SYNTEGON
PROCESSING & PACKAGING

Fluid Bed Systems

HD/HDG/ HDGC.

Drying. Granulating. Coating.

5.800
employees

66.000
machines in the installed base

Count on it.

30
locations

160
years of experience

1.4 billion
euros annual sales

1.100
service specialists

1.800
patented inventions

Syntegon Technology is your reliable partner for process and packaging technology in the global pharmaceutical and food industries. Whether you are an aspiring start-up or a global market leader, we offer intelligent and sustainable solutions for everyone.

Individual machines, systems or services – as a full-service provider, we take responsibility right up to fully integrated end-to-end solutions. Fields of application in the pharmaceutical industry are the production, processing, filling, inspection and packaging of liquid and solid active ingredients in all common packaging materials. In the food industry, we offer solutions for the primary and secondary packaging of dry, liquid and frozen food as well as process technology for the production of confectionery.

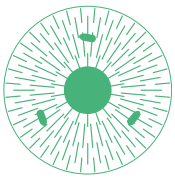
We are at your side from project planning, development and implementation to comprehensive digitization, qualification and validation services. In addition, you always have access to our worldwide network of service specialists who support you throughout the entire machine life cycle.

A lead on principle

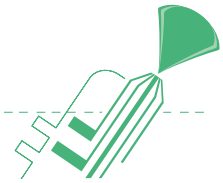
Present challenges for the pharmaceutical fluid bed technology are flexibility in production, processes that are optimized for the long term, and fast production procedures.

Fluid bed technology from Hüttlin offers all of these features and helps you to gain a competitive lead.

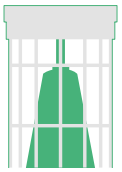
Fluid bed technology



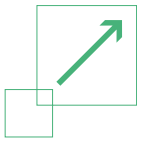
Diskjet



Three-component nozzle



Dynamic filter



NexStep software

Our solutions have one thing in common – quality

Hüttlin fluid bed lines make it possible to carry out drying, granulating and coating/layering with just one product container. As a result, it is no longer necessary to exchange the container. A more efficient operation is ensured.

Making drying more efficient

The patented process gas distributor plate Diskjet ensures fast and uniform mixing. Regardless of the drying conditions, it allows for uniform fluidization of the entire batch. The high exit speed of process air prevents sticking and clogging of the product on the bed resulting in a product with uniform residual moisture and improved reproducibility of processes.

Drying

- **Process times significantly reduced**
- **No dead zones in the product container**
- **Reduced filter load**
- **Processing of materials with different densities is possible**

Granulation better than ever

Depending on product characteristics and used binder, the particle size of granulate can be controlled and reproduced by selecting specific parameters. The uniformity of the granulates and their homogeneous size distribution produce excellent flow and compression characteristics. The efficiency of the system prevents large agglomerates from forming in most products, rendering classification in a sieving mill unnecessary.

Granulating

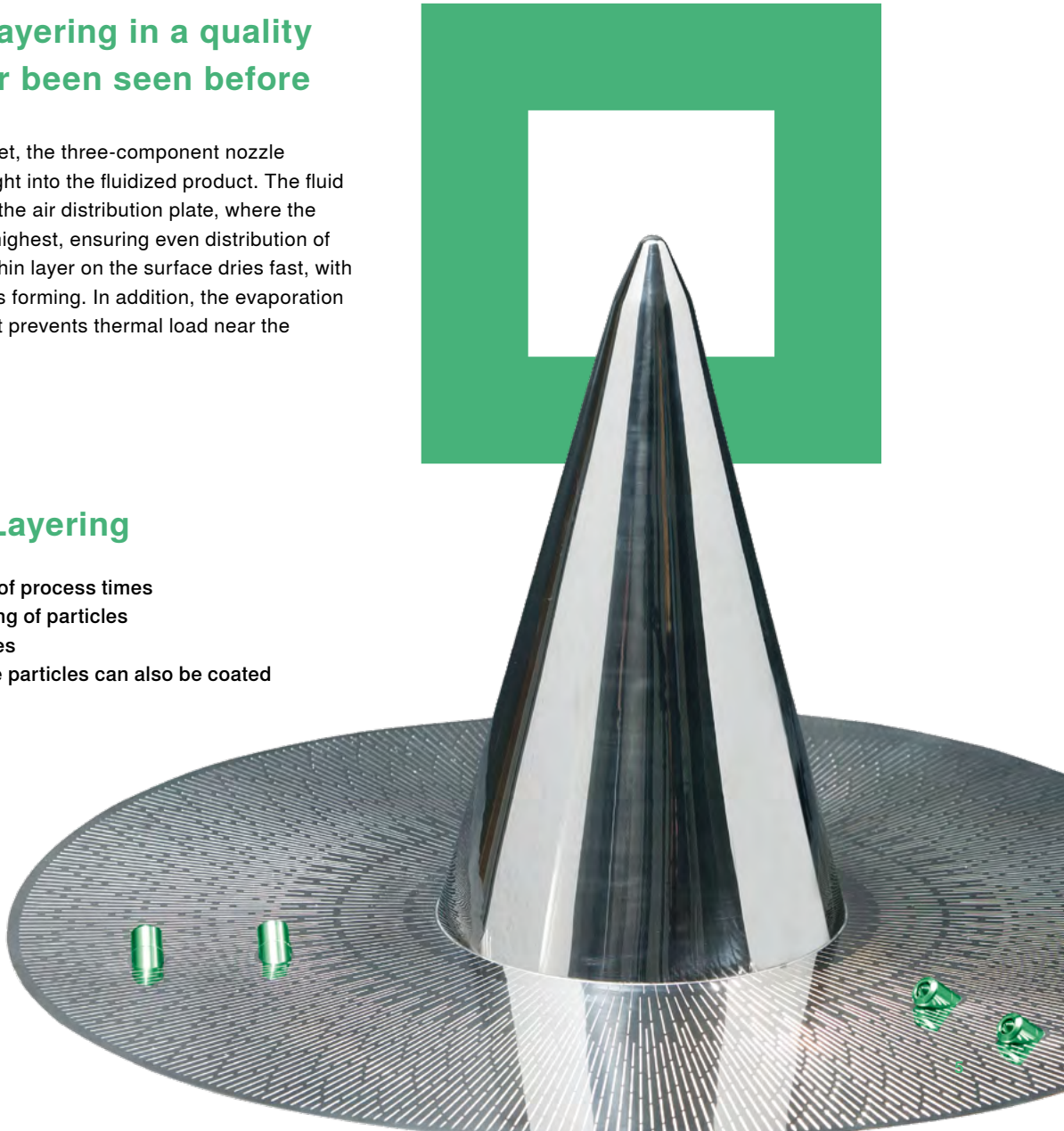
- Process times significantly reduced
- Very homogeneous granulate
- No size calibration needed
- Excipients (lubricants) can be added
- Excellent flowability of granules
- High output on tablet press

Coating and layering in a quality that has never been seen before

Combined with the Diskjet, the three-component nozzle delivers spray fluid straight into the fluidized product. The fluid is coated directly above the air distribution plate, where the speed of the product is highest, ensuring even distribution of the spray medium. The thin layer on the surface dries fast, with virtually no agglomerates forming. In addition, the evaporation energy above the Diskjet prevents thermal load near the bottom.

Coating and Layering

- Maximum reduction of process times
- Homogeneous coating of particles
- Minimum spray losses
- Microtablets and fine particles can also be coated



Product overview/dimensions fluid bed technology

	Dryer	Granulator	Coater
Standard systems	HD 100	HDG 100	HDGC 100
	HD 200	HDG 200	HDGC 200
	HD 300	HDG 300	HDGC 300
	HD 400	HDG 400	HDGC 400
	HD 600	HDG 600	HDGC 600
	HD 800	HDG 800	HDGC 800
	HD 1200	HDG 1200	HDGC 1200
	HD 2000	HDG 2000	HDGC 2000
UltraClean	HD 100$^{\text{UltraClean}}$	HDG 100$^{\text{UltraClean}}$	HDGC 100$^{\text{UltraClean}}$
	HD 200$^{\text{UltraClean}}$	HDG 200$^{\text{UltraClean}}$	HDGC 200$^{\text{UltraClean}}$
	HD 300$^{\text{UltraClean}}$	HDG 300$^{\text{UltraClean}}$	HDGC 300$^{\text{UltraClean}}$
	HD 400$^{\text{UltraClean}}$	HDG 400$^{\text{UltraClean}}$	HDGC 400$^{\text{UltraClean}}$
	HD 600$^{\text{UltraClean}}$	HDG 600$^{\text{UltraClean}}$	HDGC 600$^{\text{UltraClean}}$
	HD 800$^{\text{UltraClean}}$	HDG 800$^{\text{UltraClean}}$	HDGC 800$^{\text{UltraClean}}$
	HD 1200$^{\text{UltraClean}}$	HDG 1200$^{\text{UltraClean}}$	HDGC 1200$^{\text{UltraClean}}$
	HD 2000$^{\text{UltraClean}}$	HDG 2000$^{\text{UltraClean}}$	HDGC 2000$^{\text{UltraClean}}$

The right unit for the right purpose

The modular design makes it easier to decide between dryers, granulators or coaters. The range of application can be extended with little additional capital investment.

HD
- Hüttlin Dryer

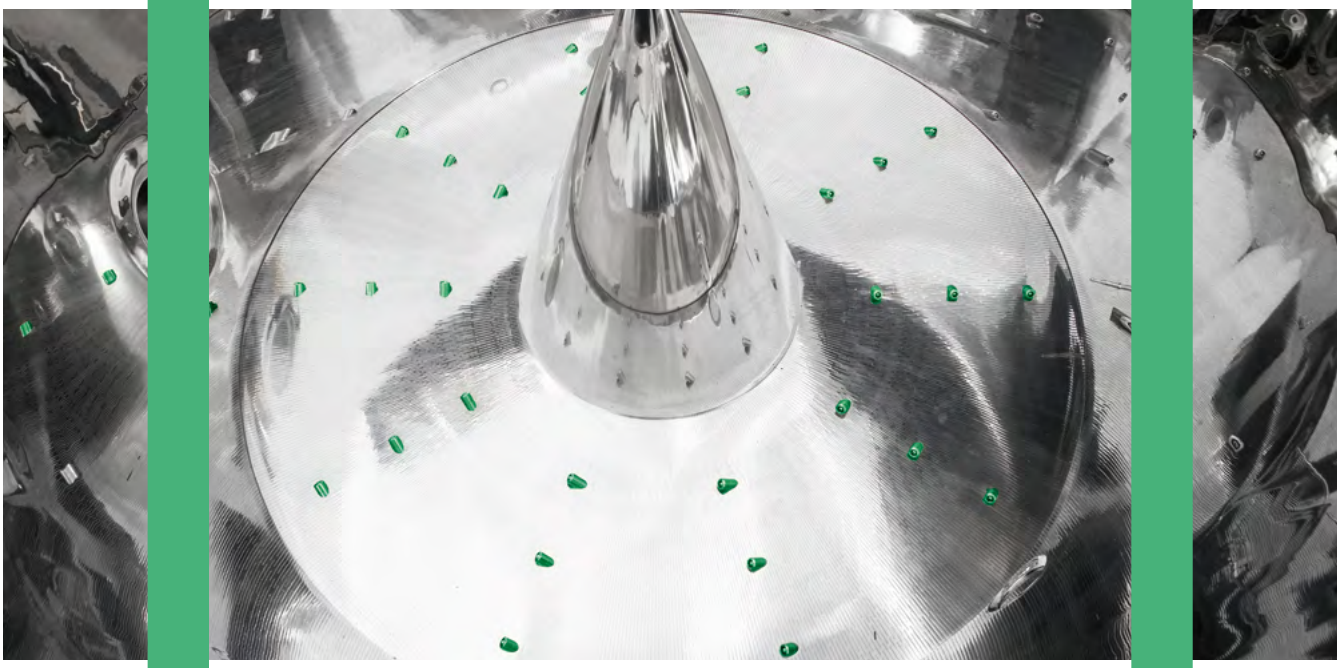
HDG
- Hüttlin Dryer-Granulator

HDGC
- Hüttlin Dryer-Granulator-Coater

Application matrix

	HD	HDG	HDGC
Mixing	◻	◻	◻
Drying	◻	◻	◻
Granulating		◻	◻
Coating			◻

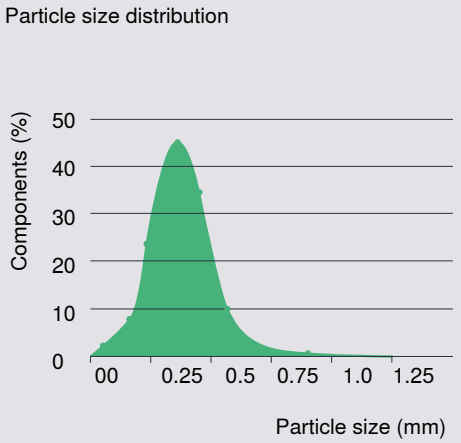
Convinced by top-notch results



HDGC spray nozzle

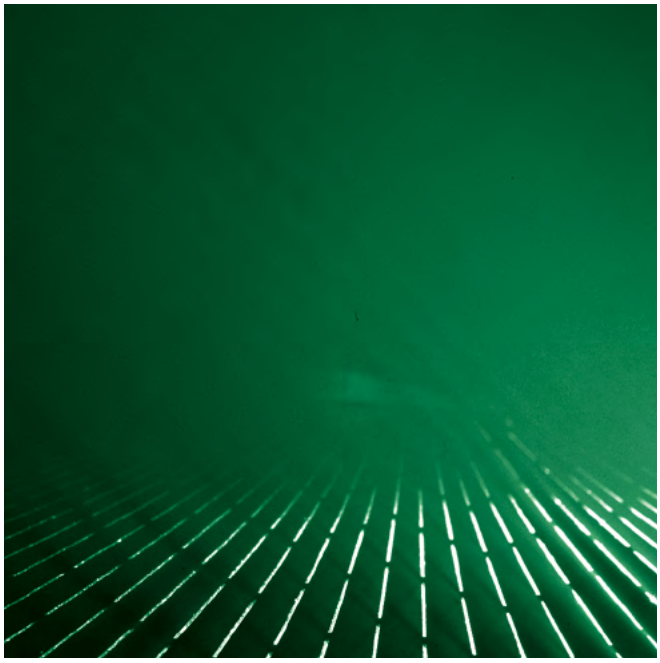
Hüttlin fluid bed granulation technology does not involve any milling of the granulate for many products – a process that is still standard in traditional fluid bed lines. The uniformity of the granulate means that excipients (lubricants) can be added in the unit.

Results from granulation



Sieve analysis	
0.00 mm	0.00 %
0.05 mm	0.65 %
0.10 mm	5.20 %
0.16 mm	16.25 %
0.25 mm	39.65 %
0.32 mm	28.60 %
0.50 mm	8.45 %
0.80 mm	0.65 %
1.00 mm	0.65 %
1.25 mm	0.00 %

Inspired to think ahead



Tangential gas exit

Any company laying claim to leadership in fluidized-bed technology must constantly tread new paths to open up new horizons. This results in technological feats such as the Diskjet gas distribution plate (patented), the dynamic filter system (patented) and the three-component spray nozzle spraying system.

Diskjet – for a perfect mixing behavior

The patented process gas bottom ensures fast and thorough mixing as well as short drying periods. Independently of drying conditions, the Diskjet produces even fluidization of the entire filling. A homogeneous air stream provides optimum exchange of substance and energy. The tangential gas exit improves the efficiency of the filter system. The high exit speed of process air prevents the product from settling on the bottom resulting in uniform residual humidity of the product and processes with enhanced reproducibility.

Spraying system

Three-component nozzle

Three-component nozzle

In addition to the spraying fluid and the atomizing air, the Hüttlin spray nozzle also has a third component, the microclimate. The microclimate is gas that protects the spray nozzle from clogging. The spray direction of the nozzles is aligned with the exit of process air from the Diskjet. The number of nozzles increases with the size of the unit, making scale-up processes simpler and ensuring consistent product quality.

Dynamic filter

The patented process filter system with its sequential-cleaning filter elements meets even the most stringent requirements. An internal cone in each filter element serves to increase the overall filter surface considerably and reduces the burden. When the filters close in the clean-off cycle, particles of the product that are circulating or sticking to the filter surface are returned to the process efficiently using compressed air. Depending on the process, fabric, Teflon or metal filters can be used.

Diskjet

- Homogeneous airflow ensures optimum exchange of substance and energy, the tangential air outlet puts less strain on the filter system
- Best product mixing results due to controlled and uniform process air distribution
- Process times can be significantly reduced

Dynamic filter

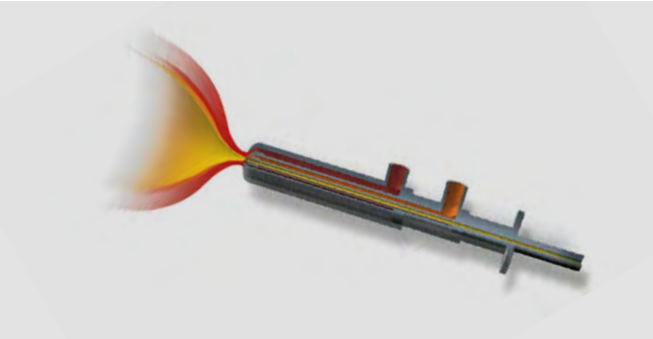
- Continuous filter cleaning speedily reroutes the particles to the process
- Various filter materials can be selected to suit the respective processes

Three-component nozzle

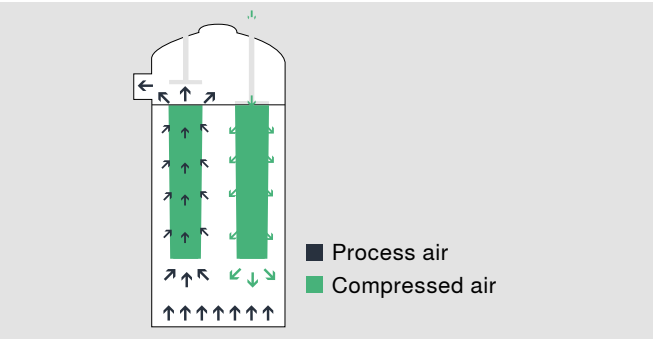
- Extremely low spraying losses due to the spray nozzle arrangement
- Homogeneous granulates, classification with a sieve mill is no longer necessary
- Excellent coating quality and gentle handling of the product during coating
- Very short granulation and coating times

NexStep

- Process development and optimization at the laboratory-scale and reliably applied in the production-scale via NexStep
- Scale-up without intermediate steps



Scheme three-component nozzle



Dynamic filter

Optimum combination of fluid bed lines

Hüttlin fluid bed lines have a modular design. The base devices are designed as heavy-duty 10 bar or 12 bar pressure shock resistant and can be adjusted using various options.

Depending on the requirements, product containers are available either without spraying systems, with tangential spraying systems for simple or underbed spraying systems for demanding applications.

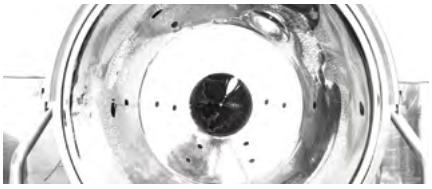
The patented dynamic filter can be fitted with different filter materials including a fully CIP-compatible metal filter. Pneumatic/gravimetric filling and pneumatic discharging as a further option offer significant advantages. As a result they are generally used as a standard.

Process filter

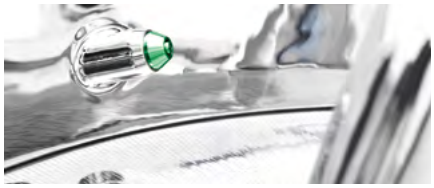


Product container

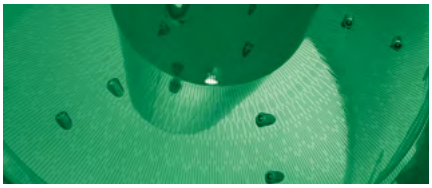




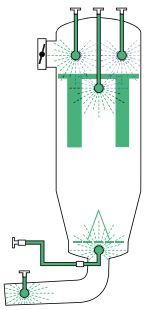
Spray systems



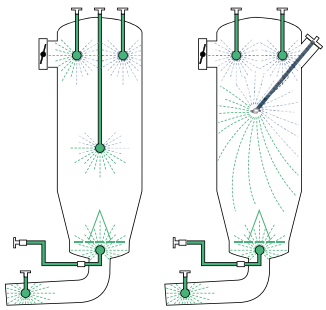
Diskjet

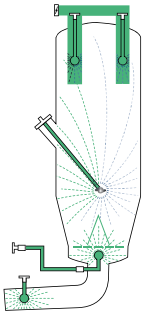

Cleaning systems



Pre-cleaning
Basic automated cleaning system

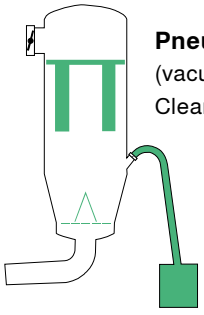


Main cleaning
1. Basic automated cleaning system
2. Advanced automated cleaning system with jet cleaner

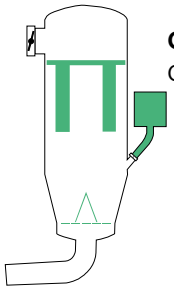


UltraClean system
Metal filter and jet cleaner

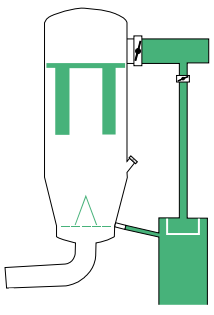
Filling/Discharging



Pneumatic filling
(vacuum)
Cleaning: option



Gravity filling
Cleaning: option



Pneumatic discharging
(vacuum)
Cleaning: option

UltraClean system – automated cleaning in action

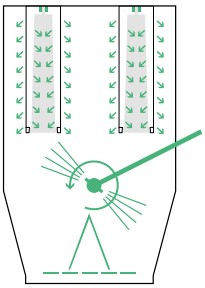
Hüttlin has made the CIP metal filter a viable solution. The UltraClean dynamic blow-back filter is an effective product retaining filter system. The stainless steel filters can be vertically opened during the automated cleaning and do not require to be disassembled during the cleaning process. Tests can be performed in our Pharma Solid R&D Center. Especially products prone to swelling amplify this problem.

Hüttlin has come up with an ingenious solution: a metal filter that opens. An internal cone in the filter cartridge such as the one used in the proven dynamic filter is pushed downwards via a piston rod and the filter opens. This makes it possible to rinse off solids on the clean gas side of the filter quickly, thus reducing cleaning time significantly without compromising cleanliness.

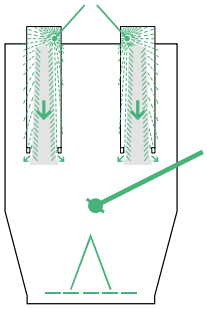
Retractable jet cleaner

A retractable jet cleaner in the center of the unit rounds off the UltraClean system. With three different positions, the 360°-rotating cleaning nozzle guarantees that the unit is cleaned completely. Thanks to computer-assisted calculation of the spray nozzle opening combined with the rotation speed of the jet cleaner it is possible to optimize the cleaning design towards the equipment requirements.

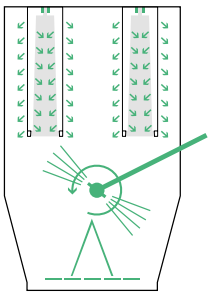
5 Steps to perfectly cleaning of the unit



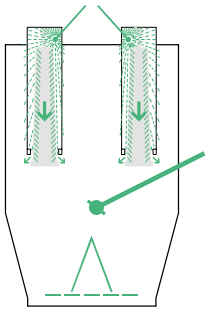
1. Pre-clean the product area and the metal filter from the outside with the jet cleaner and blow clear the metal filters with compressed air.



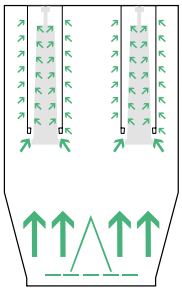
2. Clean the metal filters with the inside CIP nozzles. This opens the metal filters.



3. Proceed with the main cleaning of the unit using the jet cleaner and rotating spray nozzles in the peripheral devices. Various cleaning agents can be added to the warm water during this process.

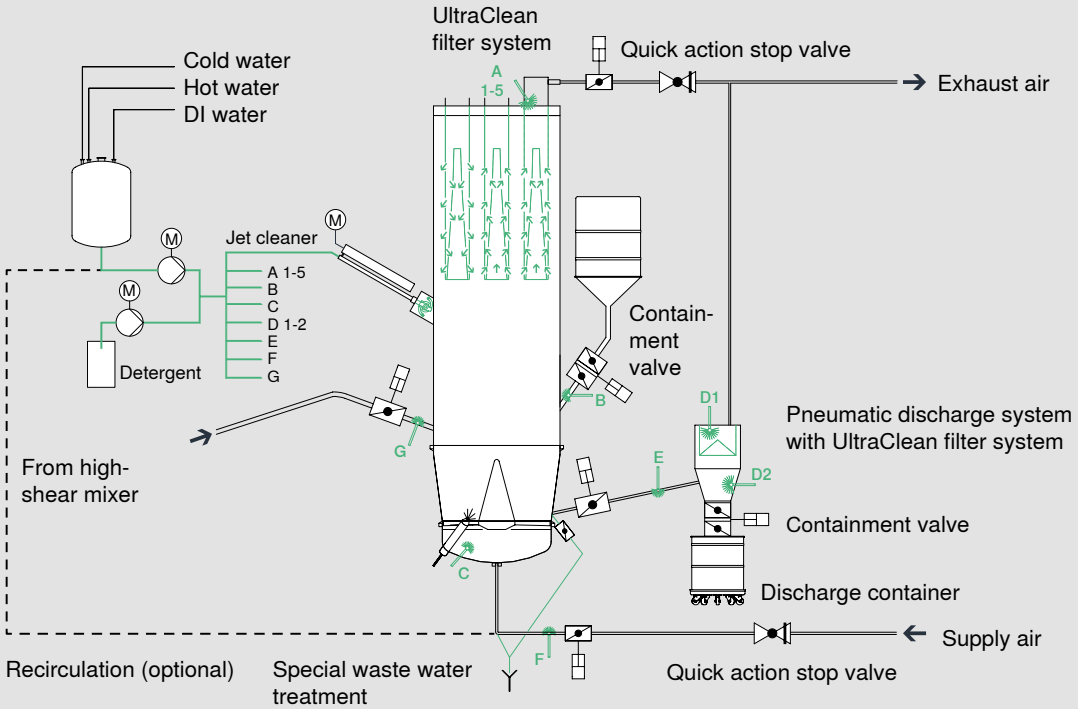


4. Rinse the entire unit and peripheral devices with DI water as for the previous step. The filters can alternately be cleaned from their inside and outside.



5. Dry the unit with preheated process air while the filter cartridges alternate through an open and close cycle.

Cleaning concept



Inline process – overall perfection

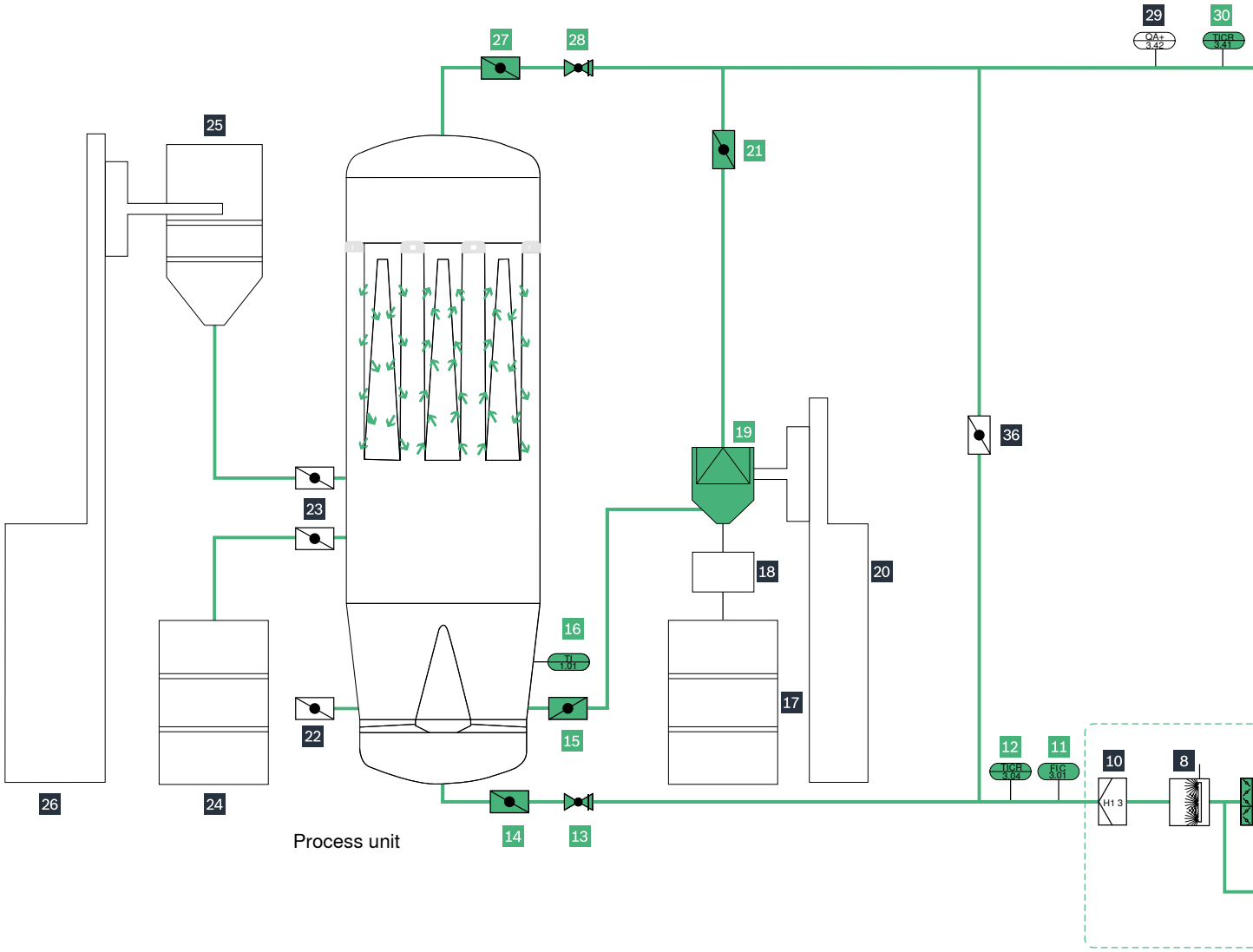
Inline process at Hüttlin means that the high-shear mixer granulator is physically attached to the fluid bed system using a product transfer line. The product is extracted from the high-shear mixer granulator using negative pressure and transported to the fluid bed with the process air.

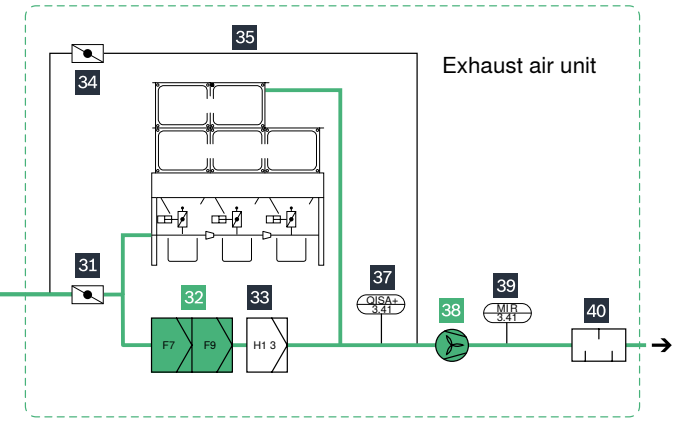
Regardless of whether a cone mill is interposed or whether the product is a difficult one, Hüttlin can rise to the challenge. Minimum transfer times combined with a maximum degree of emptying are proof of this. Closed product handling is proven technology at Hüttlin.

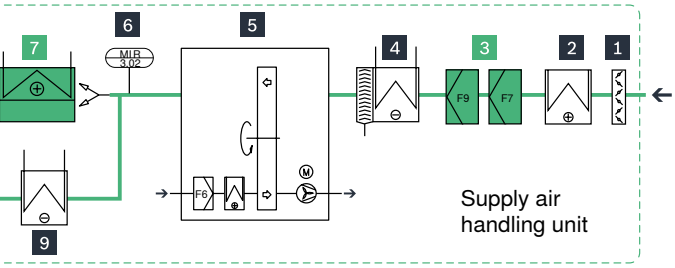
1	High-shear mixer granulator	**6**	Discharge filter
2	Cone mill, wet mill	**7**	Cone mill, dry mill
3	Transfer line	**8**	Distributor cone
4	Fluid bed processor	**9**	Product barrels
5	Discharge hose	**10**	Lifting and swivelling column

On the path to containment

On an Hüttlin unit, filling and discharging is carried out without any vacuum conveyor systems. This eliminates the need for complicated additional installations. As is the case with the inline process, the unit is filled and discharged by means of conditioned process air. Competence in closed product handling is necessary for viable containment solutions.







Components of a fluid bed system

Supply air handling unit

1 Fresh air isolation flap
2 Anti-freeze heater
3 Prefilter*
4 Cooler (air dehumidification)
5 Adsorption dryer
6 Humidity sensor for process inlet air
7 Steam heating with bypass*
8 Humidification
9 Post cooler
10 HEPA filter H13
11 Flow sensor for process air*
12 Temperature sensor for process inlet air*

Process unit

13 Ex-valve process inlet air
14 Inlet air flap
15 Product discharge valve*
16 Temperature sensor for product*
17 Discharge container
18 Cone mill
19 Discharge air filter*
20 Lifting device
21 Discharge air flap*
22 Product transfer valve
23 Filling valve
24 Filling container
25 Filling container
26 Lifting device
27 Outlet air flap*
28 Ex-valve process outlet air*

Exhaust air unit

29 Sensor for dust concentration
30 Temperature sensor for exhaust air*
31 Shut-off flap
32 Exhaust air filter*
33 HEPA filter
34 Shut-off flap bypass
35 WIP bypass
36 Flap for dilution air
37 Gas sensor (LEL)
38 Process air fan*
39 Sensor for exhaust humidity
40 Silencer

*Standard

Technical data

Size HD/HDG/HDGC

	100	200	300	400	600	800	1200	Bigger sizes on request
Product container volume (l)	256	527	749	937	1,315	1,880	3,266	Subject to technical specification
Air flow (m3/h)	2000	3,000	3,800	5,000	6,500	8,000	12,000	Subject to technical specification

Data

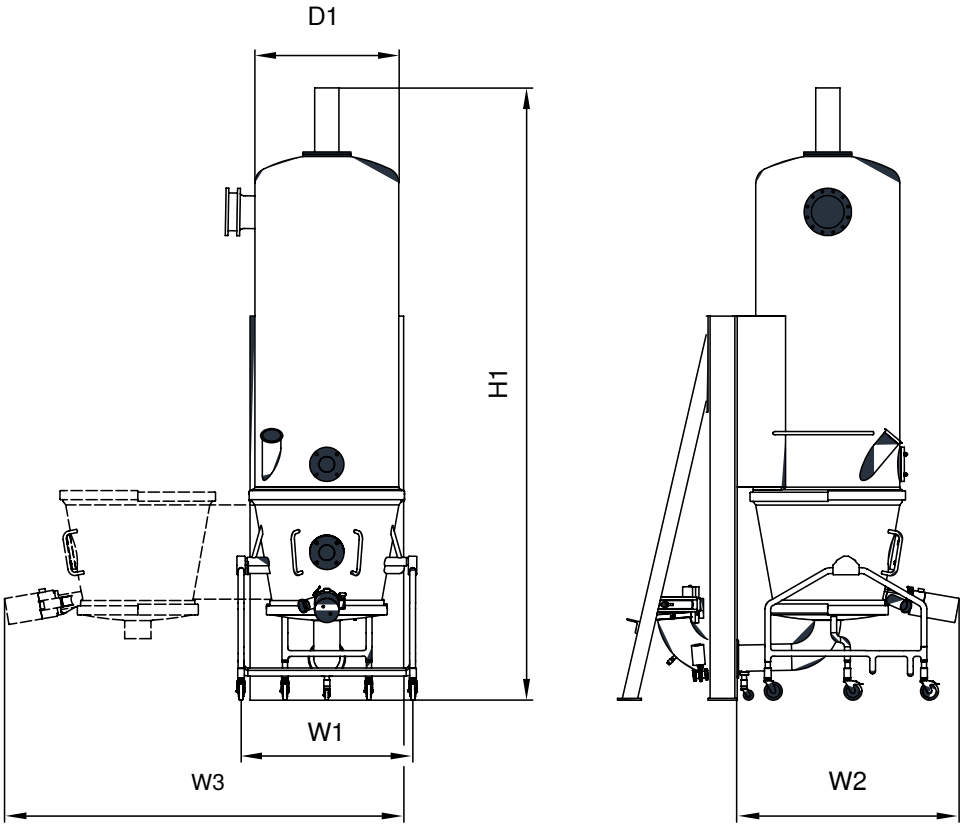
	100	200	300	400	600	800	1200
Spray nozzles (standard)							
Granulator HDG	3	4	4	4	6	6	10
Granulator/coater HDGC	6	6	6	12	12	12	18
Spray nozzles (extended)							
Coater HDGC		12	12	18	18	18	30

All technical data subject to alterations.

Dimensions

	100	200	300	400	600	800	1200
W1 (mm)	1,080	1,280	1,430	1,500	1,600	1,800	2,360
W2 (mm)	1,500	1,700	1,850	2,120	2,900	3,100	4,020
W3 (mm)			2,900	3,100	3,600	3,975	4,725
D1 (mm)	800	1,050	1,200	1,300	1,500	1,700	1,900
H1 (mm/min)	4,180	4,660	4,700	5,010	5,400	5,900	
H1 (mm/max) Depending on options, e.g. jet cleaner	4,660	5,120	5,200	5,480	5,830	6,320	8,370

Machine configuration example




HDx Detail
HxG Detail
EMERGENCY STOP

Device control and process monitoring

The variety in requirements on modern control systems means that it must be possible to adjust them flexibly. Hüttlin's control systems were developed based on this premise. Their modular structure can be adapted very easily, from control of an individual machine to entire production lines and integration into ME-systems.

PAT-Integration

Process monitoring is one of the most important measures for meeting and reproducing the required quality. In addition to monitoring conventional indicators such as temperature, torque, pressure and flow rate for liquid binder and strip gas, Hüttlin provides monitoring of product humidity and particle size distribution. A NIR (Near Infrared) sensor can be integrated for inline monitoring of the product quality, residual humidity, mixing quality and particle size distribution.

Based on Siemens, the control system was consistently developed according to GAMP guidelines and is extended to include a PC above a certain scope. Provicon fulfills all requirements of the FDA 21 CFR part 11.

Innovative services tailored to your needs.

A comprehensive service portfolio lays the foundation for smooth production processes. We at Syntegon support you throughout the entire machine life cycle, from spare parts management to digital line optimization. Service agreements are a key element of our portfolio structure. We minimize production risks and maximize the efficiency of your equipment by working with you as equal partners.

Together, we tailor our solutions to your individual needs. You benefit from fixed conditions and guaranteed services.

Our global network of experts supports you with maintenance planning, technical support, and modernizations, as well as operator training and expert services. With our digital solutions, you gain control over your production processes and create transparency on product and machine data – anytime, anywhere. Whether it is switching to sustainable materials or upgrading to automated technologies, together with us you will take the next steps towards the factory of the future.

How can we help you? Please get in touch with us: www.syntegon.com/services

Connect
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