INNOJET®
HERBERT HÜTTLIN

The various physical properties of the product solids that come from our customers involve having to perform quality coating and drying under the same physical conditions, i.e. either using INNOJET VENTILUS® or INNOJET AIRCOATER® technology.
Thus, for example, smaller and more easily fluidisable qualities have more pronounced flying and hovering characteristics when they are treated, than do larger and less easily fluidisable ones.

To account for this fact, Dr. h.c. Herbert Hüttlin and his team developed two new technologies based on an air flow bed (not a fluidised bed), which ensures optimal process control and the desired results.

The VENTILUS® technology is for smaller and more easily fluidisable particles (powders, crystals, granules & pellets), while the AIRCOATER® technology is for larger and less easily fluidisable moulded solids (tablets of various shapes, sizes, densities and specific gravities, as well as hard and soft gelatine capsules).

"Linear scale-up" was the basic philosophy of the development work for INNOJET VENTILUS® and INNOJET AIRCOATER® systems.

The product groups are broken down into the most appropriate respective technology in the table below:

Powder, crystals	Granulates	Small pellets	Large pellets	Micro-tablets	Small tablets	Large tablets	Gelatine capsules	Special shapes
2 – 20 µm	20 – 200 µm	0.1 – 0.4 mm	0.4 – 1.2 mm	1.2 – 3.0 mm	3 – 7 mm	7 – 30 mm	10 – 30 mm	2 – 30 mm
Production scales								
VENTILUS® (V-100 – V-1'200)				Custom design				
The powder recovery system *Sepajet*® is necessary				AIRCOATER® (A-25 – A-150)				
Laboratory and pilot scales								
VENTILUS® laboratory scale (V-2.5)								
VENTILUS® pilot scale (V-25 – V-50)								
The powder recovery system *Sepajet*® is necessary				AIRCOATER® (A-025 – A-10)				

Welcome to our test lab!

We are glad to invite you to run coating and granulation trials with your materials at our facilities. The trials will be performed by our qualified and experienced laboratory staff.

The following trials can be performed at our lab:

- Coating of tablets, capsules, pellets, crystals, granulates and other pharmaceutical, chemical and food products with a particle size of 10 µm to 30 mm
- Granulation, agglomeration and coating of powders
- Drying of free-flowing bulk materials
- Hot-melt coating, agglomeration with wax or hard fats with a melting point to 90°C

A-025
(laboratory scale)

A-10
(pilot scale)

V-2.5
(laboratory scale)

V-25
(pilot scale)

INNOJET VENTILUS®
Production scale

For high-efficiency coating and granulation processes

600 E / 2.000 / 0911

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TECHNOLOGY PROGRESS MADE IN GERMANY

INNOJET®
HERBERT HÜTTLIN

INNOJET VENTILUS® Production scale

int. pat. Dr. h.c. Herbert Hüttlin

INNOJET VENTILUS® is an air flow bed technology (not fluidised bed), developed to efficiently perform granulation, coating and drying processes. The main functional components are: the booster *Orbiter®* (bottom of product container), the spray nozzle *Rotojet®*, which operates dynamically at its centre and the *Sepajet®*, a continuously dedusting powder recovery system. A touch screen control panel allows simple operation. INNOJET® systems are easily accessible for cleaning, and no tools otherwise usually required are necessary for maintenance or disassembly.

With its consistently cylindrical, double-walled and insulated casing, a processing unit was developed that meets the highest pharmaceutical standards. INNOJET VENTILUS® systems in production scale are equipped with a dimensionally-integrated, high-efficiency-operation washing in place system. The product is filled in and emptied out pneumatically, directly above the booster *Orbiter®*.

The INNOJET spray nozzle *Rotojet®* works strictly in bottom spray in the centre of the booster *Orbiter®*. To produce rapid and homogeneous distribution of the sprayed liquid (coating media or adhesive media), the spray nozzle *Rotojet®* has an annular spraying gap, which is surrounded above and below by a spraying air gap and a support air gap. A dynamic spraying gap is created between the static and rotating parts of the nozzle orifice. Any blockage of the fluid spraying gap is thus nearly impossible.

The atomised spray coming out radially and horizontally slanted upward at a looping angle of 360° causes the ultra-finely dispersed liquid droplets to travel with spacing between one another, preventing formation of drops from multiple droplets, and producing a coating that is as even as possible, i.e. homogeneous.

The booster *Orbiter®* gives the product to be treated a gentle, consistently orbital spiral motion oriented around the centre. This means that, carried on a cushion of air and flowing in a radial, tangential fashion to the cylindrical container wall, the product is conducted up the steep 90° wall angle, dispersing spirally, and (then dried) falls back to the centre, i.e. to the application zone, in which the spray nozzle *Rotojet®* is located, from where the orbital spiral and circular motion begins anew. The continuous return of the powdery, mostly air-separated product into the primary granulating or ultra-fine particle coating process, takes place via the powder recovery system *Sepajet®*, which operates in the filter dome.

The individual, patented filter bags are made of folded stainless steel sheet, onto which anti-static PE textile media (bags) are applied. Operating above the *Sepajet®* circuit board, the blowing-air rotor, ensures even, continuous, shock-free and complete cleaning of the individual filter bags in succession. No compressed air is used for this cleaning, but rather a substream from the conditioned process air.

Serving as infrastructure units, the INNOJET® monobloc system type *Tubus*, which was developed to meet pharmaceutical designing requirements, with a cylindrical, double-walled, insulated and outdoor-installation-capable design, making it weatherproof.

Application examples

Active agent and retard coating on pellets
Starter material: Sugar pellets,
Particle size: 200 – 300 µm

- Acive agent coating (AAC)
Aqueous active agent suspension,
Concentration: 32% solids content

- Retard coating (RC)
Neutral polymethacrylate + separating agent

Granulation
Starter material: Lactose, MCC, corn starch

Adhesive solution: HPMC 8 % / PVP 20% / PVA 15 % – aqueous

Process data	V-2.5		V-600		V-2.5	V-600
	AAC	RC	AAC	RC	Granulation	Granulation
Batch size start (kg)	0.6	0.9	150	250	0.50	400
Yield (kg)	1.8	1.45	450	410	0.55	440
Product temperature (°C)	45	20 – 25	45	20 – 25	28	30
Process air quantity (m^3/h)	50 – 80	60 – 70	2'000 – 3'500	3'000 – 4'800	40	2'500 – 3'500
Spraying pressure (bar)	1.8	1.8	1 – 3.5	2.5 – 3.5	0.5	1.5 – 2.5
Spray rate (g/min)	7 – 10	4 – 10	200 – 1'200	200 – 1'200	15	600 – 1'800
Spraying time (h)	7	6	14 – 18	12 – 15	0.5	1.5
Cooling / drying time (min)	5 – 10	5 – 10	10 – 15	10 – 15	0	5
Discharge time (min)	1	1	5	5	1	10

Overview of available type sizes in production scale

Technical data	V-100	V-200	V-400	V-600	V-800	V-1'200
Volume product container = max. batch size (litres)	100	200	400	600	800	1'200
Min. batch size (litres)	50	100	200	300	400	600
Product container inside ø = ø of booster (mm)	650	900	1'100	1'200	1'400	1'700
Facility material	Stainless steel 1.4404 or 1.4571					
Shock pressure resistance	10 bar overpressure					

Monobloc *Tubus*

Touch screen control panel

Washing in place system

Spray nozzle *Rotojet®*

Powder recovery system *Sepajet®*

Booster *Orbiter®*