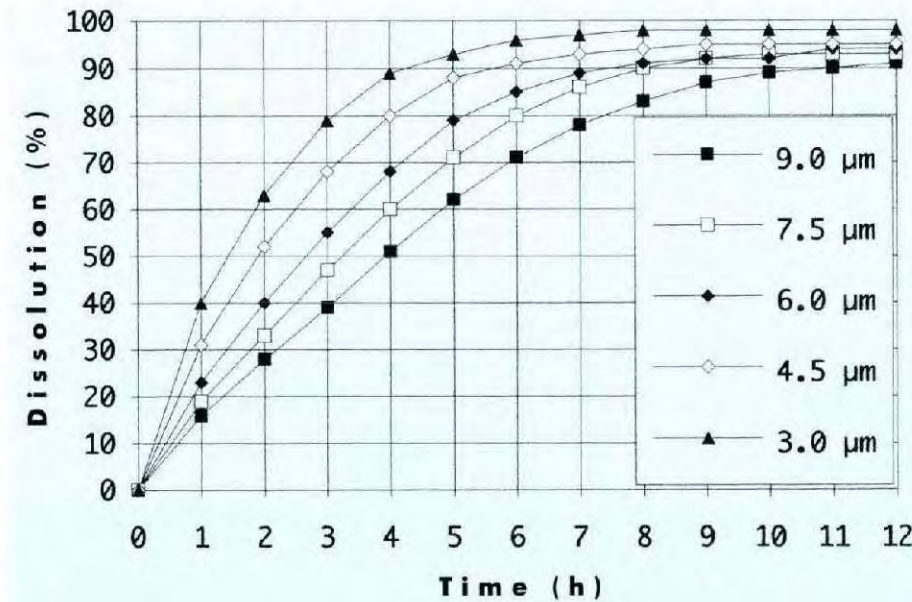
- Higher spray rates
- No agglomeration of microparticles during coating
- Retrofit option for existing conventional Wurster units



Magnification



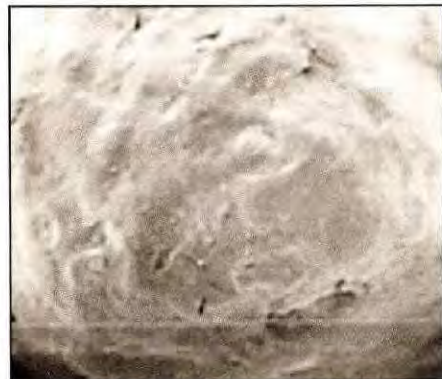
Wurster HS latex coated pharmaceutical (particle size < 150 μm) (cross-section)



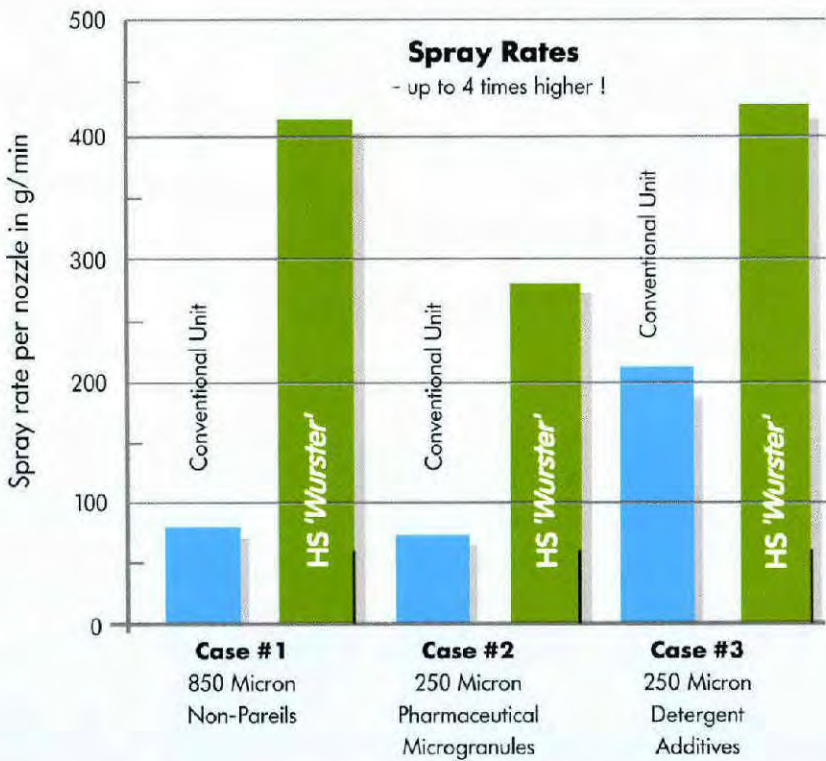
Dissolution of theophylline from coated pellets as a function of the thickness of the coating. Coating is ethylcellulose with polyvinylpyrrolidone (PVP) as a pore forming agent



Cross section of micro granule



Magnification  
Coating function: taste masking



Comparison Wurster - HS Wurster



# Control Systems

## Uni-Glatt:

Manual system with individual push buttons

## GPCG 1.1 and GPCG 3.1:

EcoView II® - microprocessor controls with modern flat-screen monitor and membrane key board

## Options

- LabView® (Trade mark of National Instruments®): PC-based software package for data acquisition and flow diagram and trend graphics (Excel® compatible) (Excel® = Trade mark of Microsoft®)
- MaintView® = Electronic service manual with integrated error analysis guidance



Uni-Glatt®



GPCG 1.1 with rotor insert and EcoView®



GPCG 3.1 with Wurster insert

## Technical Data

(All rights for changes reserved)

Model Numbers			Uni-Glatt®	GPCG 1.1®		GPCG 3.1®
Maximum product container volume			1 piece	1 piece	2 pieces	2 pieces
	Top spray	dm³	4.7	4.7	–	7.6
	Bottom spray	dm³	2.6 (6", conical)	2.4 (6", conical)	–	5.4 (7", conical)
	Tangential spray	dm³	–	–	4.5 (300 mm rotor diameter)	4.5 (300 mm rotor diameter)
Fan	Air volume*	m³/h	120	120		250
	Motor capacity	kW	1.1	2.2		2.2
Heater	Inlet air temperature	°C	up to 80	up to 80		up to 100
	Heating capacity	kW	1.8	4		11
Utility requirements	Heating medium	-	Electric	Electric		Saturated steam 3 bar (g), ~20 kg/h, (option: hot water)
	Electrical connections	Ph/V/Hz	To specification	To specification		To specification
	Compressed air	bar (g)	6	6		6
Approximate dimensions	Width	mm	700	1500		2700
	Depth	mm	604	680		850
	Height	mm	2085	2260		2560
Approximate weights		kg	150	500		900

\* other air volumes upon request



# Features of the new GPCG 1.1

- Improved GMP conformity
- Optional HS-Wurster insert for the coating of particles down to 10  $\mu\text{m}$
- Optional discharge sifter for continuous rotor pelletizing
- Integrated rotor drive with frequency control
- Integrated handling system for process inserts facilitates product handling
- Housing on rollers and hinged filter housing for easy relocation
- Increased table area with separate table for pump, scale and spray liquid container
- Easy-to-handle exhaust air filter
- Modern microprocessor controls
- PID loop control characteristics
- Precise air volume monitoring
- Quick disconnect plugs for all utilities

## Additional Features

Dual chamber filter housing with product retaining filter and quick coupling for manual filter change, pneumatically actuated filter shake pistons, various filter materials available with different porosities



Powder feed device with nozzle for powder layering



Sample port on the product container side wall with sample collector for receiving the product.



Integrated rotor drive



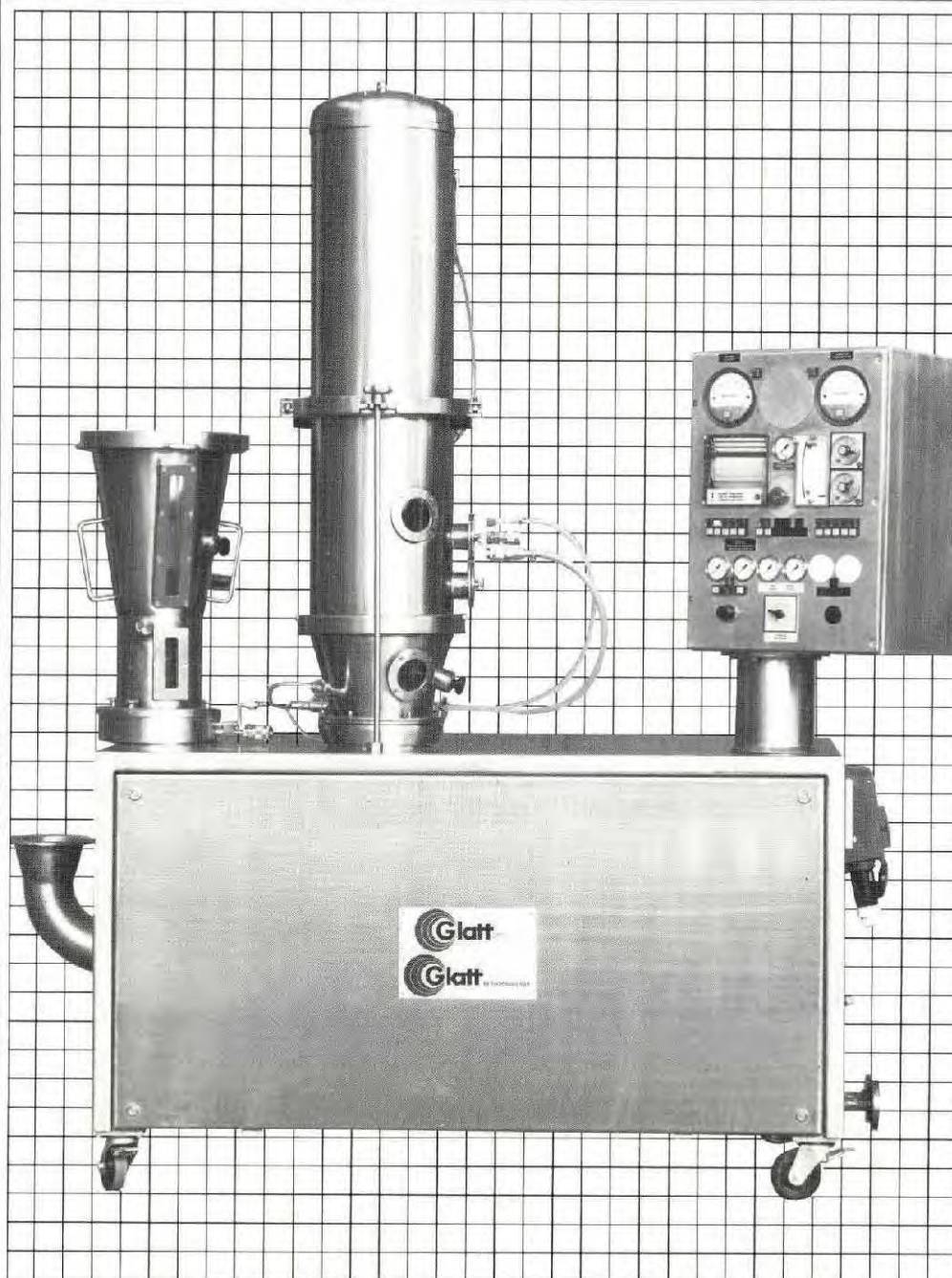
Different process inserts as modular design technique



Integrated handling system

# Fluid Bed Pilot Unit GPCG-3

Product  
Technology  
Service



GPCG-3 in all stainless steel construction shown with granulation, filmcoating, rotor pelletizing and powder coating change parts.



The Fluid Bed Pilot Unit GPCG-3 offering a wide variety of applications such as:

- Granulating, Drying
- Agglomerating, Instantizing
- Filmcoating of Powders, Pellets and Tablets
- Scaleable to production equipment

#### Standard Design Features

- product container, spray housing, filter housing and base console made from stainless steel
- choice of steam or hot water heater
- multiple nozzle positions for nozzle height adjustment
- quick disconnect coaxial air atomized spray nozzle with peristaltic pump
- increased capacity fan
- observation windows
- rapid change exhaust air filter system (twin-chamber)
- pneumatic exhaust air flap for control of fluidization height
- intrinsically safe pressing system
- sophisticated control panel
- work area at optimum bench height
- designed to conform to good Good Manufacturing Practices

#### Instruments

- inlet air temperature controller
- automatic filter shaking
- exhaust air flap with position indication
- pump control
- emergency on/off
- 2 pen recorder

#### Change Parts

- GPCG-1 change parts for granulating and drying
- 7 inch Wurster Filmcoating change parts
- GRG-3 rotary change parts

#### Options

- Powder feeder
- 2- or 3-pen recorder
- Magnehelic gauges
- Product bed temperature control

#### Technical Data

Fan: capacity 2,5 kW  
 air volume 400 Nm<sup>3</sup>/h  
 total delta/p 600 kPa/m<sup>2</sup>  
 heating capacity 11 kW  
 weight 500 kg

container volume	ltr.
GPCG-3	8,5
GPCG-1	5
7" Wurster	4
GRG-3 rotor	5
capacity (product dependent)	kg
GPCG-3	3-5
GPCG-1	1-3
7" Wurster	2-4
GRG-3 rotor	1-3
dimensions	mm
A	2200
B	890
C	300
D	850
E	1500

**Type E:**  
 2 bar pressure shock resistant processing unit, pressure relief via inlet and outlet ducts, electric controls, non-ex motors, contactors etc.

Unit for the processing of combustible powders and aqueous based solutions.

**Type P:**  
 2 bar pressure shock resistant processing unit, pressure relief via inlet and outlet ducts, pneumatic controls, ex-motors, contactors etc.

Unit for the processing of combustible powders and flammable solvents.

#### Glatt GmbH

D-7852 Binzen/Lörrach (BRD)  
 Tel. (07621) 664-0  
 Telex 773573 glatt d  
 Fax (07621) 6 47 23

#### Glatt AG

Kraftwerkstrasse 6  
 CH-4133 Pratteln (Schweiz)  
 Tel. (061) 814481  
 Telex 968011 glatt ch  
 Fax (061) 81 84 11

#### Glatt-Pharmatech S.à.r.l.

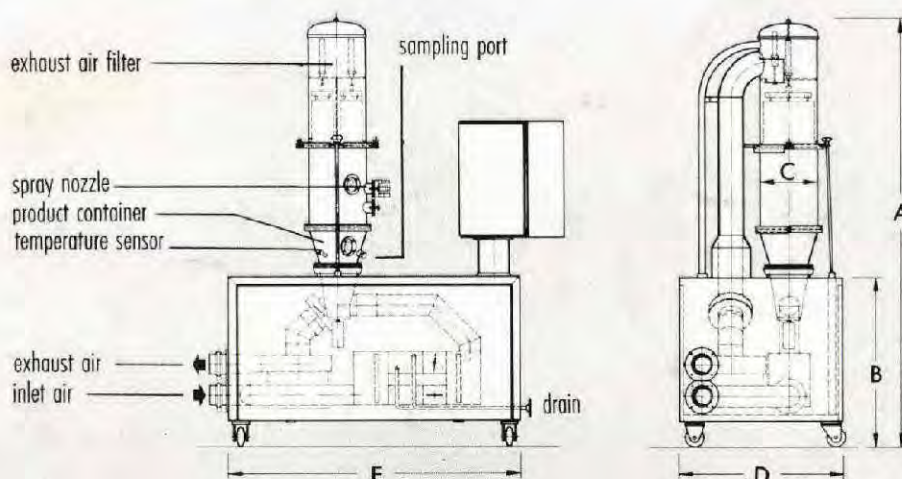
44 Route d'Ennery  
 F-95520 Osny (France)  
 Tel. (1) 30 38 82 20  
 Telex 696722 f glatpha

#### Glatt Air Techniques Inc.

20, Spear Road  
 Ramsey, N.J. 07446 (USA)  
 Tel. (201) 825-8700  
 Telex 0642378  
 Fax (201) 825 03 89

#### Glatt Labortecnic SA

Paseo Guayaquil, no. 19  
 (Pol. Ind. del Besós)  
 E-08030 Barcelona (España)  
 Tel. (3) 345-67-00  
 Telex 97408 glat e





# WSG 5

— for versatile applications of drying, granulating and film coating

Easy change-over within a few minutes

— to fluidized bed spray granulator WSG 1

— to fluidized bed film coater system Glatt-Zeller

WSLD 3–5

— to fluidized bed film coater Glatt-Wurster System

4 and 6 inch



WSG



WSLD



Wurster

The movement of particles in the various systems.



The various inserts of the changeable Glatt Fluidized Bed system.

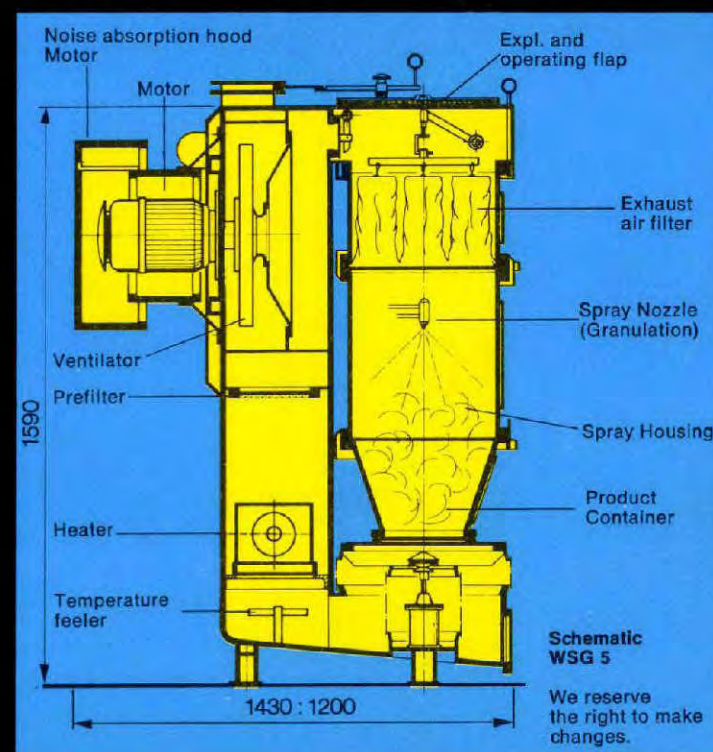
## Technical data:

Ventilator capacity: 875 cfm  
Ventilator motor: 2.5 kW  
Pump Motor: 0.25 kW  
Heating capacity: 64 000 BTU/h  
Compressed air pressure: 75/90 psi  
Compr. air consumption: 525 ft<sup>3</sup>/h

Glatt WSG 5 installations are standard equipped with antistatic devices and explosion proof electric component parts.

Werner Glatt – Spezialschnelltrockner –  
Lufttechnischer Apparatebau  
D-7851 Binzen-Kr. Lörrach  
Telefon (07621) 6049, Telex 773573.  
Cabel: GLATTBINZEN (Germany BRD)

Glatt – Maschinen- und Apparatebau AG  
CH 4132 Muttentz, Wildensteinerstraße 21  
Telefon 613600-02  
Cabel: Glattag Muttentz (Schweiz).



Presented by:

FLUIDIZED BED TECHNIQUE  
FOR RESEARCH  
AND DEVELOPMENT



LABORATORY UNIT

uni  
Glatt





# uni Glatt

LABORATORY UNIT

## VERSATILE IN ITS APPLICATIONS

drying of conventional granules, powders and crystalline substances

Mixing, agglomerating, drying in a single unit operation (Fluidized bed spray granulating)

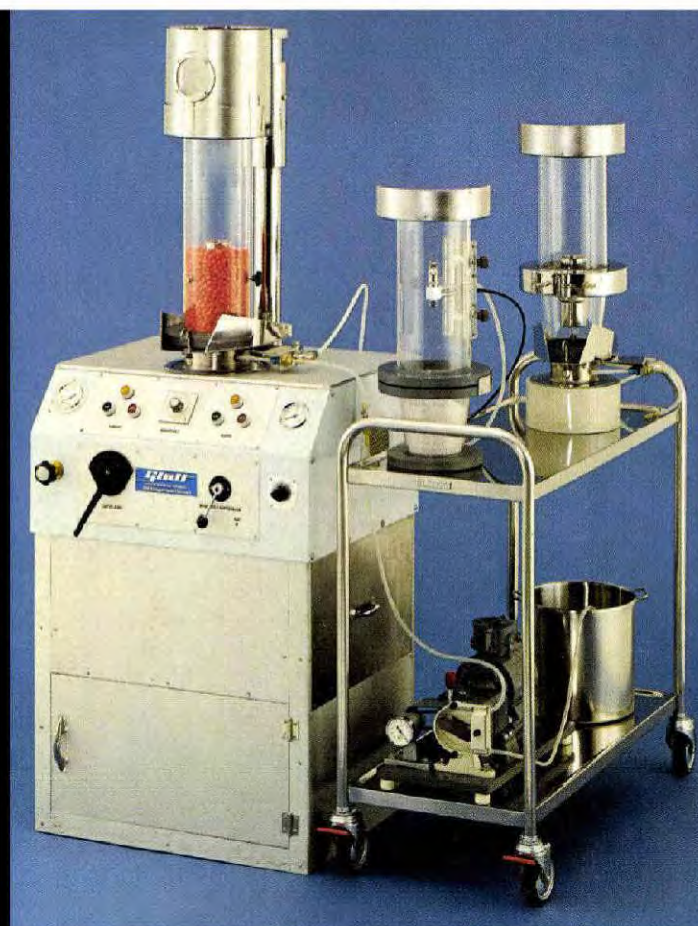
Coating of tablets, pellets, granules, hard and soft gelatin capsules, metal beads and seeds as per the fluidized bed process.  
(The Glatt-Wurster system)

## THESE ARE THE ADVANTAGES

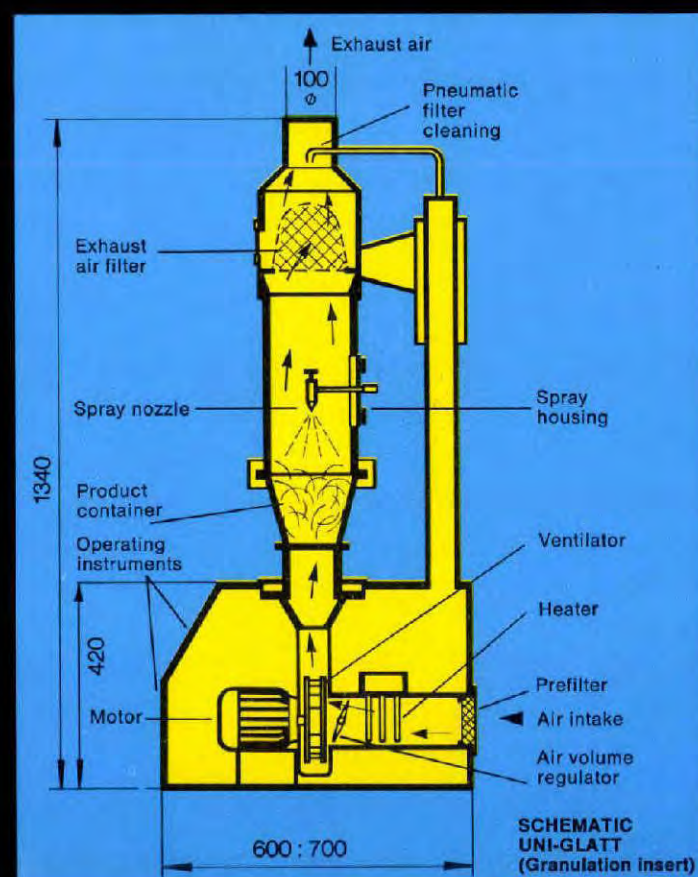
- ... Production capacity from 0.1–3 kg
- ... Bench top model can be placed anywhere
- ... Well designed base cabinet with storage space upon request
- ... Easy to use by quick change-over of inserts
- ... Control Instruments and operating elements are well arranged and mounted on the front panel.

### Technical data:

Ventilator capacity: 140 cfm  
Ventilator motor: 1.1 kW  
Pump motor: 0.25 kW  
Heating capacity: 1.8 kW  
Compressed air pressure: 75–90 psi  
Compr. air consumption: 175 ft<sup>3</sup>/h



Laboratory Unit UNI-GLATT with inserts  
Glatt-WSG and Glatt-Wurster 6 inch and 4 inch.  
Pump Unit and insert parts can easily be placed  
in the base cabinet.



## ...AND FOR LARGER REQUIREMENTS

For example clinical test lots  
Small production runs

With the same high technical assurance as the  
Glatt Production Models.

# WSG 5



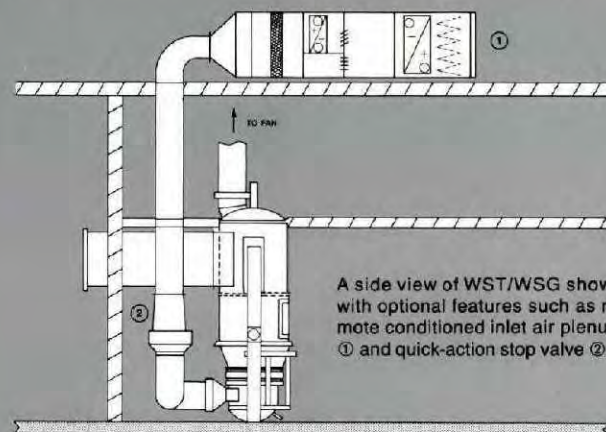
Fluidized Bed Granulator WSG 5

### Capacities and Applications

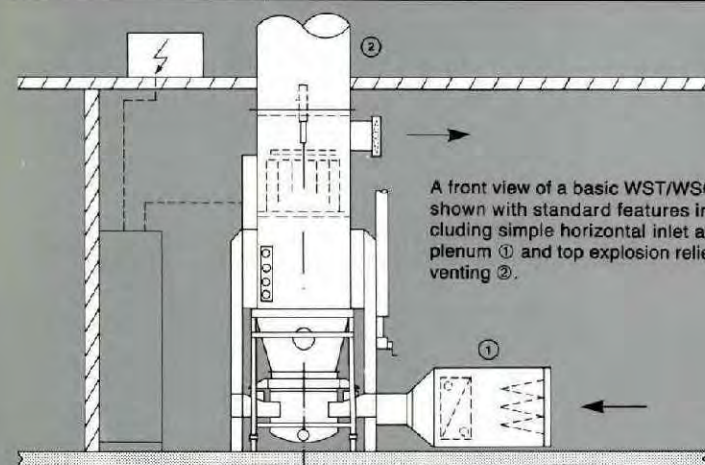
	Basic Unit WSG 5	Change Parts WSG 1	Change Parts Glatt-Zeller WSLD 3–5	Change Parts Glatt-Wurster 4 Inch	6 Inch
Container Volume	20 liter	5 liter	7 liter	2.5 liter	3 liter
Capacity	5–7 kg	0.5–2 kg	3–5 kg	0.5–2 kg	1–3 kg
Application	Mixing Agglomerating Drying			Film Coating of Tablets, Pellets, Granulates, hard and soft Gelatine capsules, Metal beads, seeds etc.	



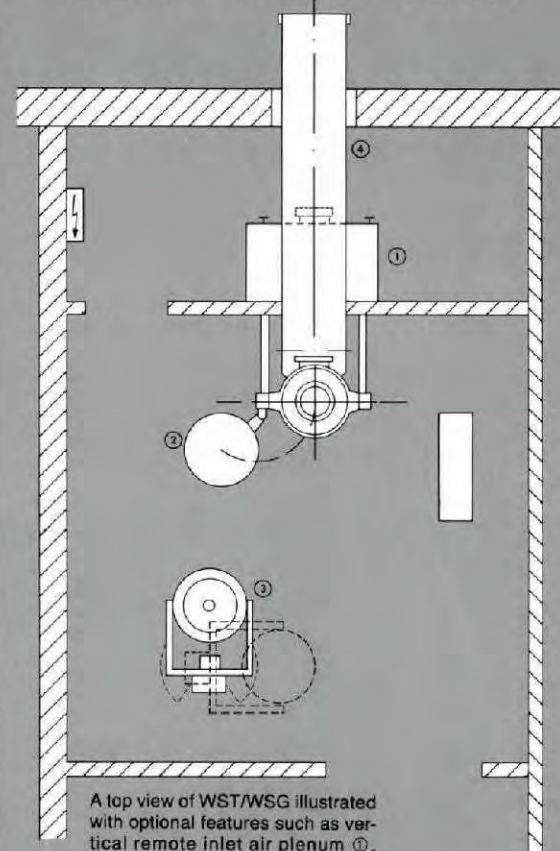
SHOWN ARE THREE OF THE VARIOUS WAYS TO CONFIGURE AND INSTALL THE GLATT WST/WSG:



A side view of WST/WSG shown with optional features such as remote conditioned inlet air plenum ① and quick-action stop valve ②.



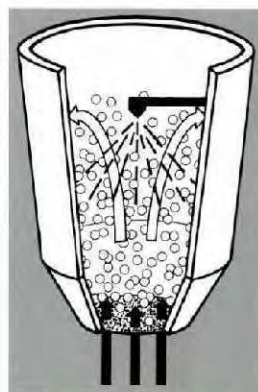
A front view of a basic WST/WSG shown with standard features including simple horizontal inlet air plenum ① and top explosion relief venting ②.



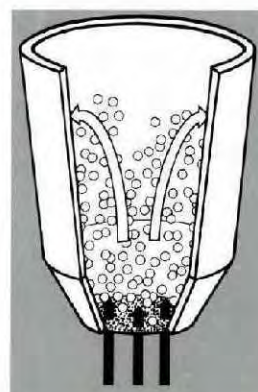
A top view of WST/WSG illustrated with optional features such as vertical remote inlet air plenum ①, swing-out expansion ② and post-hoist product discharge system ③. Also shown is horizontal explosion relief venting ④.

#### SAFETY AND CGMP CONSIDERATIONS:

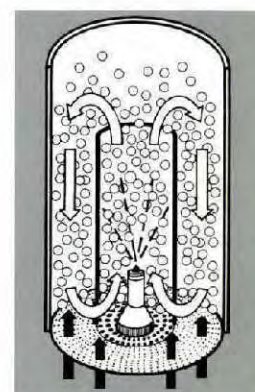
- The WST/WSG fluid bed unit is constructed of reinforced stainless steel, type 304, to maintain a 2-bar pressure shock-resistant rating.
- The WST/WSG fluid bed unit is designed to vent an explosion through either the top or the back of the unit via an explosion-relief vent.
- Quick-acting explosion-protection valves which inhibit the propagation of an explosion through either the inlet or exhaust air ducts are available.
- The WST/WSG is supplied with a complete pneumatic control system.
- The lower transition plenum is dome shaped, equipped with a cleanout drain, and maintains a 2-bar pressure shock-resistant rating. When installed, the plenum is positioned several inches above the floor to minimize the accumulation of bacteria and contaminants, and to provide for easy cleaning of the exterior of the machine and the surrounding process area.
- The exhaust air filter is suspended on a stainless steel ring with metal-to-metal contact between filter socks and the ring to achieve proper grounding. (Requires conductive filter.) The entire exhaust air filter may be quickly and easily removed for cleaning purposes.
- The WST/WSG machine is designed and constructed to assist the customer in their conformance with Current Good Manufacturing Practices and to facilitate efficient cleaning with minimum down time.



WST



WSG



WURSTER

**Glatt®**  
Air Techniques Inc.

20 Spear Road  
Ramsey, N.J. 07446 USA  
Tel. (201) 825-8700  
Fax (201) 825-0389

Glatt GmbH  
Bühlmühle  
P.O. Box 42  
D-79589 Binzen  
GERMANY  
Tel: (011 49) 7621-6640  
Fax: (011 49) 7621-64723

Glatt AG  
Postfach 1245  
CH-4133 Pratteln 1 (Schweiz)  
SWITZERLAND  
Tel: (011 41) 61-8214481  
Fax: (011 41) 61-8218411

Glatt Pharmatech S.a.r.l.  
Parc d'Activites Technologiques  
Quartier de Pouilly  
Rue Louis Neel  
21000 Dijon  
FRANCE  
Tel: (011 33) 3-80-743264  
Fax: (011 33) 3-80-744395

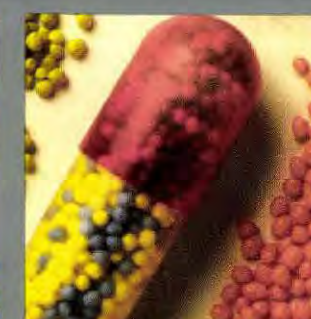
Glatt Labortecnic SA  
Paseo Guayaquil, No. 19  
(Pol. Ind. del Besos)  
E-08030 Barcelona  
SPAIN  
Tel: (011 34) 3-3456700  
Fax: (011 34) 3-3461304

THE NEW GENERATION OF GLATT FLUID BED DRYERS AND GRANULATOR/DRYERS

# WST/WSG



**APPLICATIONS:** • Batch or batch-continuous drying, granulating or coating for the processing of pharmaceutical, food and chemical products. • Drying of moisture-laden materials. • Agglomeration and instantizing of powdered products. • Coating of small to intermediate-size particles and tablets. • Dedusting by agglomeration of materials with large amounts of fines.



**Glatt®**  
Air Techniques Inc.

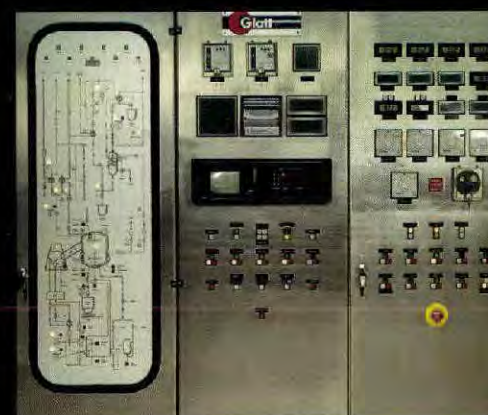


# NEW CONCEPT

## THE BASIC GLATT FLUID BED PROCESSING SYSTEM...

Glatt Air Techniques has developed a new concept of designing fluid bed dryers, granulators (for agglomerating or down-spray coating) and bottom-spray (Wurster) tablet and pellet coaters. This concept allows equipment to be individually designed for the customer's specific application. The Basic Glatt Fluid Bed Processing System, Type WST/WSG, originates with a simple construction fluid bed dryer. An option package permits this unit to be converted to a fluid bed granulator, down-spray coater, and/or bottom-spray (Wurster) coater. Controls range from the standard pneumatic logic to the more complex and sophisticated computerized process control. Air-handling packages can vary from the basic compact prefilter/heater configuration to conditioned-air systems, providing complete control over processing air.

SEM (Scanning Electron Micrograph) of WSG agglomeration.



Control panel including microprocessor



Granu-Glatt Fluid Bed Granulator/Dryer



Final inspection of World's largest Fluid Bed Granulator/Dryer installation at Glatt, prior to shipment.

## STANDARD DESIGN FEATURES....

### AIR HANDLING:

The standard air handling package includes:

- Remotely located horizontal inlet air plenum containing pocket prefilters and a steam heat exchanger.
- Remotely located centrifugal type fan.

### Optional features:

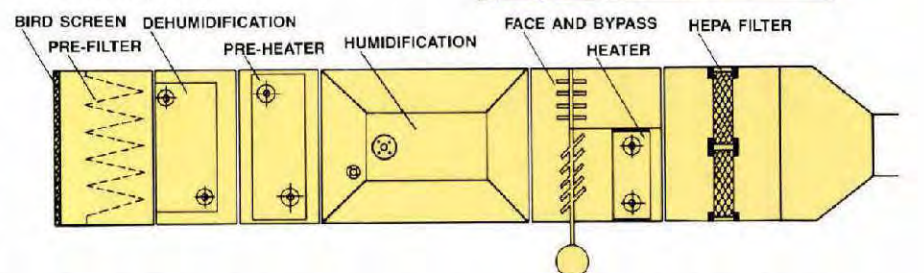
An air handling system may be designed and configured to comply with a unique set of process/production requirements through the appropriate selection of options. These options may include H.E.P.A. filtering, face and bypass temperature control to maintain a tighter tolerance of inlet air temperature set points, freeze-protection heating coil to facilitate outdoor installation, and the precise control of inlet air moisture levels through humidification, dehumidification, dew point sensing/control, and/or relative humidity sensing/control. Many other air-handling features are available.

### PRODUCT HANDLING:

The standard product handling package includes:

- Product container exclusively designed for maximum heat transfer, rapid processing, and uniform drying characteristics of material.
- Extended expansion chamber zone for efficient circulation of product.

- Stainless steel construction. With product contact parts mirror-polished.
- Transportation trolley to provide mobility of the product container.
- Observation windows in the product container and expansion area.
- Pneumatic exhaust air flap for control of fluidization pattern.



- Automatic exhaust filter shaking system. The filter-cleaning process results in a consistent fluidization pattern and enhances process reproducibility.

### Optional features:

The product handling system may also include: pneumatic and gravity product charging ports, access doors with observation windows, agitator to enhance fluidization for fluid bed drying applications, chopper system for delumping of product, surge hoppers for raw-material supply and finished product discharge, bottom

### MACHINE PRESSING SYSTEM:

Pneumatic or externally mounted hydraulic pressing systems are available. WST/WSG units up to and including the 120 model are supplied with standard pneumatic pressing, while the larger units are hydraulically pressed. Each of the pressing systems is designed to seal all machine sections to maintain a 2-bar pressure shock-resistant

rating. The hydraulic system allows for a separate/removable expansion chamber and the inclusion of additional granulator/dryer and Wurster (bottom spray) change inserts.

### PROCESS CONTROL:

The standard, free-standing, explosion-proof, pneumatically-operated control console includes the following features:

- Inlet air temperature controller and indicator.
- Exhaust air temperature indicator.
- Automatic exhaust filter shaking control network including timers to adjust the interval and duration of the shaking cycle.
- Pneumatic exhaust air flap controller and indicator for optimum control of fluidization pattern.
- Compressed air regulator and indicator.
- Various safety interlocks.
- Liquid spray pump control (Granulator or Wurster only).
- Atomization air pressure regulator and indicator (Granulator or Wurster only).

A separate, remotely-located pneumatic/electric interface box provides a communication link between an electric source and a pneumatically controlled device, and

contributes to the explosion-proof integrity of the fluid bed unit and control console.

### Optional features:

The control system may be designed to a unique level of process control and automation. Some options which may be considered include various processing interlocks, fluidization air volume control/indication system, automatic pneumatic process shut-down systems, complete and partial pneumatic process automation, and sophisticated high-tech microprocessing control systems, etc. Also available are process parameter recorders and indicators.

### FLUID BED GRANULATOR AND/OR WURSTER COATER CONVERSION PACKAGE

The following option package will convert the WST dryer to a WSG granulator.

- Multiple-spray nozzle entrance ports mounted in a vertical configuration to allow for the appropriate adjustment of the liquid spray distance and area for optimum control of granulation size and density.

- Pneumatically-atomized nozzle with single tube coaxial connections.
- Necessary controls for spraying/pumping system including liquid spray on/off control and atomization pressure regulation and indication.
- Liquid pumping systems.

Bottom spray (Wurster) coating conversion package available.

### ENVIRONMENTAL CONSIDERATIONS:

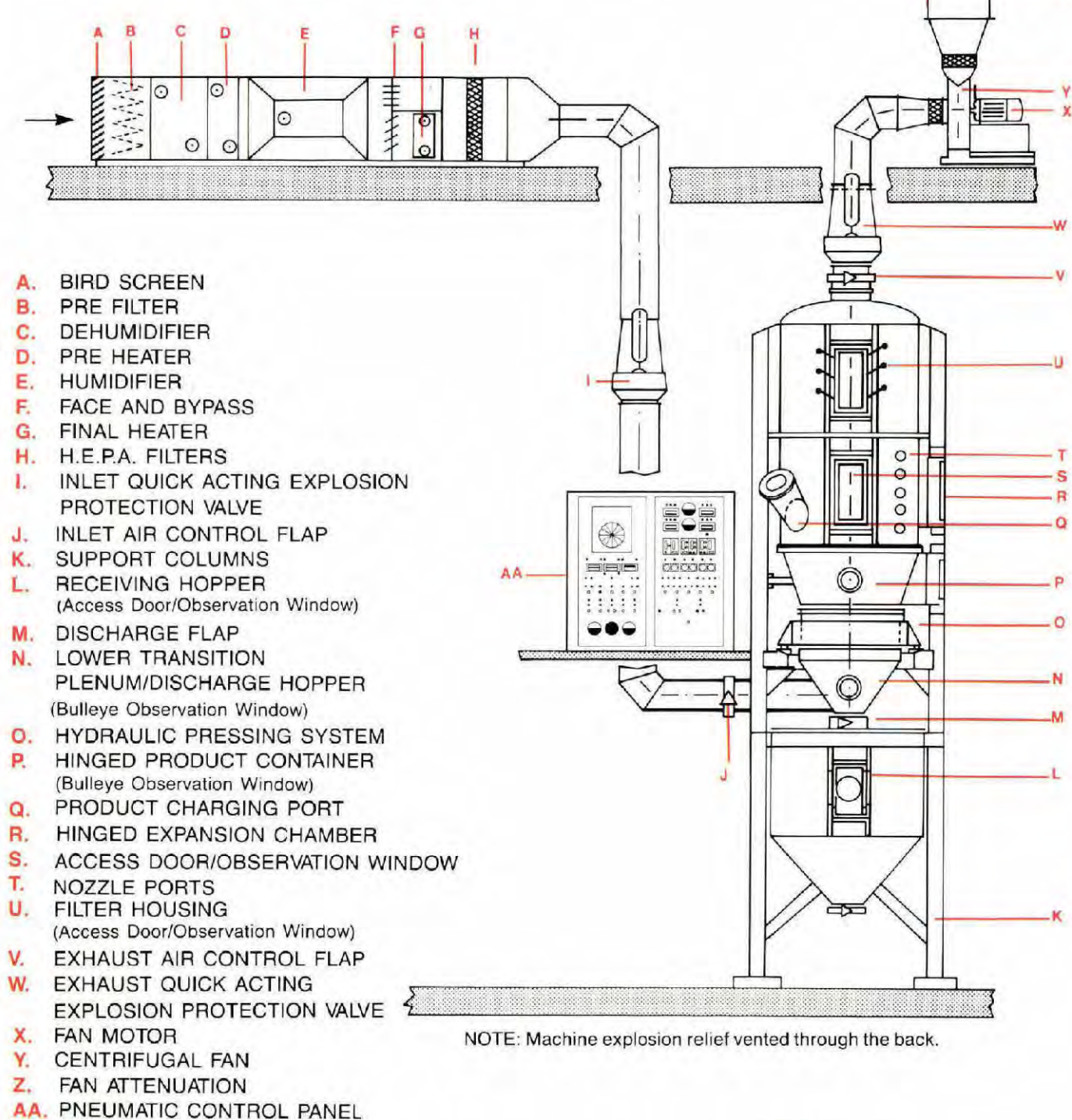
- Solvent recovery systems designed to comply with a customer's specific process are available in the following configurations: split and full stream closed loop utilizing inert N<sub>2</sub> process gas, and multi-stage once through systems.
- In-line dust collectors to insure maximum retention of fine particulate emissions.
- Fan attenuation packages for noise reduction.





# GLATT FLUID BED INSTALLATION

## INLET AIR PLENUM



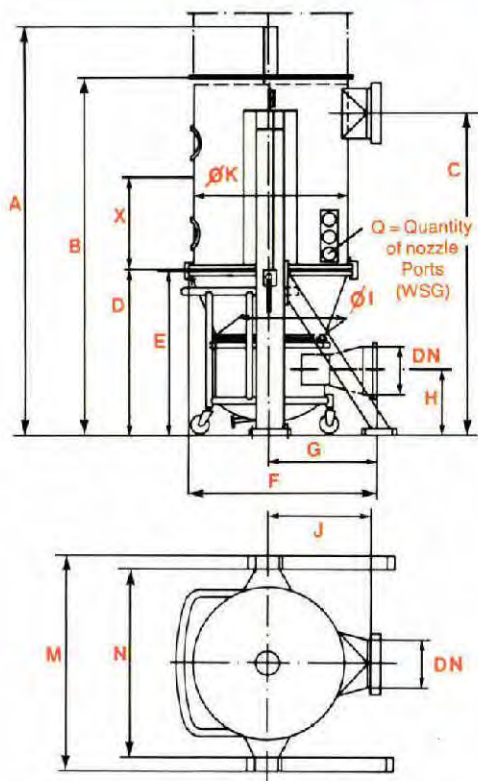
NOTE: Machine explosion relief vented through the back.

NOTE: THIS IS ONE EXAMPLE OF THE VARIOUS GLATT FLUID BED INSTALLATIONS.

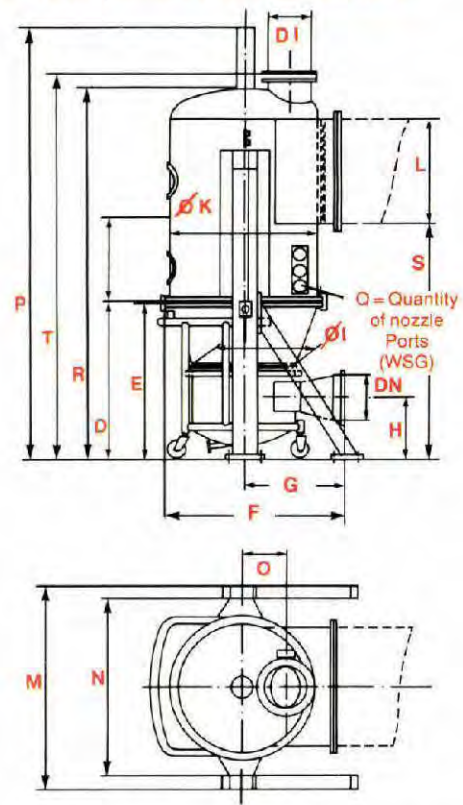
**Glatt®**  
 Air Techniques Inc.



### THE BASIC GLATT FLUID BED PROCESSING SYSTEM... (2 bar pressure shock-resistant cons.)



TOP VENTED EXPLOSION RELIEF



REAR VENTED EXPLOSION RELIEF

MODEL NUMBER	5/9 *	15/30	30/60	60/100	120/200	200/300	300/500	500/800
PRESSING SYSTEM TYPE	HYDRAULIC	PNEUMATIC				HYDRAULIC		
PRODUCT BOWL CAPACITY (Liters)	22	45	100	220	420	670	1100	1560
FAN CAPACITY DESIGN POINT VOLUME (M <sup>3</sup> /hr)	750	1500	3000	4500	6000	8000	10000	12000
TOTAL STATIC PRESSURE (mmWs) AT DESIGN POINT	1000	1000	1000	1000	1000	1100	1100	1100
MOTOR POWER (KW)	5.5	7.5	15	22	30	37	45	55
MOTOR SPEED (RPM)	3550	3550	3550	3550	3550	3550	3550	3550
HEATING CAPACITY (°C) AT ABOVE SPECS **	-10°C heated to 60°C at the above air volumes. Steam at 4.0 bar							
(BTU/hr) **	63,000	126,000	252,000	378,000	504,000	672,000	840,000	1,008,000
ELECTRICAL SOURCE	SPECIFIED BY CUSTOMER							
HEATING MEDIUM	SATURATED STEAM AT 4.0 BAR							
STEAM CONSUMPTION (Kg/hr) AT ABOVE CONDITIONS **	30	58	115	172	230	305	382	458
COMPRESSED AIR AT UNIT	8 BAR MINIMUM (continuous)							
NOMINAL COMPRESSED AIR CONSUMPTION (M <sup>3</sup> /hr) (free-air)	55	55	55	55	160	160	160	300

MODEL NUMBER	5/9 *	15/30	30/60	60/100	120/200	200/300	300/500	500/800
FLOOR LOADING (Kg/cal.)	200	250	300	550	700	1050	1450	1800
REMOTE AIR HANDLER (Kg)	115	145	185	225	265	310	355	400
REMOTE FAN (Kg)	245	250	355	410	440	560	615	685
CONTROL PANEL (Kg)	120	200	200	250	250	300	300	500
A	2464	2862	3061	3336	3506	4425	4855	5565
B	2175	2576	2775	3030	3200	4115	4545	5255
C	1925	2326	2475	2580	2850	3715	4145	4805
D	935	856	925	1030	1200	1615	1795	2005
E	930	851	918	1023	1193	1590	1770	1980
F	660	725	910	1200	1400	1610	1810	1960
G	400	400	500	650	750	850	950	1000
H	300	320	340	420	450	500	550	560
I	230	350	497	727	900	1000	1150	1250
J	300	400	500	700	800	950	1050	1200
K	400	550	720	1000	1200	1400	1590	1800
M	720	920	1060	1405	1605	1965	2260	2500
N	600	800	920	1205	1405	1605	1900	2100
DN	200	200	300	400	400	500	500	600
X	400	500	600	700	800	1000	1250	1500
O	2	3	3	3	3	4	4	5
L HEIGHT	525	705	785	785	785	1035	1035	1265
L WIDTH	355	505	655	905	1105	1035	1505	1705
O	150	170	210	300	350	400	500	600
P	2515	2857	3056	3281	3551	4415	4895	5605
R	2245	2486	2685	2890	3160	4075	4505	5215
S	1520	1402	1307	1495	1665	2700	3140	3590
T	2270	2615	2815	3040	3310	4180	4660	5370

Larger sizes available. Details upon request. Specifications and dimensions are for reference only.

\*The WST/WSG-5/9 is supplied in a 3-piece construction

\*\*These heating specifications are based upon a maximum insulated ductwork (using minimum R21 insulation factor) distance not to exceed 10 linear meters downstream of final heat coil.



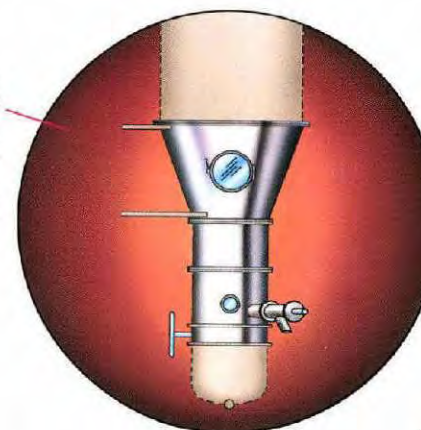
# MULTI-PURPOSE FLUID BED PROCESSING

GPCG SERIES

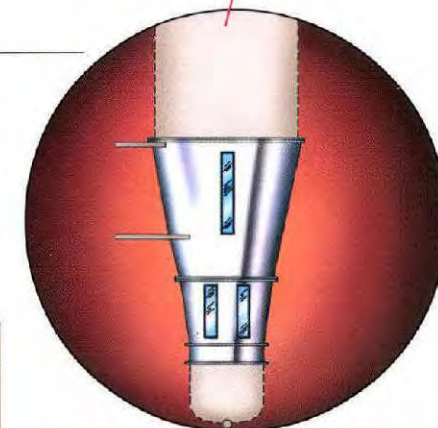
**Glatt®**  
Air Techniques Inc.

## GPCG PROCESSING

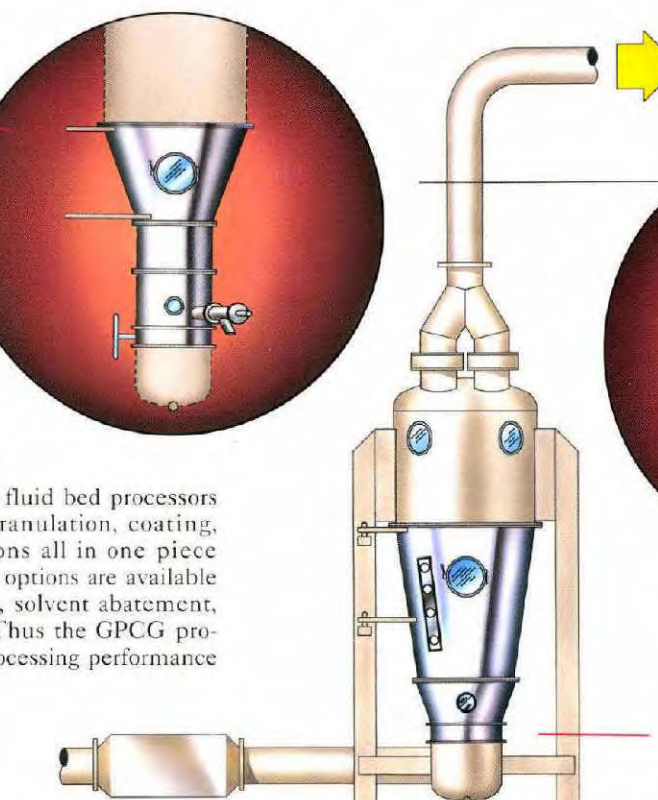
**TANGENTIAL  
SPRAY INSERT**  
The most versatile of the three  
inserts, this provides the ability  
to spheronize, granulate, coat  
and layer in a single insert.



**BOTTOM  
SPRAY INSERT**  
Exclusively used for high  
performance coating and  
layering applications.



**TOP SPRAY INSERT**  
Most commonly used for drying  
and granulating and certain  
coating applications.



### INTRODUCTION

The GPCG is a line of multi-purpose fluid bed processors designed to accommodate drying, granulation, coating, spheronization and layering operations all in one piece of equipment. In addition, a variety of options are available for material handling, control systems, solvent abatement, clean-in-place and exhaust filtration. Thus the GPCG provides the ultimate in terms of both processing performance and flexibility.

### THE GPCG SYSTEM

A GPCG processing system is composed of several major components: an air handling unit, a machine tower and an exhaust fan. Air is drawn in through the air handling unit where it is preconditioned before it enters the machine tower. Components within the air handling unit may include filters, heaters, humidifiers and dehumidifiers.

The machine tower is a multi-component unit consisting of an air inlet plenum, a process insert and a filter housing all held in place by the side support columns. Process air enters the tower through the inlet plenum which evenly distributes

airflow across the bottom of the process insert. The processing air exits the machine tower through the filter housing which contains two identical filters, each in its own airtight partition. Airflow is regulated by an exhaust damper located upstream of the exhaust fan.

This "twin filter system" allows continuous fluidization since either filter is capable of handling the total air volume passing through the fluid bed processor while its twin undergoes a purging cycle. An airtight outlet flap prevents airflow during the purging cycle thus allowing material to fall back into the product bed where it is reclaimed by the process. Glatt offers filter housings designed for use with bag filters, cartridge filters as well as a "convertible" housing capable of using bags or cartridges.

The heart of any fluid bed processor is the processing insert; the GPCG can accommodate three processing insert designs, each differing in particle flow dynamics and liquid addition methods. Thus, each offers distinct processing capabilities.





# TOP SPRAY PROCESSING

## THE PROCESSING CHAMBER

The top spray processing insert consists of a conically shaped product bowl and expansion chamber. The angled walls of the product container allow for a more vigorous fluidization pattern in the product bowl area. As particles travel from the product bowl into the extended height expansion chamber, the increased diameter reduces the air velocity, resulting in a less dense fluidization pattern. As gravity overcomes the upward force of the air velocity, particles fall back into the product bowl. Throughout the batch, particles are recirculated through this random and unrestricted fluidization pattern.

The fluid bed is inherently a highly effective and efficient method of drying. Fluidization suspends each particle exposing the entire surface area to the air stream for optimal convective heat transfer. This assures uniform heating and uniform evaporation of excess moisture, preventing local overheating and allowing the use of higher inlet air temperatures while maintaining the product slightly above room temperature.

For granulation or coating processes, a liquid is introduced to the system via a pneumatically atomized nozzle. Nozzle entrance ports on the exterior of the expansion chamber allow the height of the nozzle above the product bowl to be adjusted. In granulation processes, the liquid is introduced high in the expansion chamber where the bed surface area is at its maximum, resulting in a narrow particle size distribution of the final product. In coating processes the liquid is introduced just above the product bowl where particle density and velocity is at its highest, thus minimizing the distance the droplets travel before contacting the substrate where they spread to form a continuous film.

### MULTIPLE NOZZLE PORTS

in the top spray expansion chamber permit the height of the nozzle above the product bed to be adjusted for granulation or coating processes.

## APPLICATIONS:

### Drying

- Short Batch Times
- Uniform Drying
- Temperature Sensitive Materials

### Agglomeration/Granulation

- Reduce Fines/Dust
- Enhance Flowability
- Eliminate Segregation
- Improve Compressibility
- Alter Bulk Density
- Improve Disintegration and Dissolution

### Instantizing

- Improve Dispersibility
- Increase Porosity
- Disperse Surfactants Uniformly

### Coating

- Temperature Release
- Hot Melts
- Taste Masking
- Moisture and Oxygen Barrier Coatings
- Aesthetic Coatings



# BOTTOM SPRAY PROCESSING

## THE WURSTER HS

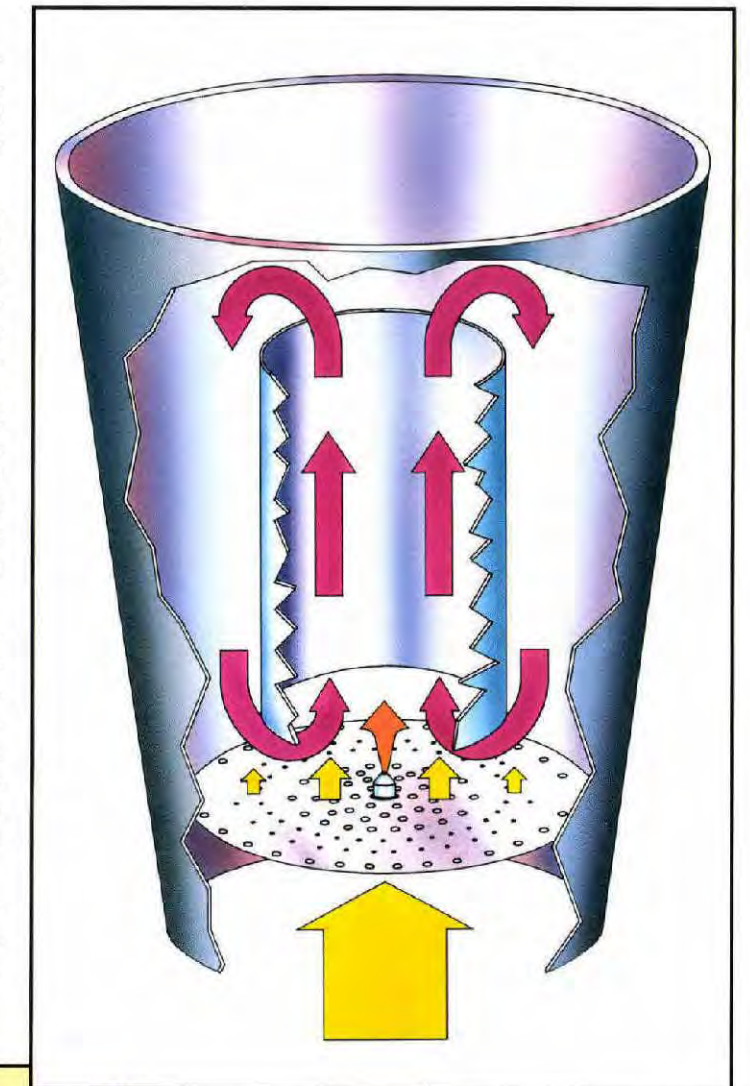
## THE PROCESSING CHAMBER

The Wurster HS was introduced in 1992 as the next evolution in Wurster Technology. This patented processing technique offers larger batch volumes, higher throughputs and for the first time, the ability to coat fine particles under 50µm, all without the occurrence of agglomeration.

The Wurster HS processing insert consists of a conically shaped product container with an open ended cylindrical inner partition. An air distribution plate is located at the lower end of the product container to distribute the fluidizing air between the inner and outer partitions. The majority of air is channeled through the inner partition, leaving sufficient airflow to just suspend particles in the outer partition. Particles are drawn into the inner partition by the pressure differential created by the difference in air velocities between the two partitions. The particles are carried through the inner partition and into the expansion chamber by the fluidizing air. As gravity overcomes the force of the fluidizing air, the particles fall back into the outer partition where they are suspended in a slowly moving "down bed."

The coating solution is added to the system via a pneumatically atomized nozzle located at the center of the air distribution plate. The nozzle sprays upward, providing a concurrent application of solution onto the substrate. As atomized droplets of the coating solution contact the particles in the inner partition, they spread and coalesce on the particle surface. As the particles continue traveling upward in the expansion chamber, excess moisture from the applied liquid is evaporated.

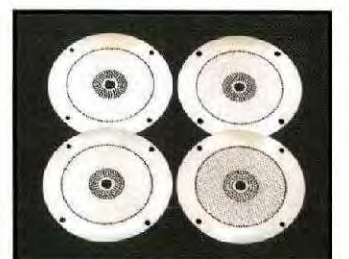
The ordered particle flow pattern lends itself to the production of coatings of extremely uniform thickness and consistency, an important factor in controlled release applications.



## APPLICATIONS:

### Coating

- Aqueous or Solvent Based Polymeric Solutions or Dispersions
- Sustained Release Coatings
- Enteric Release Coatings
- Fine Particle Coating (50µm and smaller)
- Active Layering



### MULTIPLE WURSTER BOTTOM PLATES

provide the ability to vary air volume in the inner and outer partitions of the Wurster processing insert to accommodate a variety of product sizes and bulk densities from tablets and pellets to fine powders.



# GPCG DESIGN FEATURES & CUSTOMER SERVICES



**DATAPLUS** family of automated process control systems offers varying levels of automation including: batch control, data acquisition, supervisory control, and computer integrated manufacturing. All systems are completely validatable and can be custom designed and configured for specific requirements.



**CLEAN-IN-PLACE** systems enable fully contained processing by providing a validatable means to wash down all product contact surfaces within the processing system.



**DUAL CHAMBER FILTER HOUSING** provides continuous fluidization. Trapped fines are reincorporated into the process without disturbing the fluidization pattern. Glatt provides bag or cartridge filters and the ability to switch from one type to the other.



**BOTTOM DISCHARGE SYSTEMS** for vertical integration and totally enclosed processing applications. Product is discharged through the plenum to a hopper, mill or other post processing unit below.



**PRODUCT CHARGING PORTS** enable quick and contained loading of material and can be easily automated for use with integrated processing systems.

## CUSTOMER SERVICES

### PROCESS ASSISTANCE

Glatt's FDA registered feasibility lab offers several GPCG's from lab scale through full production size units. Our highly trained staff works with processes from initial feasibility studies through clinical trials and scale-up.

### PROCESS AUTOMATION

A full range of data acquisition and control systems is available from Glatt's Dataplus series of automated control products. Systems range from simple batch controls through sophisticated menu management and integrated systems encompassing several pieces of process equipment.

### VALIDATION

Based on FDA guidelines and prevailing pharmaceutical industry practices, Glatt's support package includes documentation, procedures, protocols and test plans. In addition, Glatt personnel are available for on-site implementation of the validation plan.

### FIELD SERVICE

Factory trained technicians are available at customer sites for calibration, preventive maintenance, repairs and refurbishing. All instruments are N.I.S.T. traceable and work is performed under Standard Operating Procedures.

### TURNKEY ENGINEERING

A full range of design and engineering services is available along with site supervision and construction management. Glatt can provide plant layout, facilities design, ancillary equipment specification/procurement, detailed construction drawings and contractor specifications.

### CONTRACT MANUFACTURING

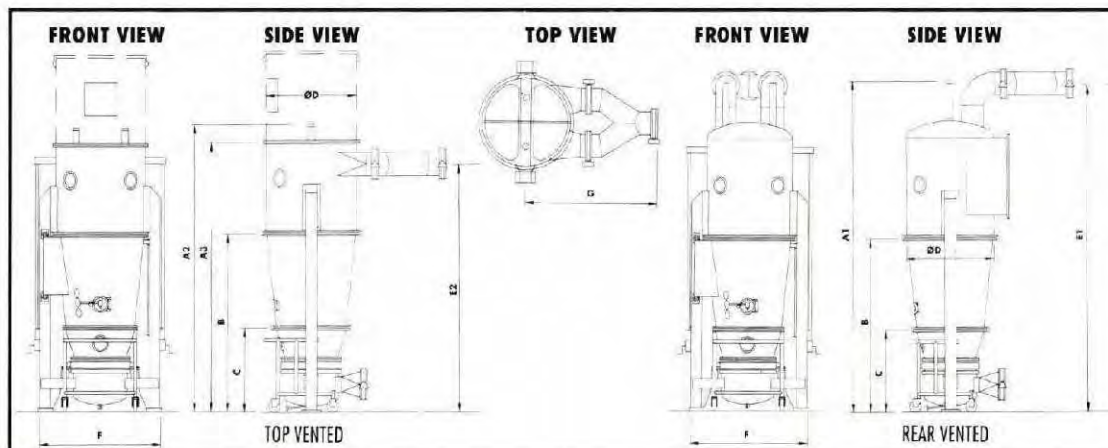
For those companies not ready to purchase equipment or interested in testing the market for new products, Glatt provides contract processing. This service is available in our FDA registered facilities in Ramsey, NJ and Winchester, KY.

# GPCG DATA

## TECHNICAL DATA OF GPCG PRODUCT LINE

Glatt Powder Coater Granulator GPCG Model No.			1	3	5	15	30	60	120	200 <sup>1</sup>	300 <sup>1</sup>	500 <sup>1</sup>
		Unit										
Maximum Working Volume of Standard Product Container	Top Spray	ltr	1	5	22	45	100	220	420	670	1100	1560
	Wurster HS (1)	ltr	2.4 (6")	5.4 (7")	6.3 (7") 14 (9") 38 (12")	14 (9") 38 (12") 102 (18")	38 (12") 102 (18")	120 (18") 417 (32")	417 (32") 820 (46")	820 (46") 1105 (55")	820 (46")	820 (46")
	Rotor	ltr	4.5 (300mm)	4.5 (300mm)	30 (480mm)	30 (480mm)	60 (620mm)	60 (620mm) 105 (790mm)	105 (790mm) 180 (1000mm)	180 (1000mm) 430 (1400mm)	430 (1400mm) 640 (1600mm)	640 (1600mm)
Inlet Air Handling Unit	Heating Capacity	kW	4	10.5	22	44	86	132	174	227	291	348
	Temperature Range	°C	10° – 140°C	0° – 100°C	< -----	< -----	< -----	-10° – +60°C	----- >	----- >	----- >	----- >
	Steam Consumption (2)	kg/hr	n/a	18	37	75	147	226	297	389	498	596
Exhaust Air Fan	Capacity	kW	2.2	2.2	5.5	7.5	15	22	30	37	45	55
	Air Volume (3)	m3/hr	255	200	1000	1500	3000	4500	6000	8000	10000	12000
	Differential Pressure (3)	mm/WG	750	800	< -----	< -----	< -----	1000	----- >	----- >	----- >	----- >
Maximum Air Consumption of Atomizing Nozzle	Top Spray	m3/hr	9	22	25	25	30	30	30	95	95	200
	Wurster HS	m3/hr	9	9	25	70	70	210	210	210	360	630
	Rotor	m3/hr	9	9	25	25	30	30	60	60	60	N/A
Weight	Machine Tower	kg	n/a	n/a	600	900	1400	2100	2400	3000	3400	4400
	Air Handler	kg	n/a	n/a	500	580	710	800	890	985	1165	1370
	Exhaust Fan	kg	n/a	n/a	200	220	300	360	500	510	550	620
	Control Panel (4)	kg	n/a	n/a	100	100	100	100	100	100	100	100
	Complete System	kg	400	750	1400	1800	2210	3360	3890	4595	5215	6490

Notes: (1) Excluding the volume in partition (5) (2) @ 3 bar (g) saturated steam pressure (3) @ 20°C and 1,013 mbar (4) Pneumatic Control System (5) On production size GPCG's, Wursters and Rotors are typically supplied as standalone machines



All dimensions in millimeters. All dimensions and specifications are for reference only and subject to change.

Patent Numbers: 4,588,366  
5,236,503  
4,772,193  
5,251,384  
5,284,678

## DIMENSIONS

SIZE	A1	A2	A3	B	C	ØD	E1	E2	F	G
5	3240	3587	3260	2155	913	500	2975	2780	750	680
15	3855	3827	3500	2315	965	900	3800	3050	1280	1200
30	4250	3952	3625	2475	1065	1200	4200	3300	1765	1520
60	5070	4590	4260	2955	1175	1500	4720	3900	2060	1865
120	5150	4860	4530	3030	1375	1500	5160	4180	2060	1865
200	5490	5070	4730	3230	1600	1800	5900	4205	2500	1865
300	6100	5250	4910	3410	1770	1800	6500	4400	2540	1865
500	7290	7170	6830	4740	1980	2700	7850	6320	3340	2300

### GLATT® GmbH

Process Technology  
Bühlmühle - P.O. Box 42  
D- 79589 Binzen  
Germany  
Tel. (+76 21) 664-0  
Fx. (+76 21) 64-723  
Tx. 773 573 glatt d

### GLATT® AG

Maschinen- & Apparatebau  
Kraftwerkstraße 6  
CH- 4133 Pratteln (Schweiz)  
Tel. (+61) 821 44 81  
Fx. (+61) 821 84 11  
Tx. 968 011 glatt ch

### GLATT®

Pharmatech S.a.r.l.  
Dijon, France

### GLATT®

Laborteknik S.A.  
Barcelona, Spain

### GLATT®

Protech Ltd.  
Leicester, England

### POWREX®

(Licensee)  
Osaka, Japan



20 SPEAR ROAD • RAMSEY, NJ 07446  
201-825-8700 • FAX: 201-825-0389



# TANGENTIAL SPRAY PROCESSING

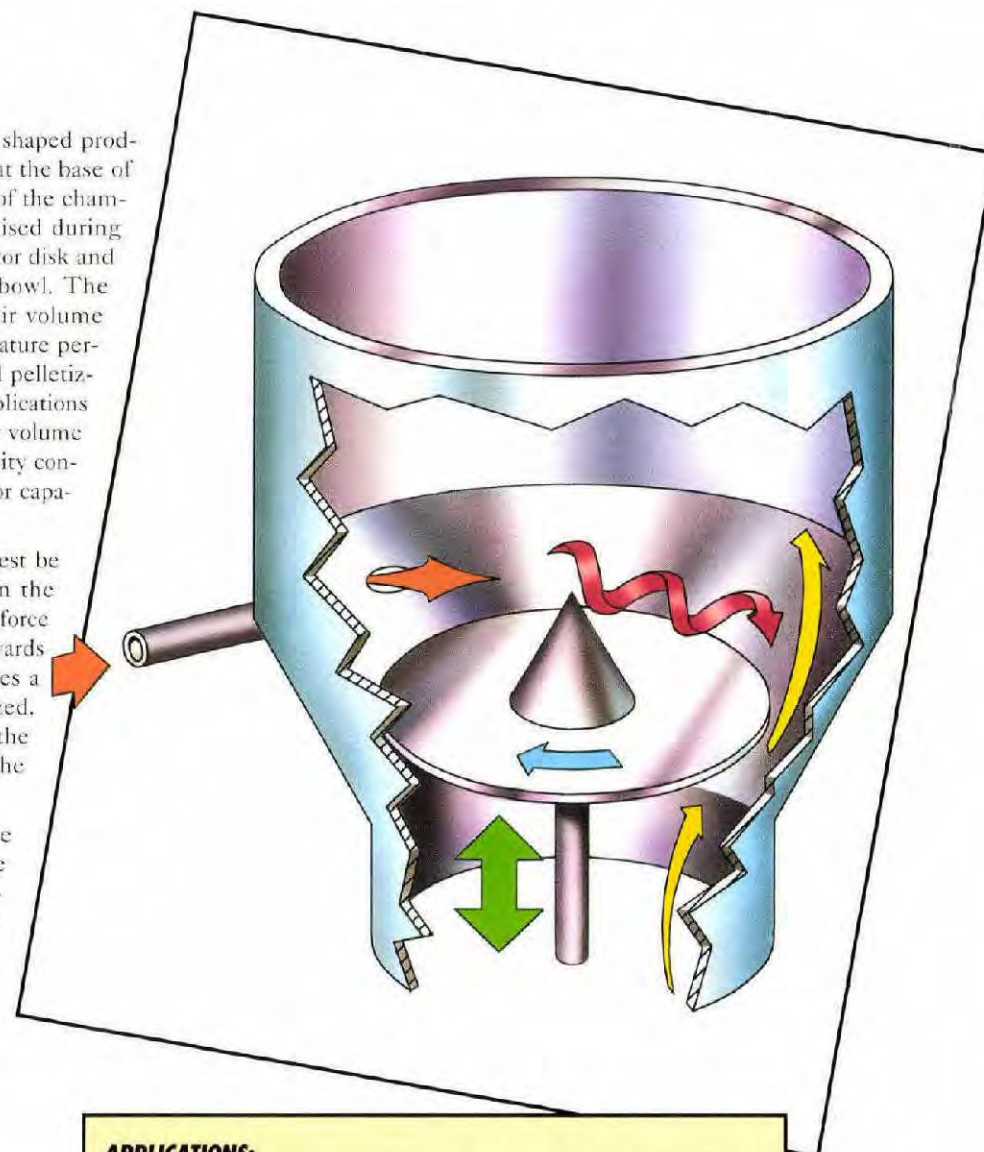
## THE ROTOR

### THE PROCESSING CHAMBER

The rotor processing insert consists of a cylindrically shaped product bowl and expansion chamber. The rotor disk sits at the base of the product bowl and seats along the circumference of the chamber when the rotor is not in motion. The disk is raised during processing to create a slit between the edge of the rotor disk and the conically shaped bottom of the rotor product bowl. The patented adjustable disk height allows control of air volume through the slit independent of velocity. This key feature permits very low drying rates for direct pelletization and pelletizing by powder layering. For granulating or coating applications requiring a medium to be evaporated quickly, the air volume can be significantly increased while keeping air velocity constant. This flexibility results in a single unit processor capable of granulating, pelletizing, layering and coating.

The fluidization pattern in the rotor processor can best be described as a spiraling helix. Three factors act on the product to create this flow pattern. The centrifugal force of the rotating disk causes product to flow radially towards the product bowl wall. Airflow through the slit creates a vertical force causing the product to become fluidized. Gravity soon overcomes the force of the airflow and the fluidized product falls back into the bowl towards the center.

Liquids or powdered solids can be added to the process through air atomizing nozzles located on the product bowl side wall. The nozzles spray tangentially into the processing chamber in the same direction as the fluidization pattern.



#### MULTIPLE ROTOR DISKS

with different surface geometries are available to control the surface friction imparted to the product.

#### APPLICATIONS:

##### Granulation

- Enhance Disintegration
- Improve Compressibility
- Increase Density
- Spherical Morphology

##### Spheronization

- Increase Density
- Produce Spherical Particles
- High Potency Spheres
- Smooth Surface Properties

##### Layering

- Solution/Suspension Layering
- Powder Layering
- High Potency Pellets
- Narrow Particle Size Distribution
- Increase Density

##### Coating

- Film Coatings
- Enteric Coatings
- Sustained Release Coatings
- Hot Melt Coatings



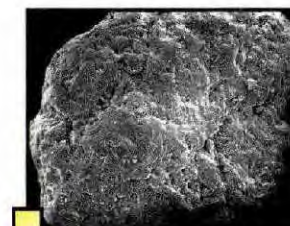
# PROCESSED PRODUCTS

GPCG flexibility provides a variety of processing techniques from a single fluid bed system. This versatility is demonstrated by the broad range of products manufactured in Glatt fluid bed processors.

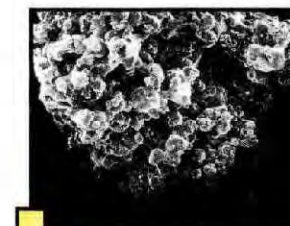
Pictured below are scanning electron microscope images of some typical GPCG applications.



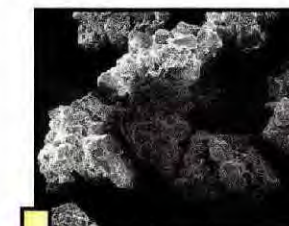
Fluid Bed Spray Dried AgriChemical



Fluid Bed Dried Pharmaceutical Granulate



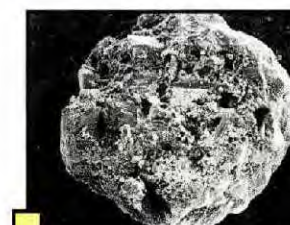
Fluid Bed Instantized Flavor



Top Spray Granulated Pharmaceutical



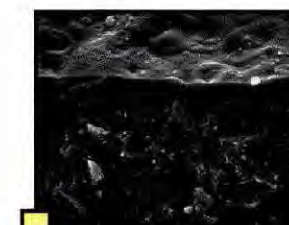
Top Spray Granulated Pharmaceutical



Top Spray Granulated Pharmaceutical (cross-section)



Top Spray Enteric Coated Pharmaceutical



Top Spray Enteric Coated Pharmaceutical (cross-section)



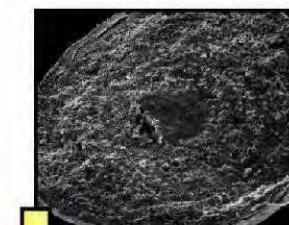
Top Spray Hot Melt Coated Flavor



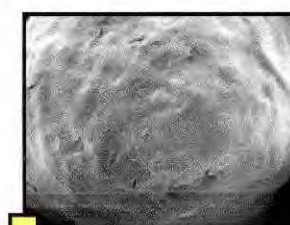
Wurster HS Latex Coated Pharmaceutical



Wurster HS Controlled Release Nutritional



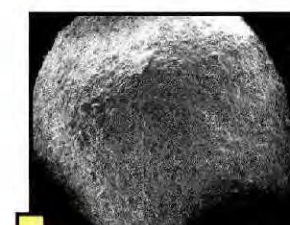
Wurster Layered and Coated Pharmaceutical



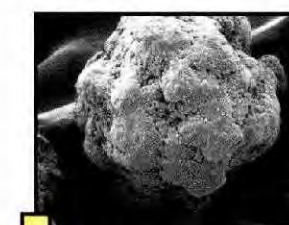
Wurster HS Latex Coated Pharmaceutical



Wurster HS Latex Coated Pharmaceutical (cross-section)



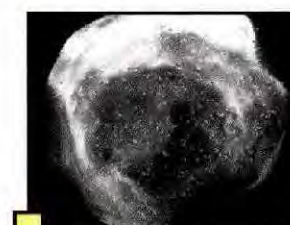
Rotor Pelletized Pharmaceutical



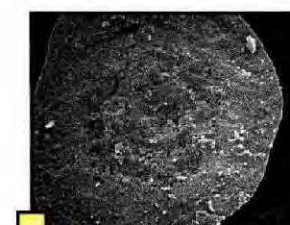
Rotor Spheronized Pharmaceutical



Rotor Spheronized Pharmaceutical (population)



Rotor Solution Layered Pharmaceutical



Rotor Solution Layered Pharmaceutical (cross-section)