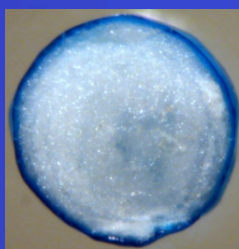
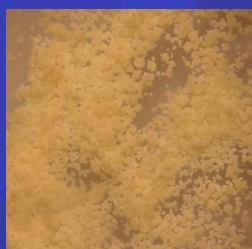
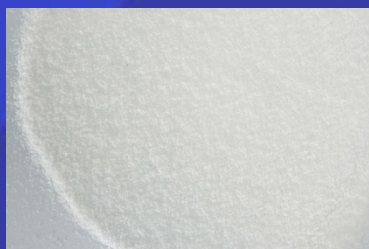
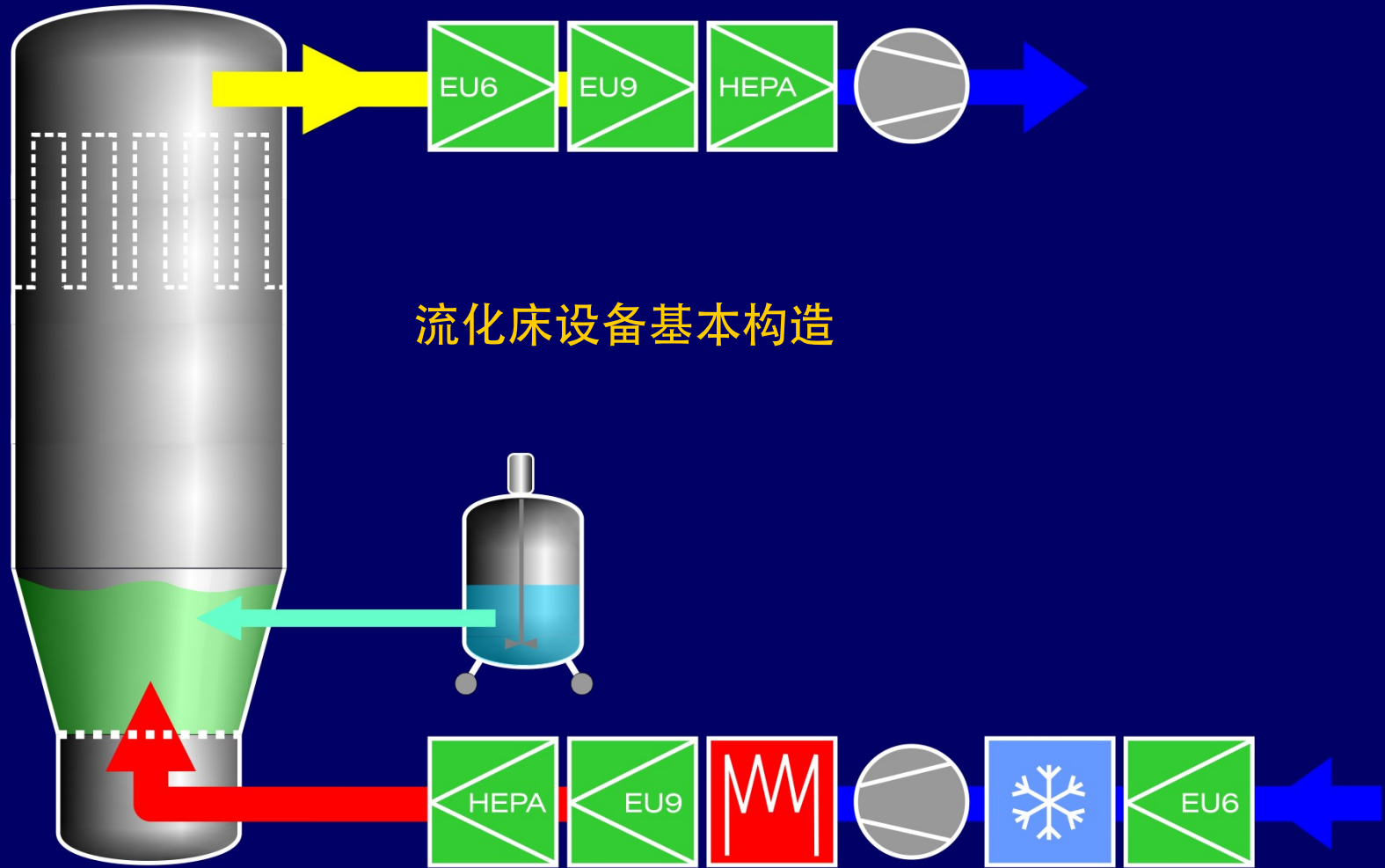


影响流化床工艺过程的关键因素及其后果

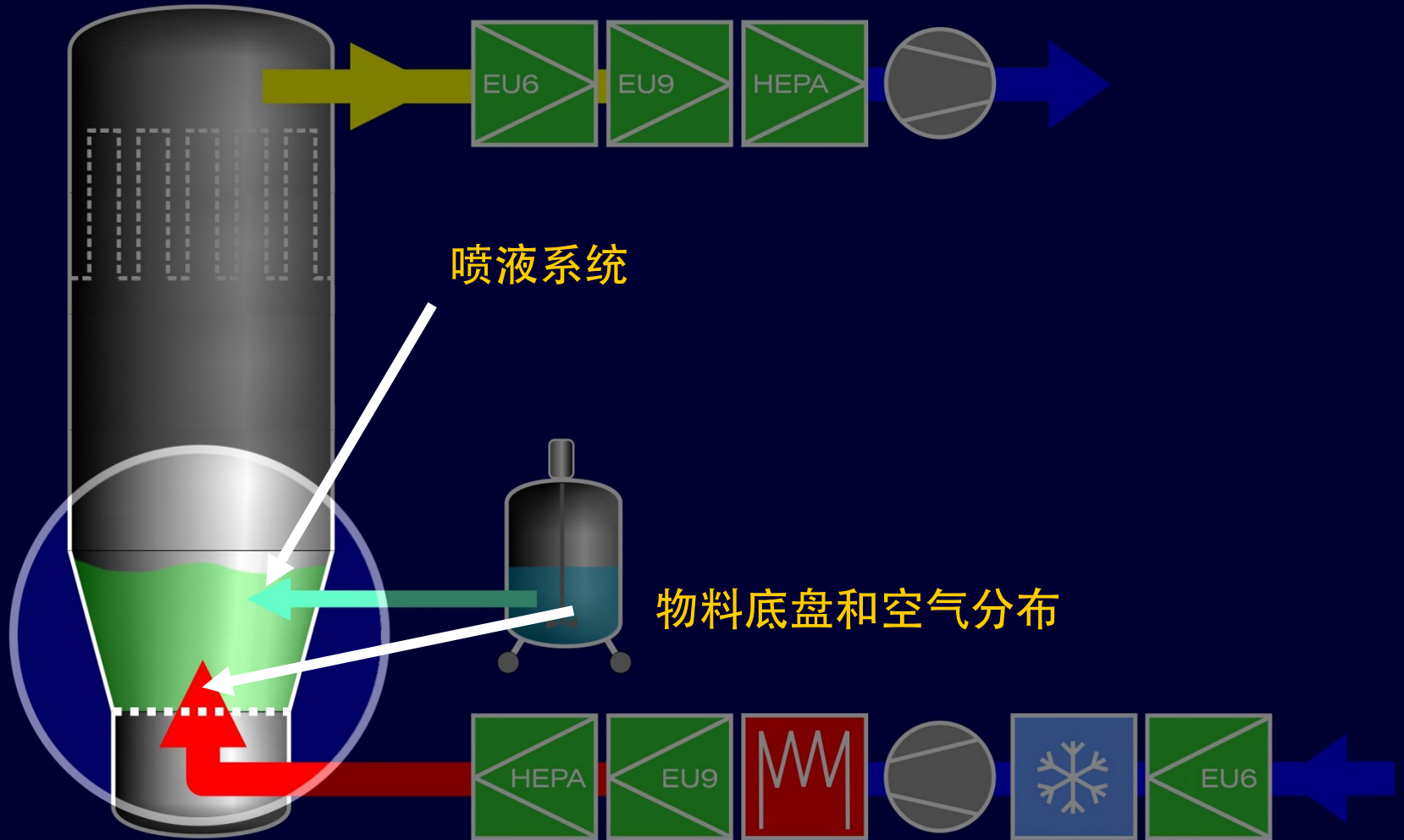
© copyright 2009 INNOJET Herbert Hüttlin

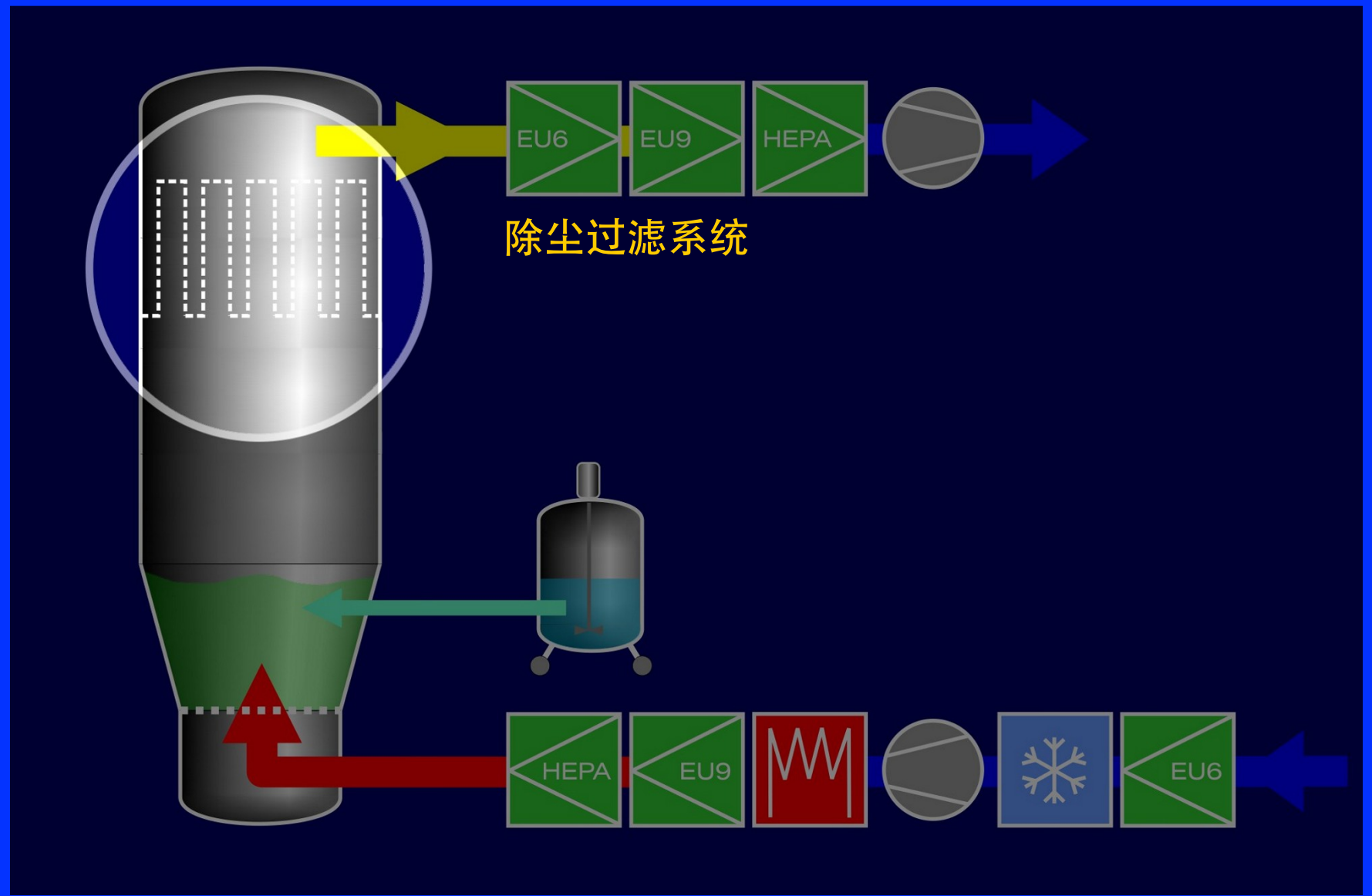
新一代固体制剂技术 - 混合 - 制粒 - 干燥 - 包衣, 适合:



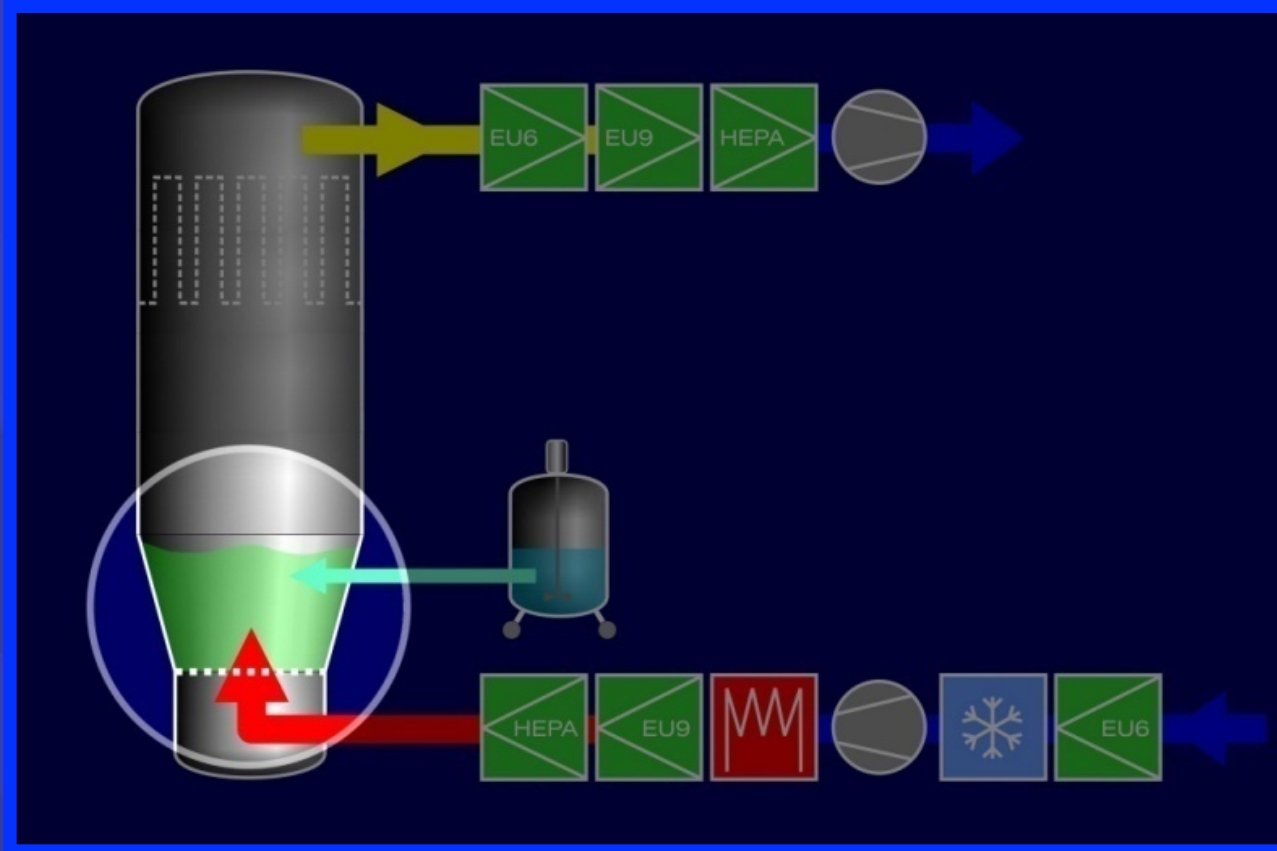


流化床设备基本构造

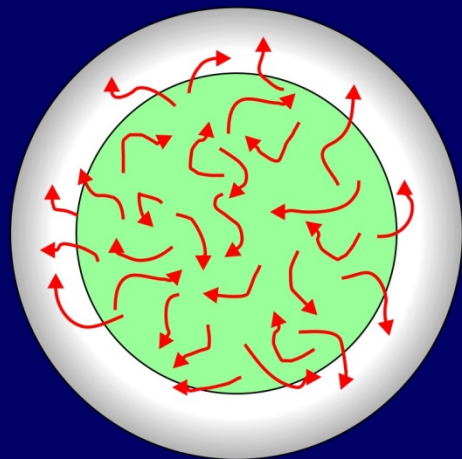
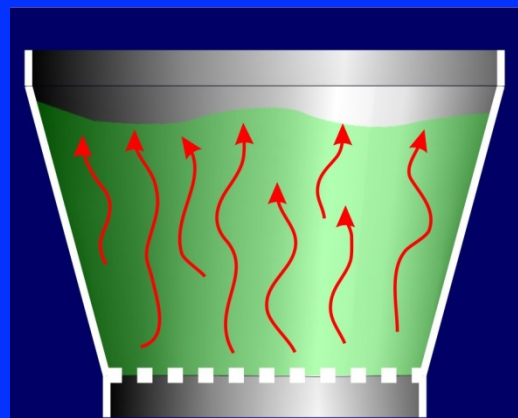




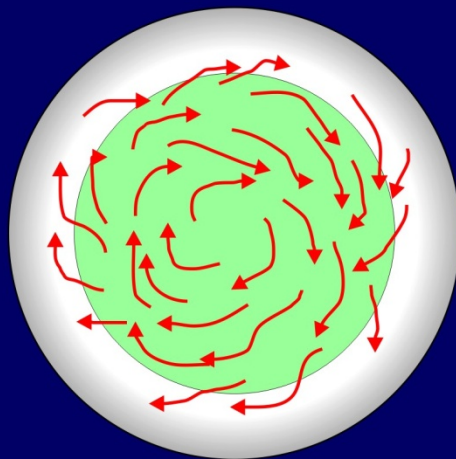
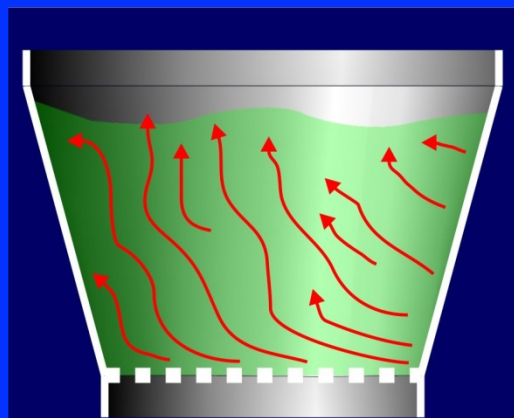
1. 物料底盘和空气分布



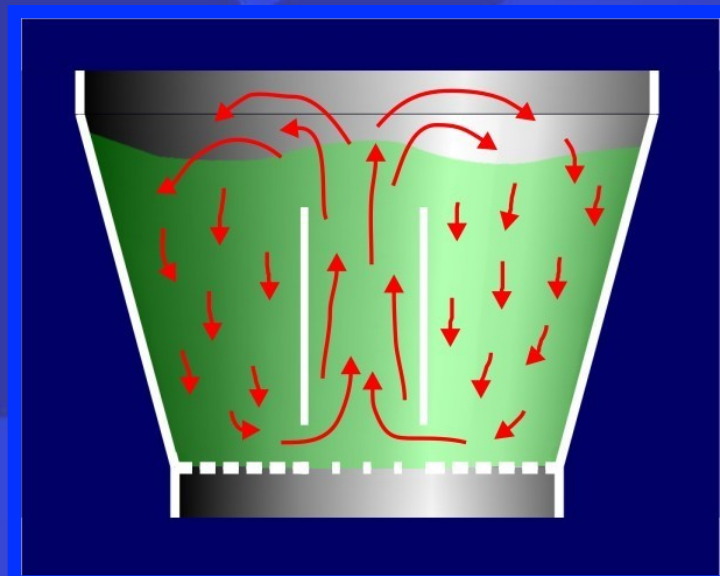
物料底盘和进风方式对物料运动乃至产品的影响



丝网底盘

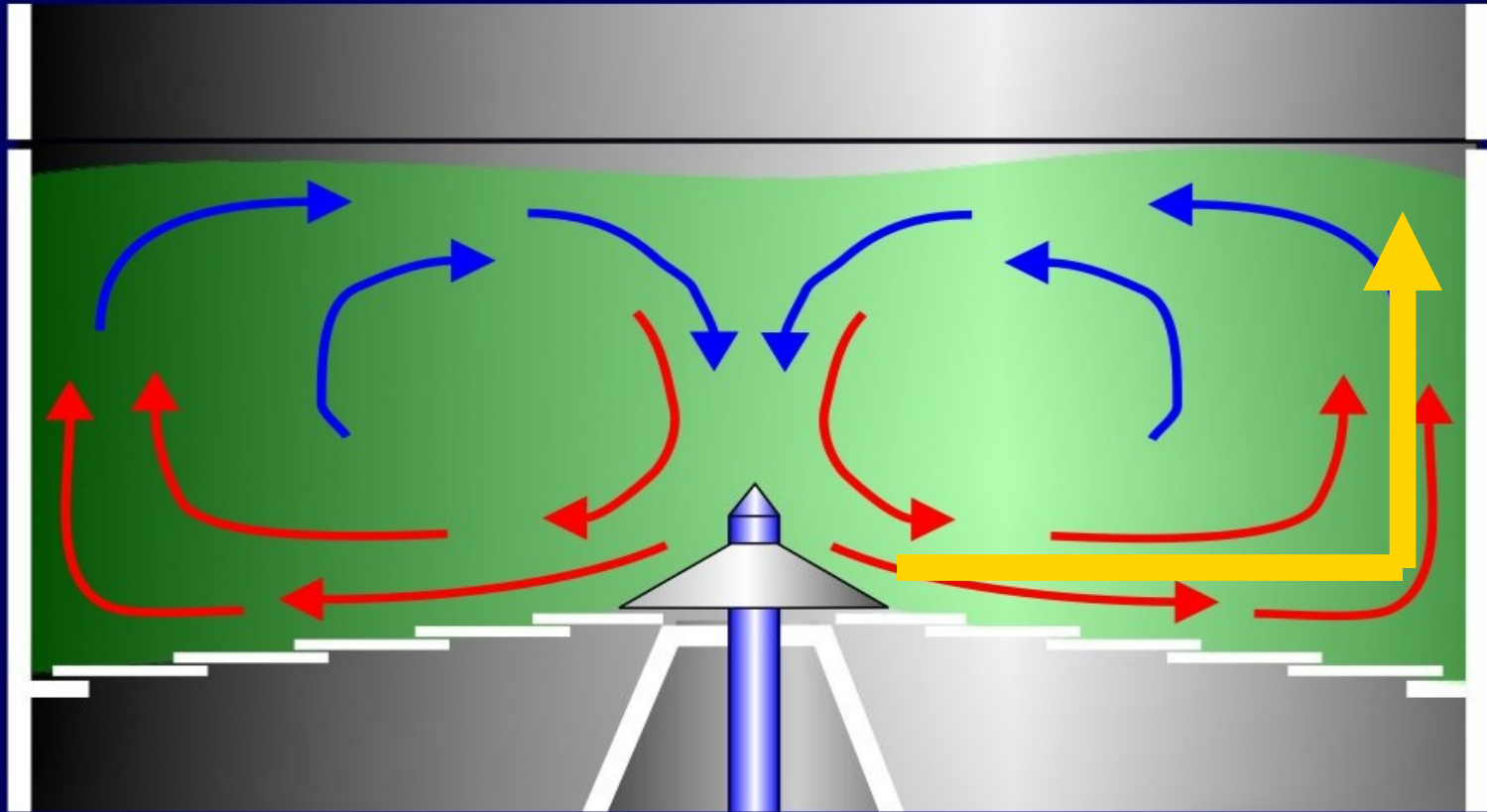


斜孔底盘



Wurster底喷底盘

Innojet底盘和进风分布形式



INNOJET booster type ORBITER底盘

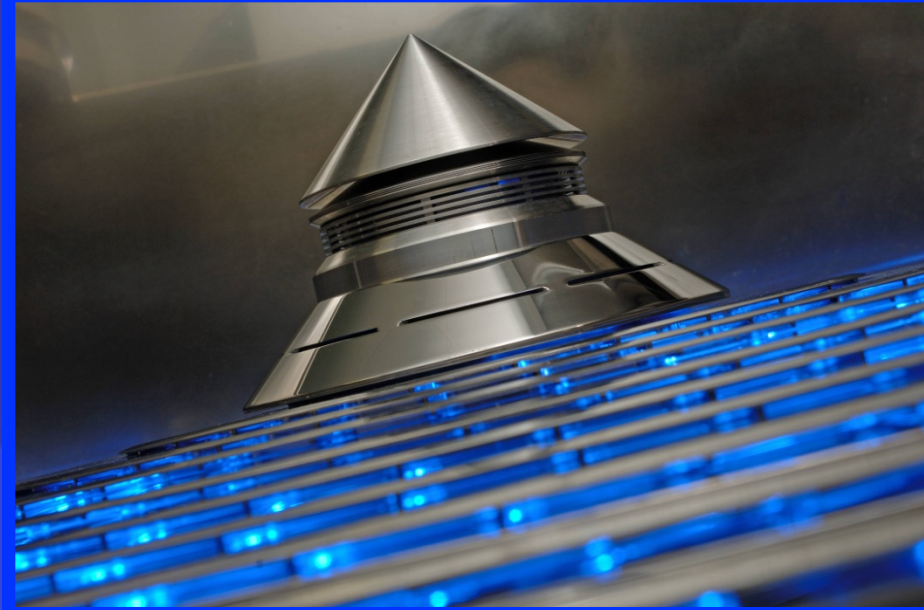


INNOJET booster type ORBITER Type IBO 1400

INNOJET[®]
HERBERT HÜTTLIN

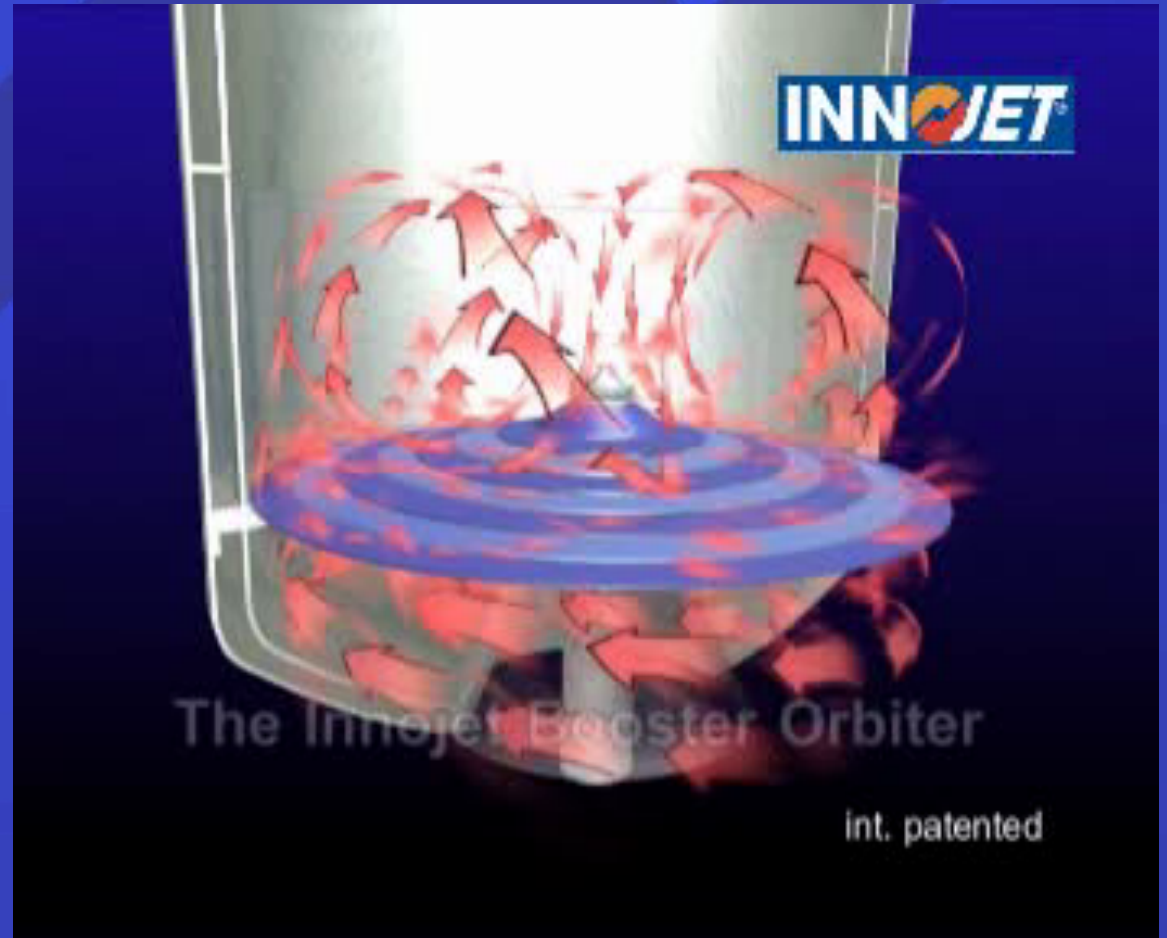
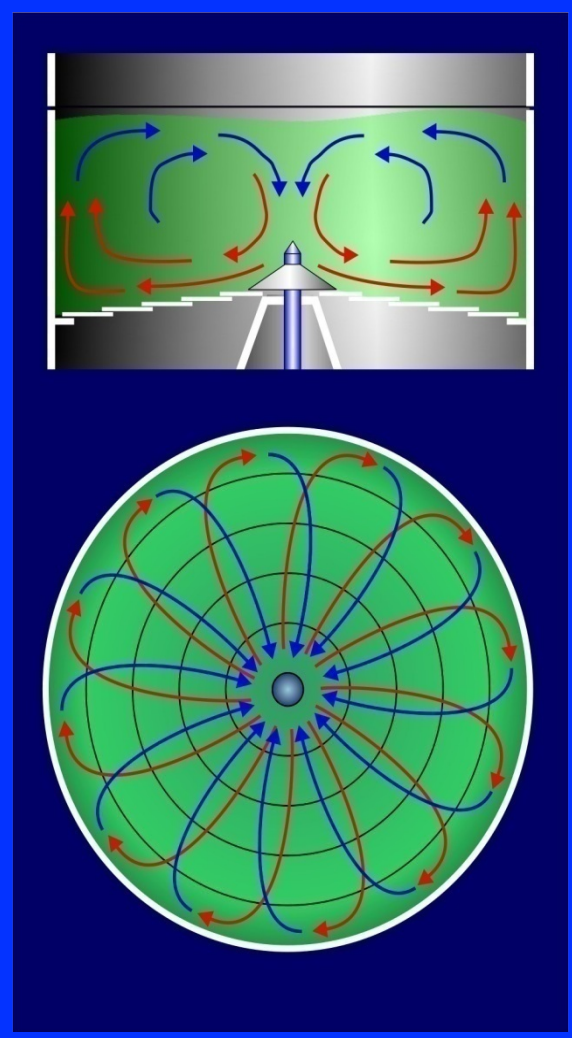


INNOJET Booster ORBITER center view
with INNOJET spray nozzle ROTOJET



INNOJET Booster ORBITER side view
(open air gaps highlighted)

INNOJET booster type ORBITER物料运动性态



INNOJET booster type ORBITER物料运动规律



Booster ORBITER之清洗:



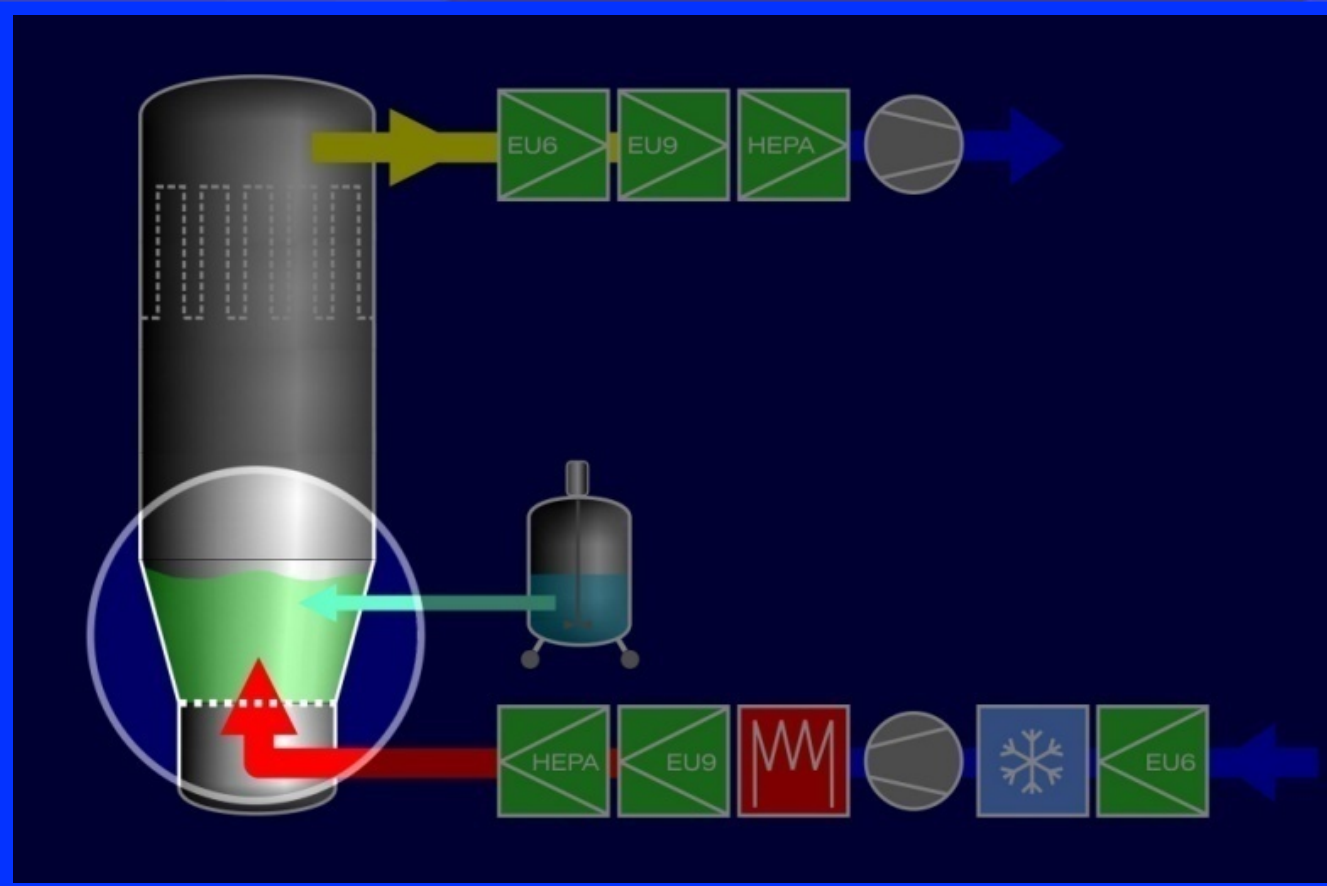
中央部件的拆装



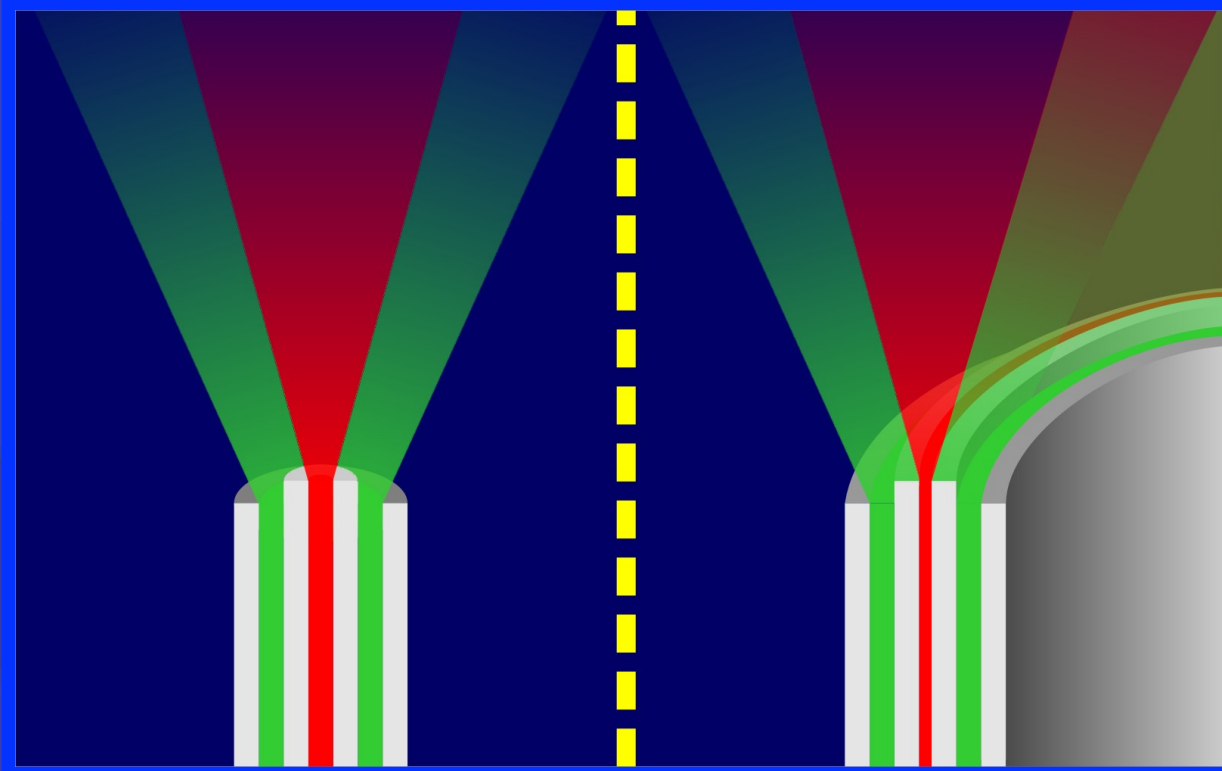
无需工具

所有环状部件可简便地装卸
▶ 设备清洗符合GMP规范

2. 喷液系统

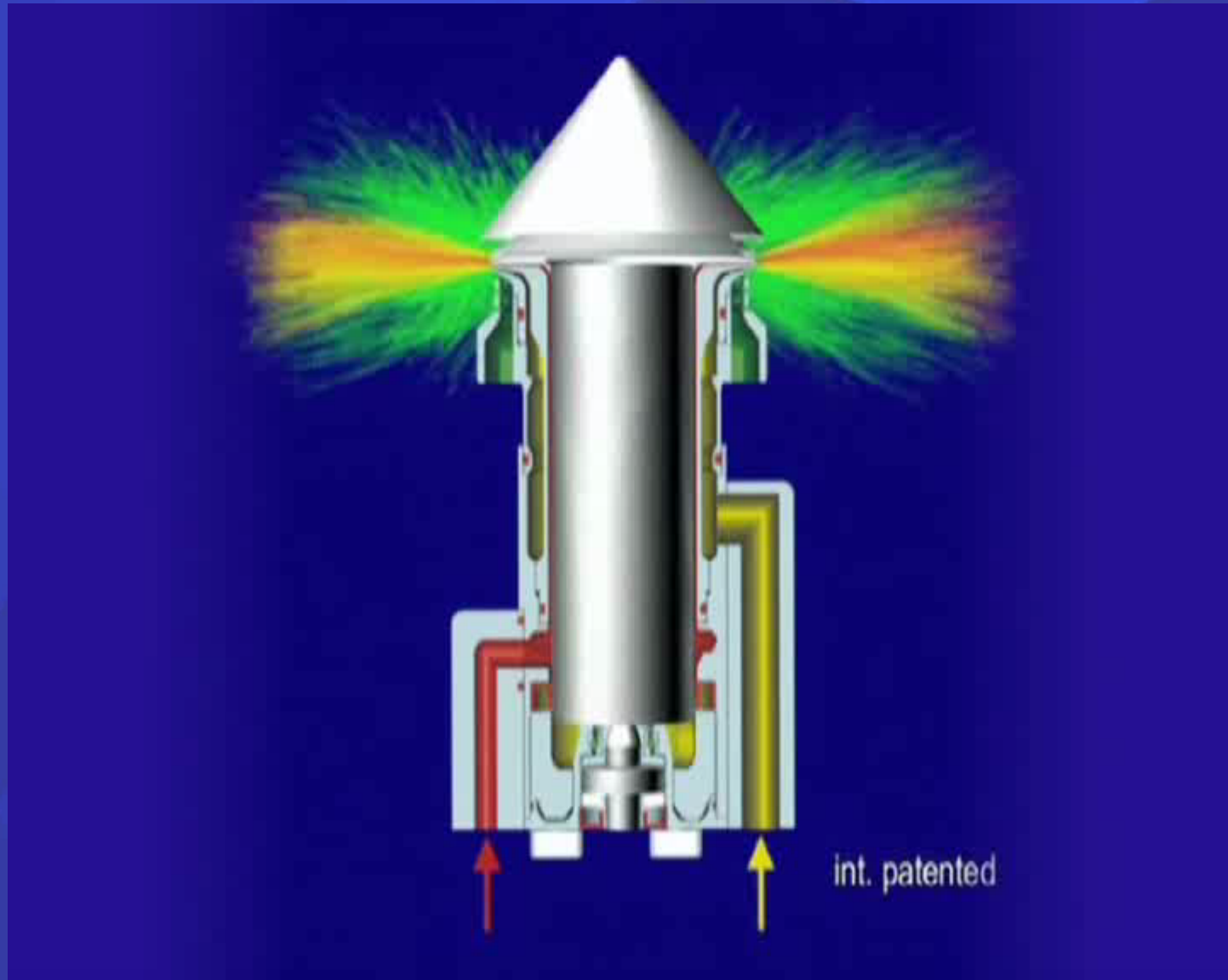


不同喷液技术

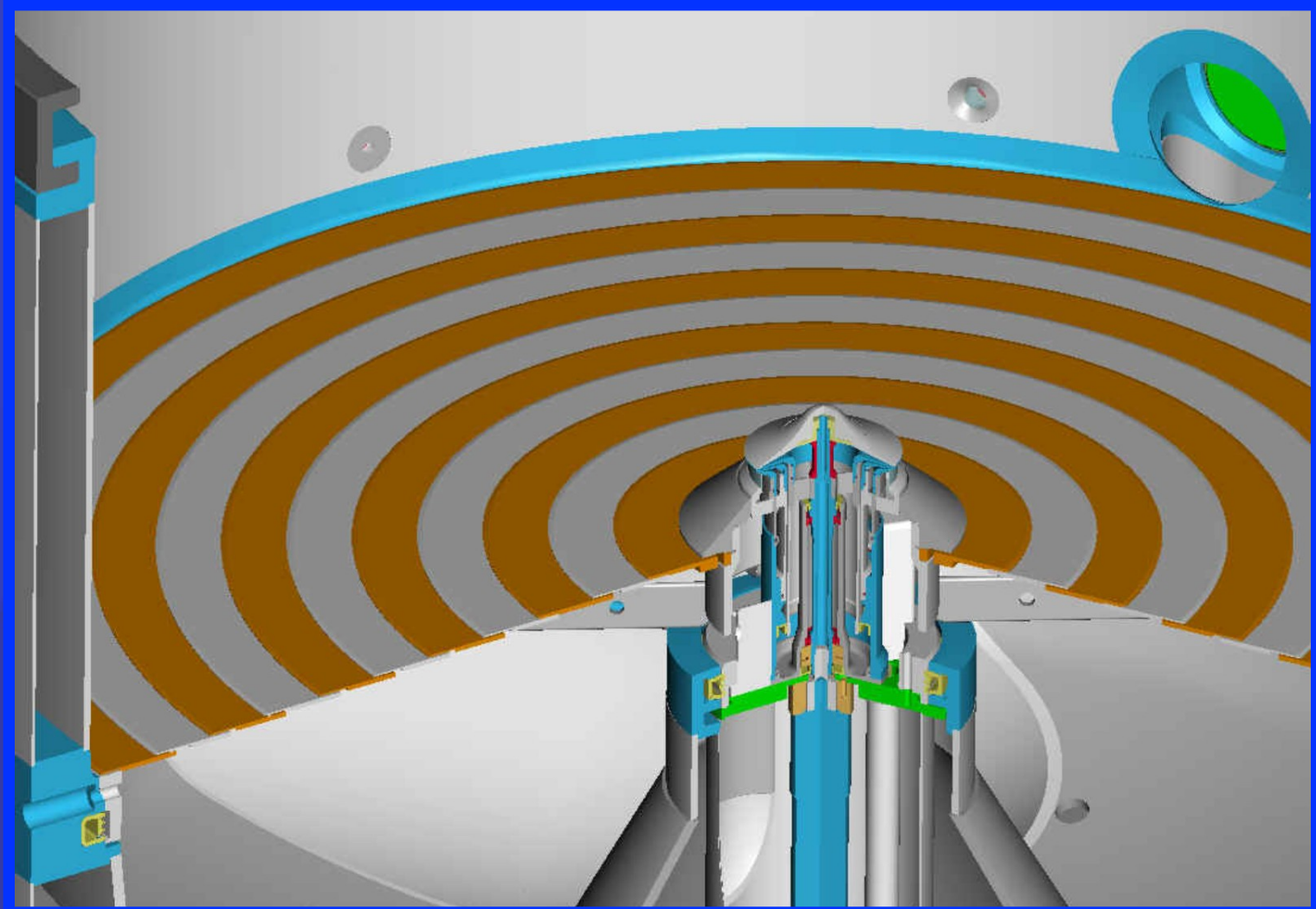


2件或3件构造喷嘴

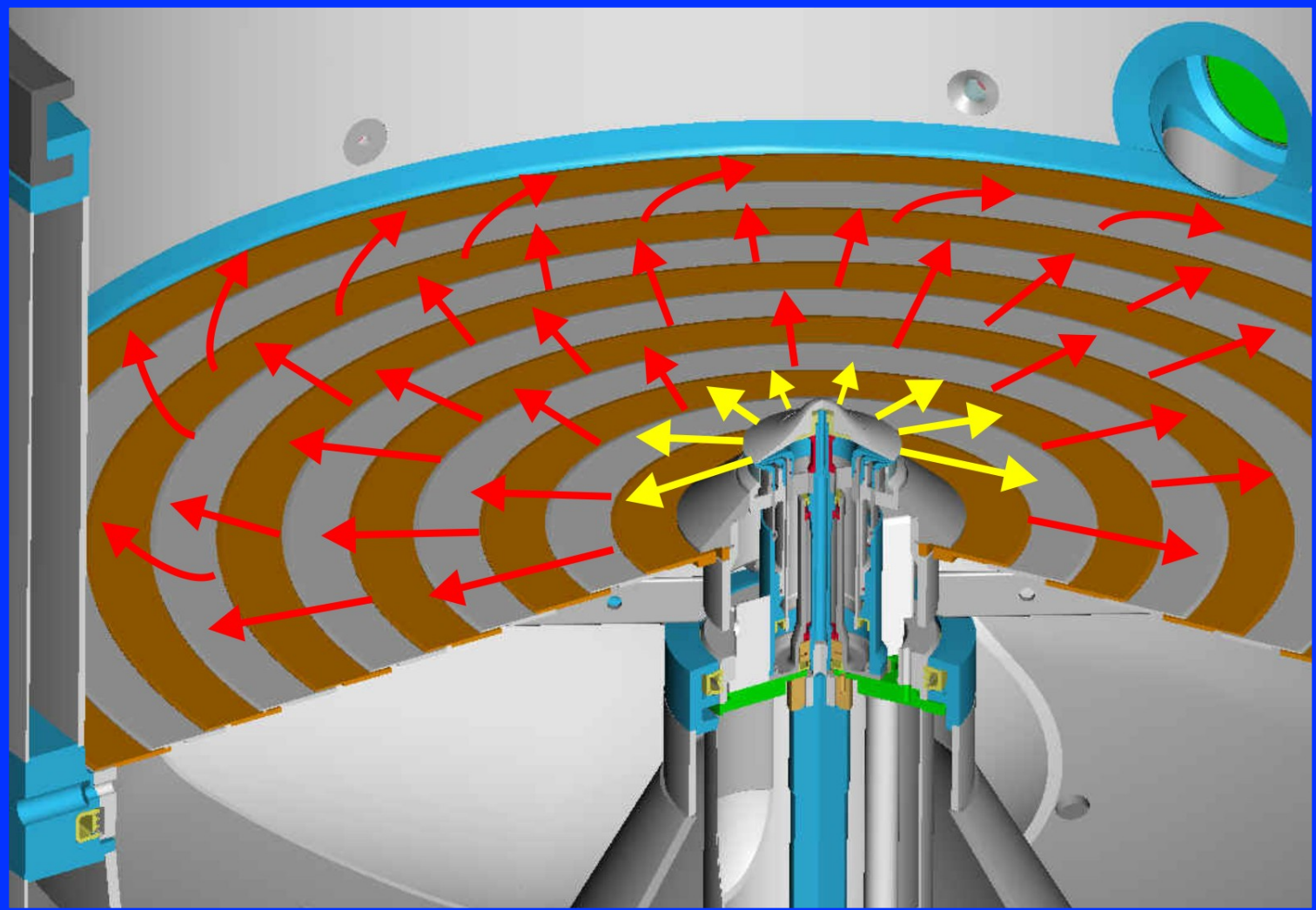
环形喷液系统



底盘和喷液系统组合



喷液和进风示意



ROTOJET 实验型和中试型喷嘴



IRN 10



IRN 20

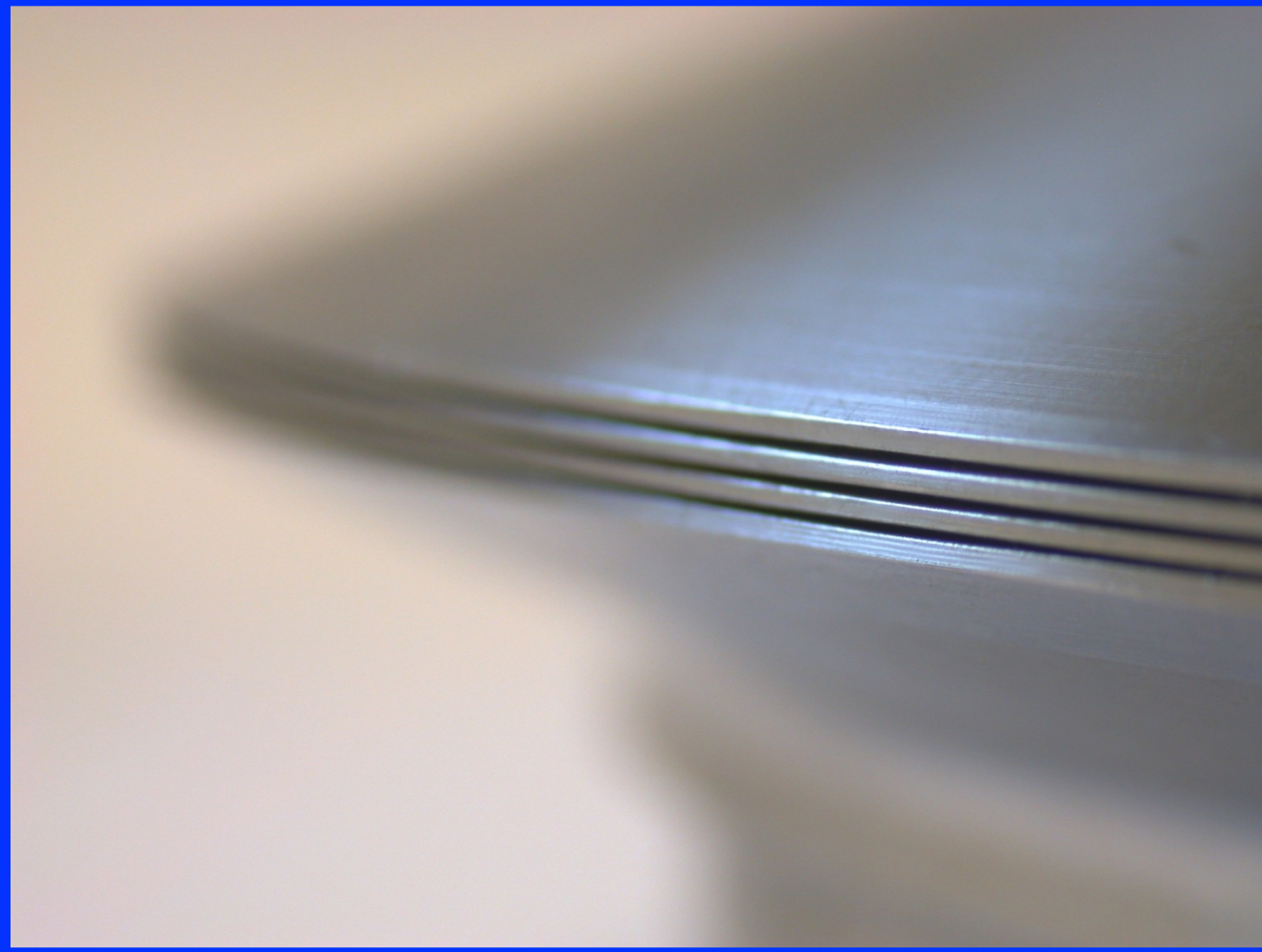
ROTOJET生产规模型喷嘴



IRN 50

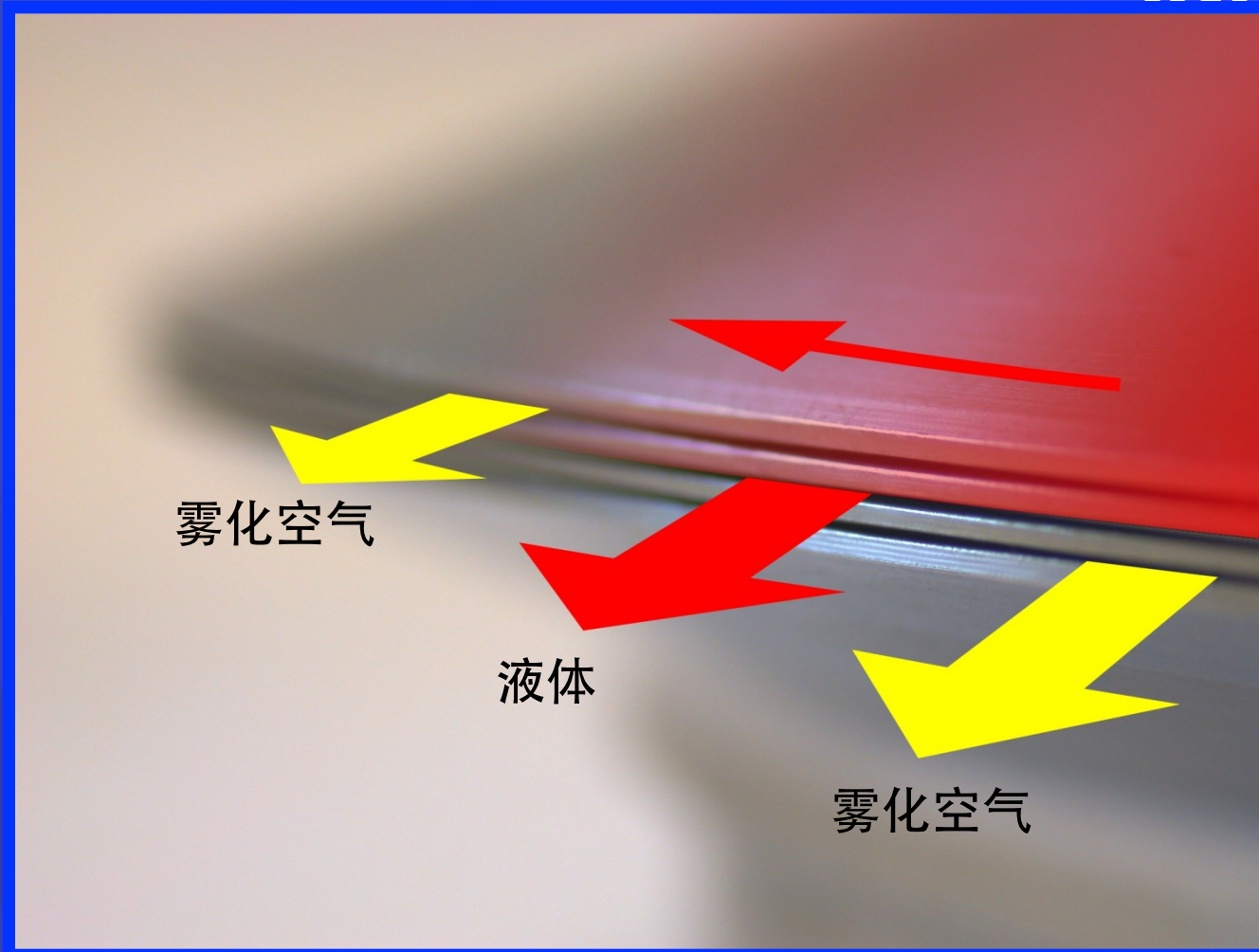


IRN 125



喷液环细节

ROTOJET喷嘴



雾化空气

液体

雾化空气

喷液环细节

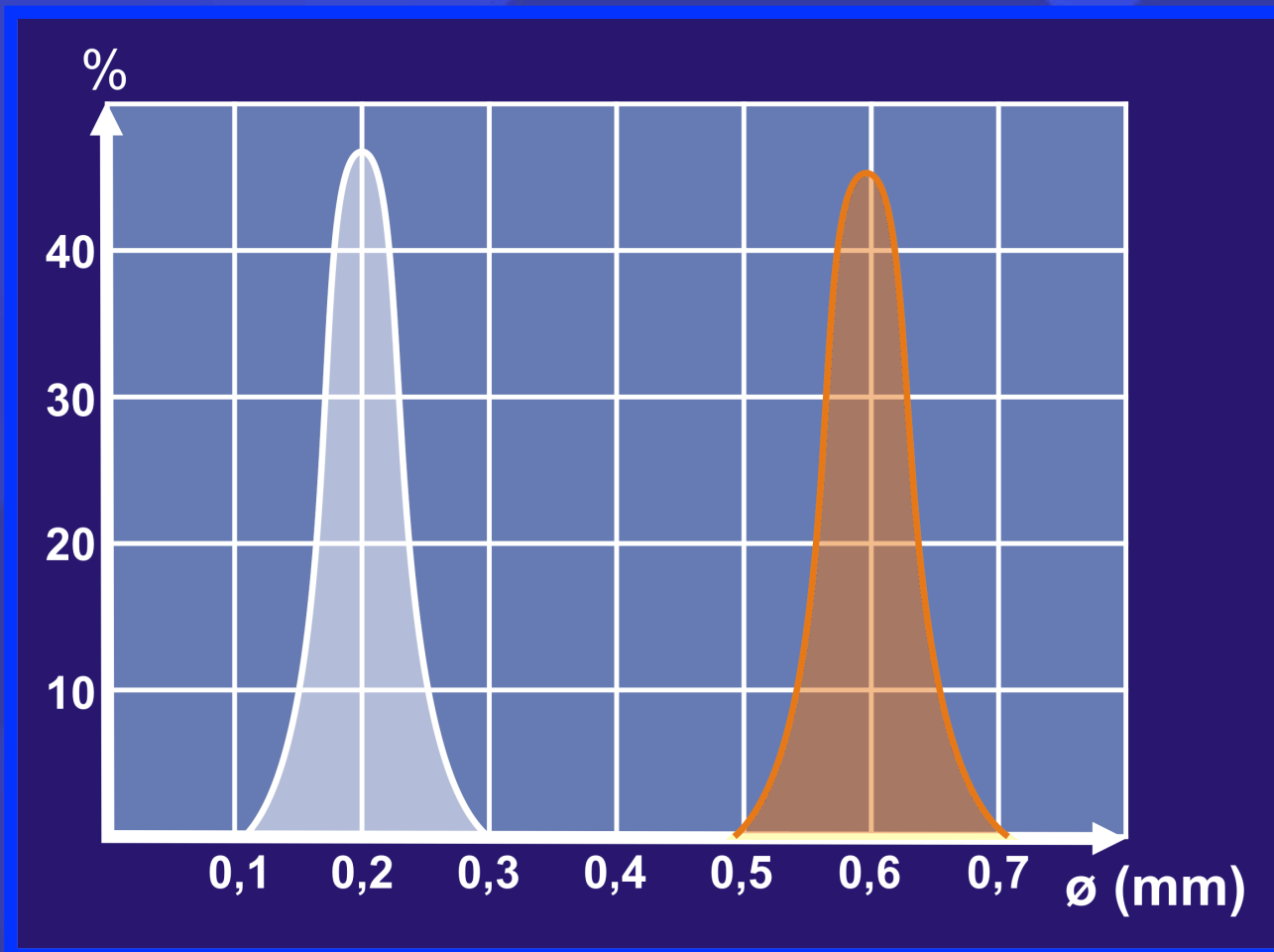
ROTOJET喷嘴

工艺个例：



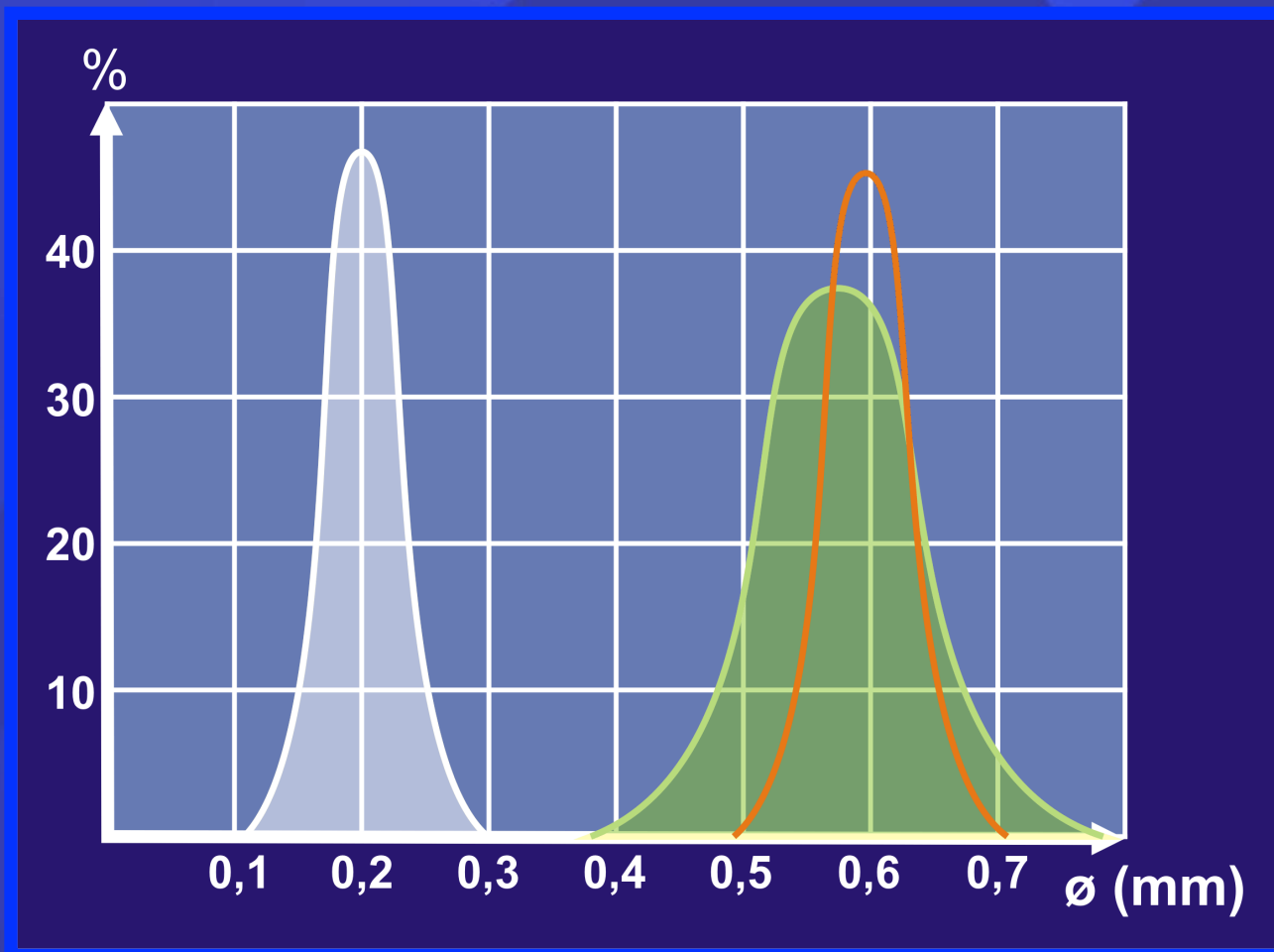
INNOJET Ventilus IEV 800生产的微丸包衣

粒径分布：



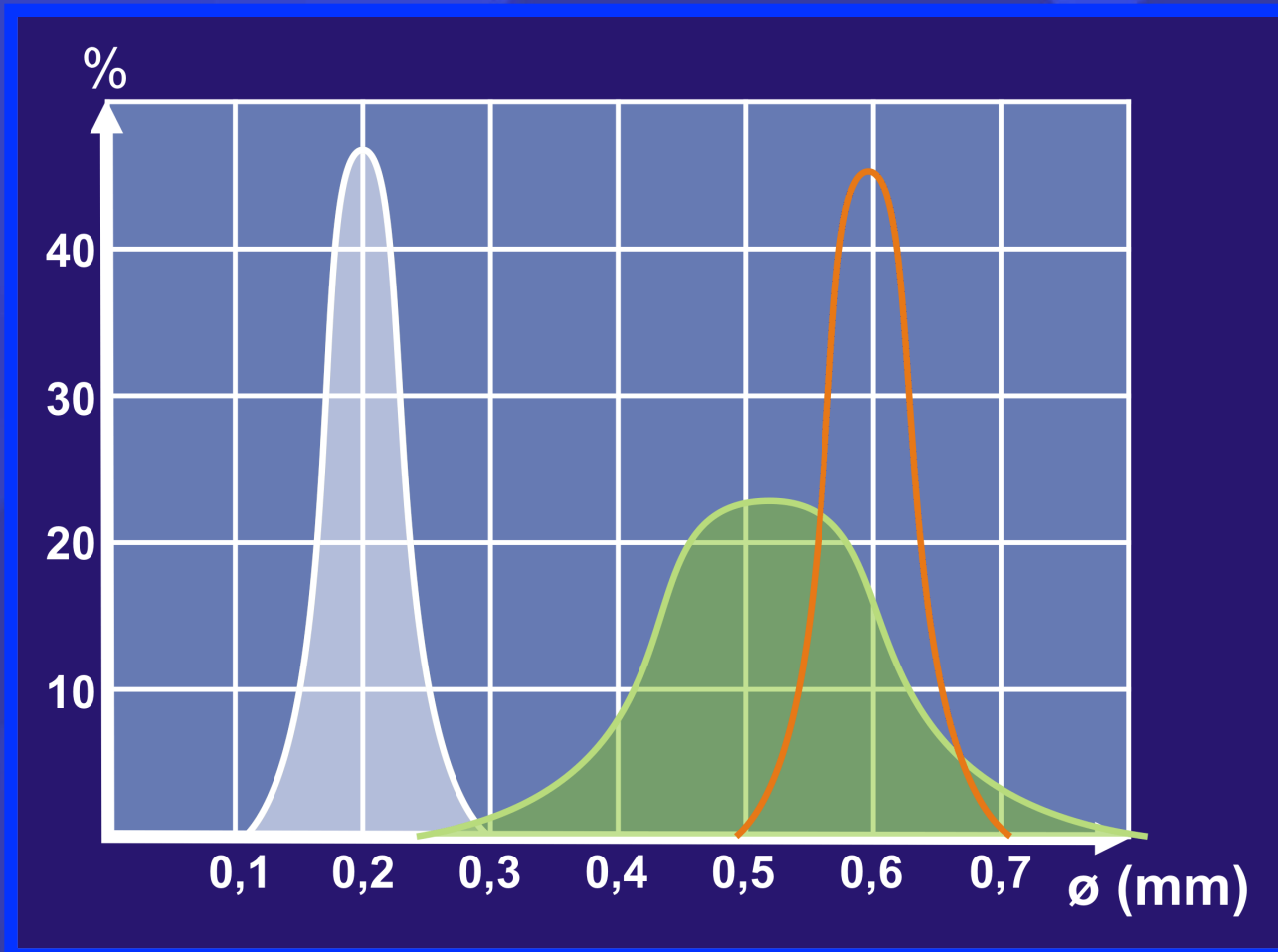
INNOJET Ventilus IEV 800 (生产实际分析结果)

粒径分布：



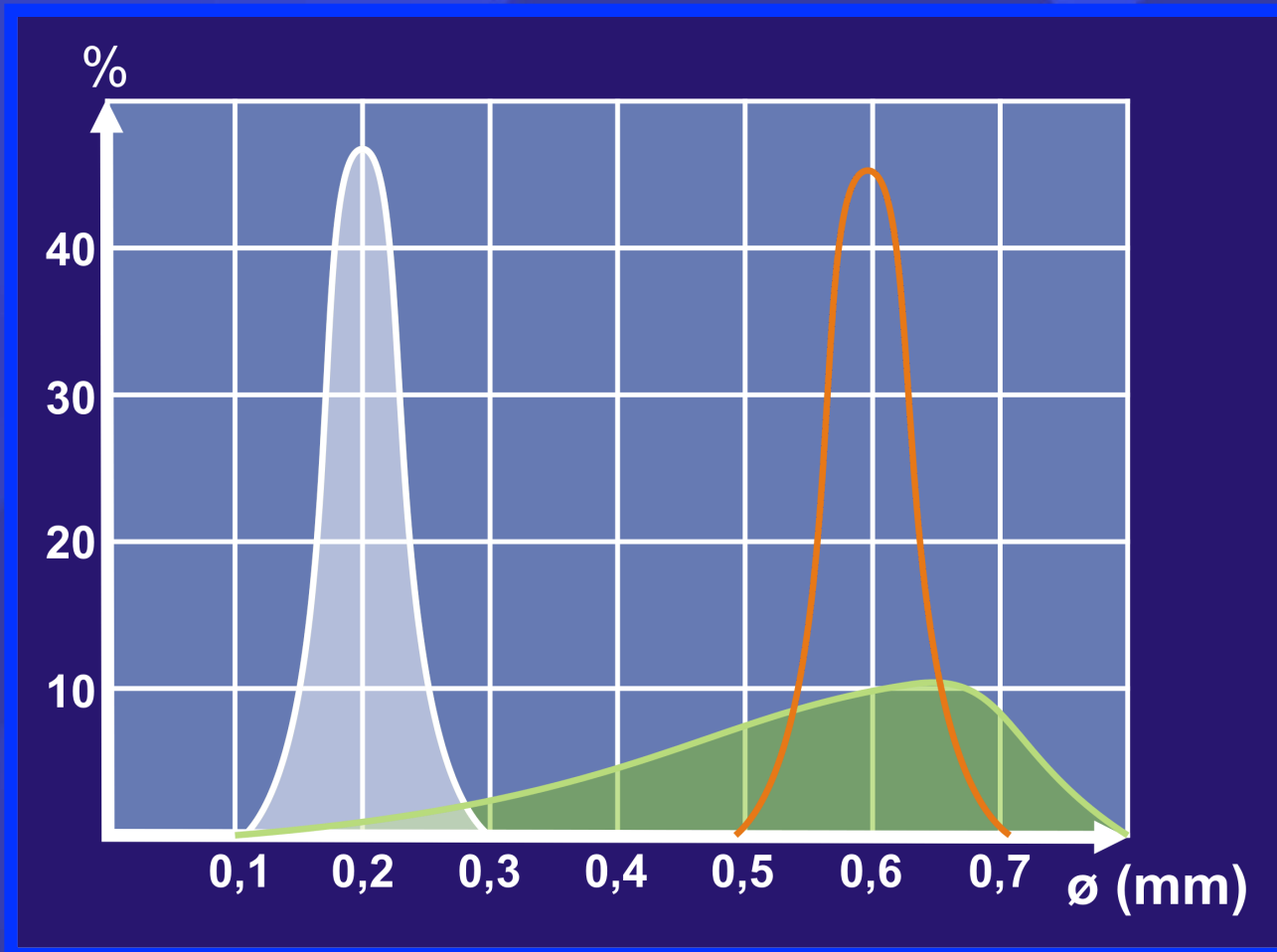
Wurster底喷实验型

粒径分布：



Wurster底喷放大试产

粒径分布：



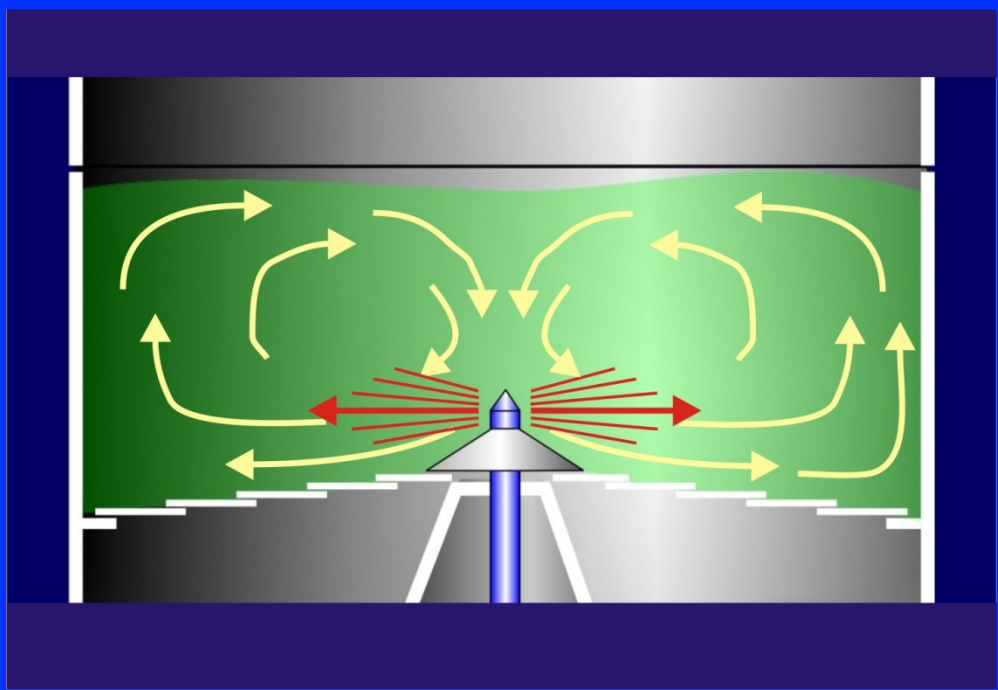
顶喷流化床制粒机FBG

热动力分析

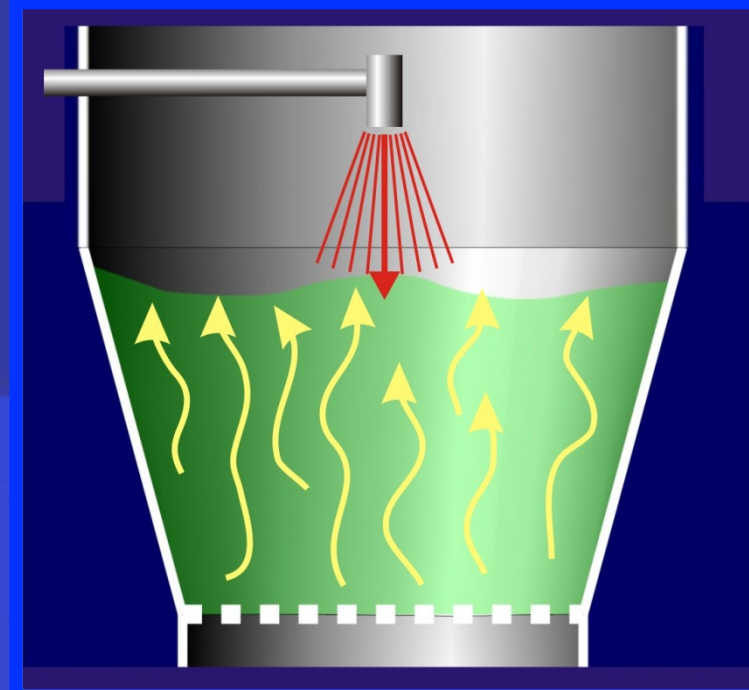
物料运动，喷液技术与均匀性之间的关系

不同喷液系统性能和影响分析

底喷 - 顶喷:



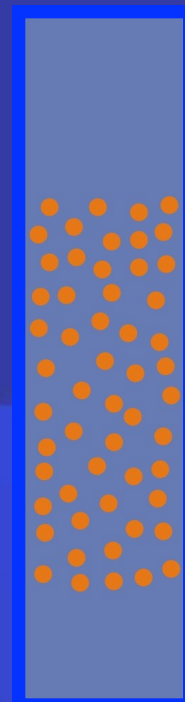
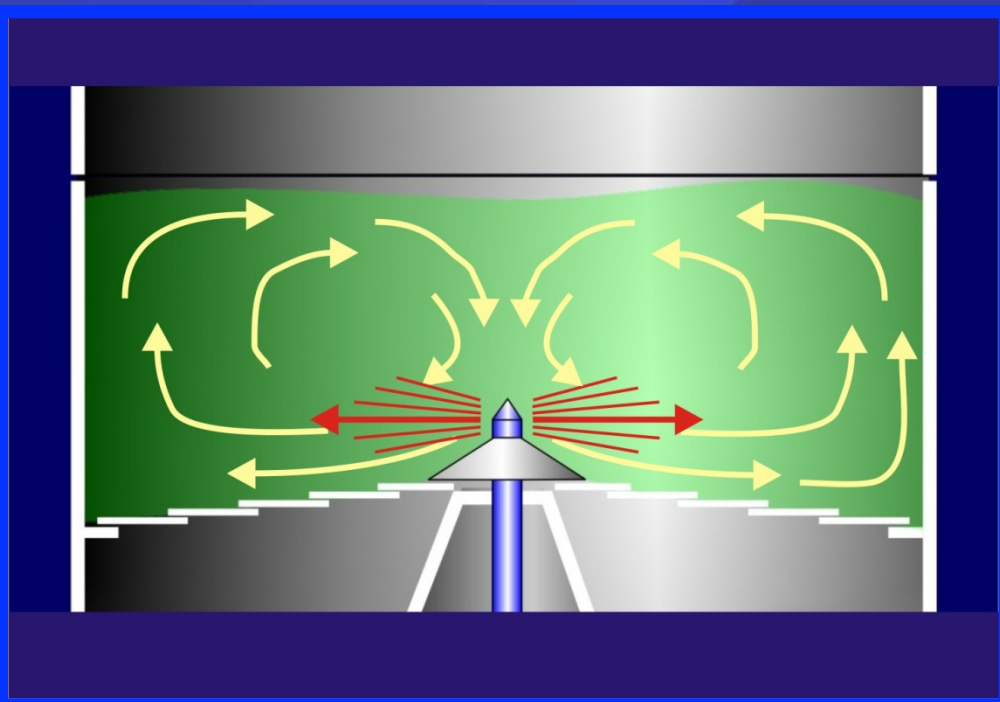
ROTOJET底喷系统



顶喷系统

不同喷液系统性能和影响分析

底喷 - 顶喷:

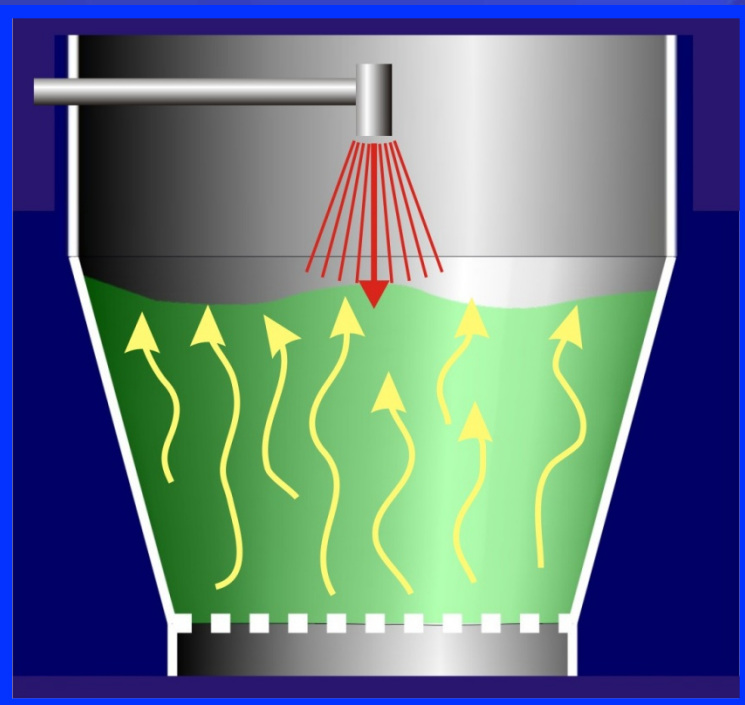


ROTOJET底喷系统

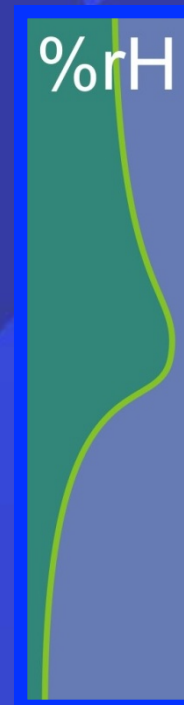
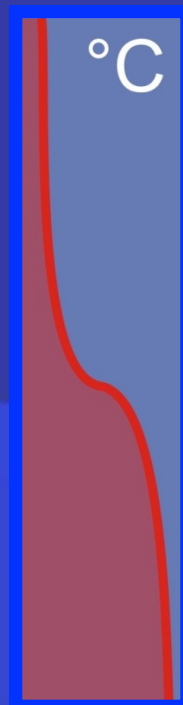
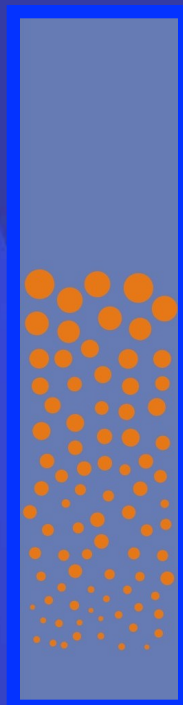
颗粒在整批物料中均匀分布
▶ 温度和湿度是均匀的

不同喷液系统性能和影响分析

底喷 - 顶喷:



顶喷系统



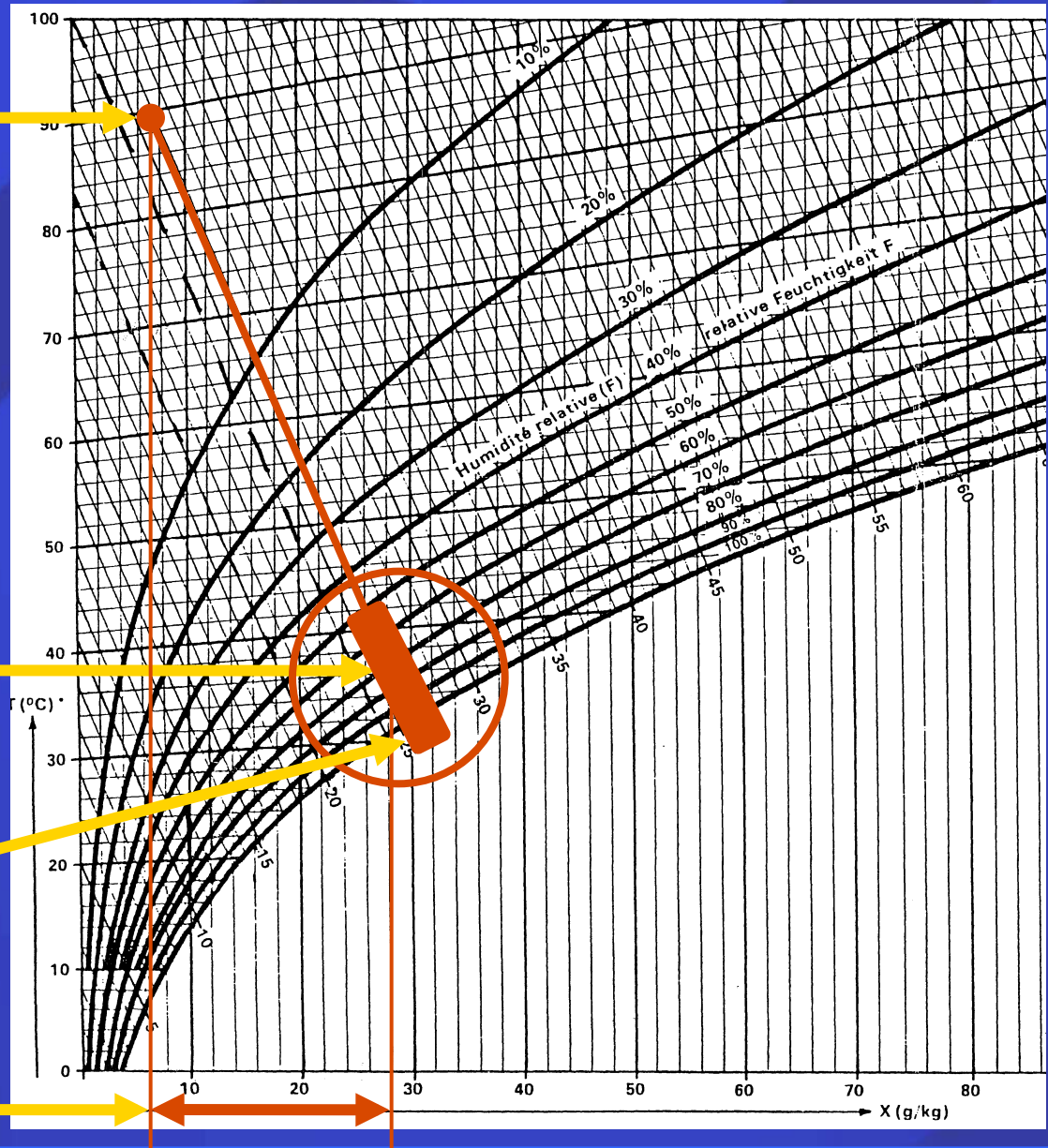
- 颗粒自下而上非均匀分布
- ▶ 湿度在物料床顶面呈峰值

进风

排风

露点

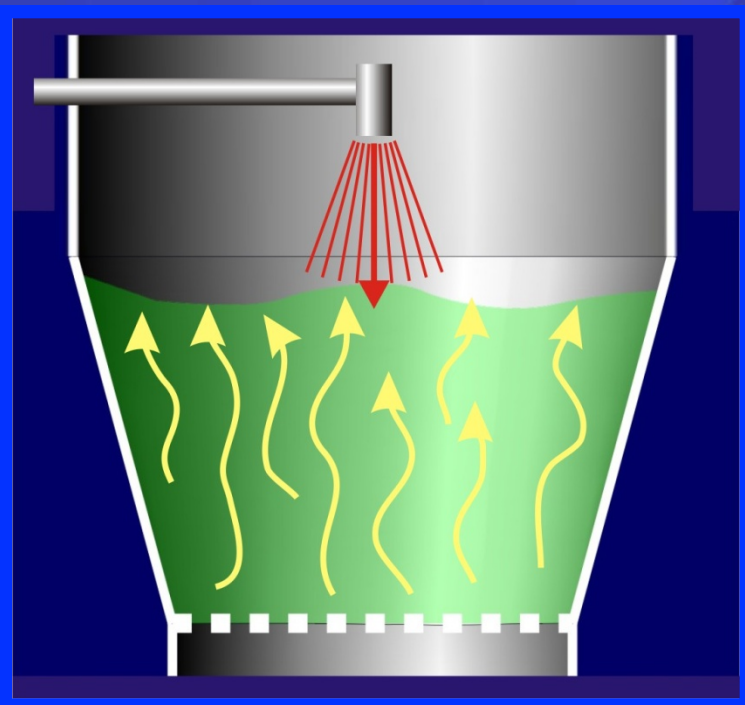
喷液率



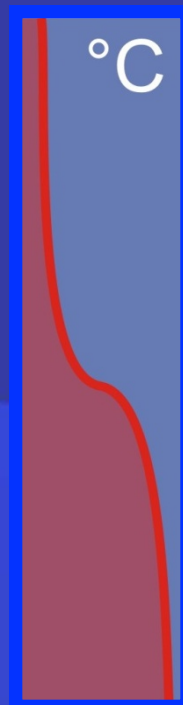
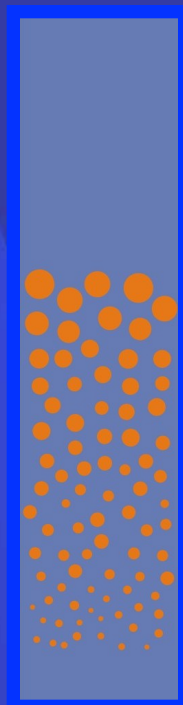
Mollier h-x diagram:
湿度-温度-能量图

不同喷液系统性能和影响分析

底喷 - 顶喷:



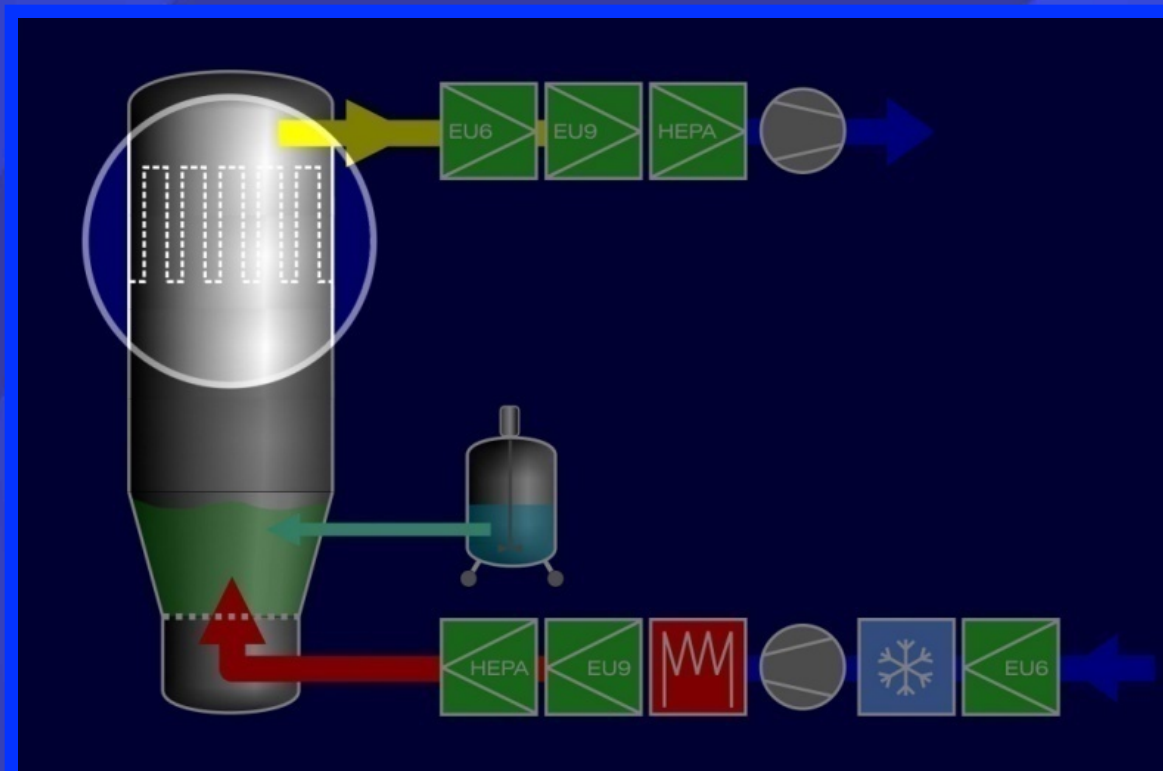
顶喷系统



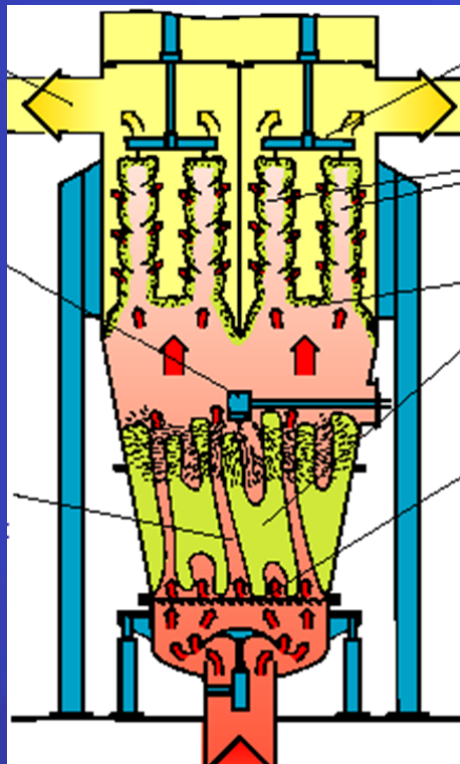
接近露点!

▶ 结块现象较严重

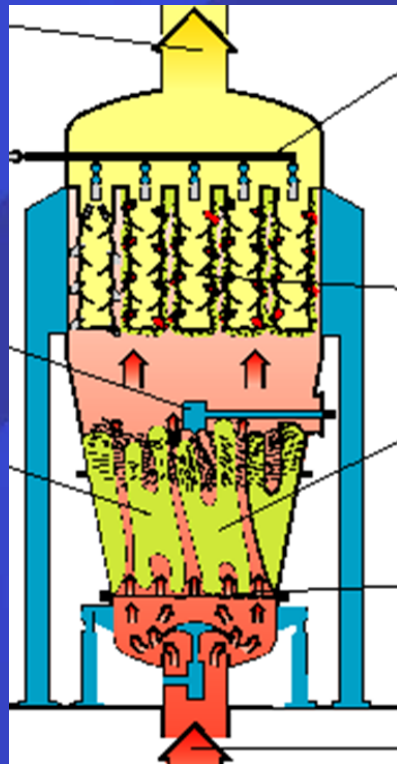
3. 除尘及物料粉尘回收系统



除尘过滤器



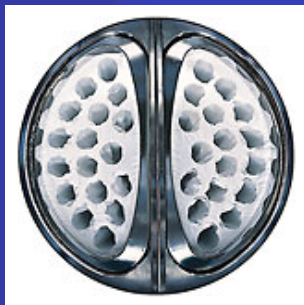
双振动式除尘过滤器



压缩空气反吹过滤器



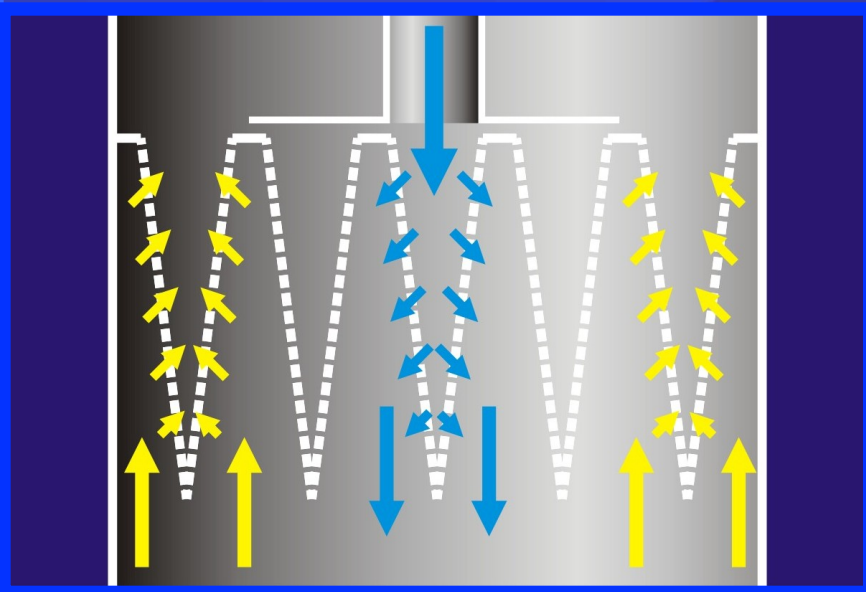
进风反吹过滤器



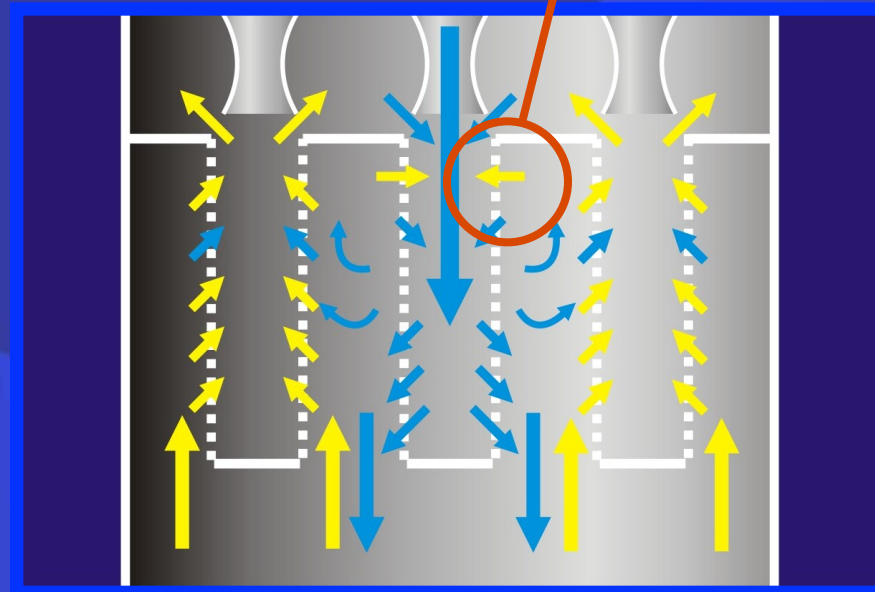
INNOJET SEPAJET除尘过滤系统和传统除尘过滤系统性能分析：

反吹除尘：

■ 排风
■ 洁净反吹空气



SEPAJET过滤器靠恒定气流反吹除尘

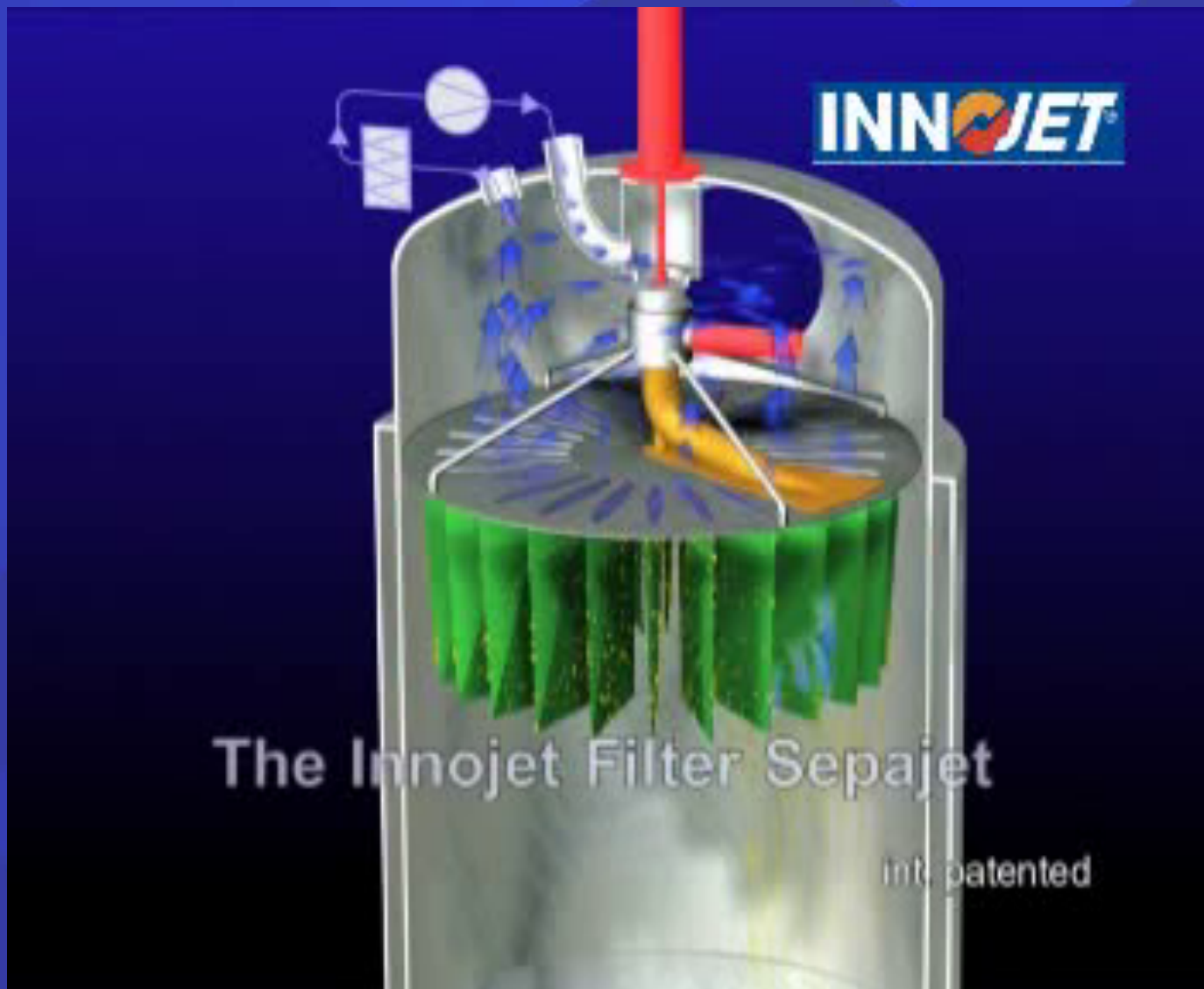


桶形过滤器靠脉冲压缩空气反吹除尘

脉冲压缩空气反吹使细粉被周围的过滤器吸附
▶ 始终有细粉逗留在过滤器上

INNOJET SEPAJET除尘过滤器

INNOJET[®]
HERBERT HÜTTLIN



SEPAJET 过滤器系统



INNOJET Filter SEPAJET

Various filter media



Stainless-steel
carrier gasket



Stainless-steel carrier
gasket with textile filter
sock

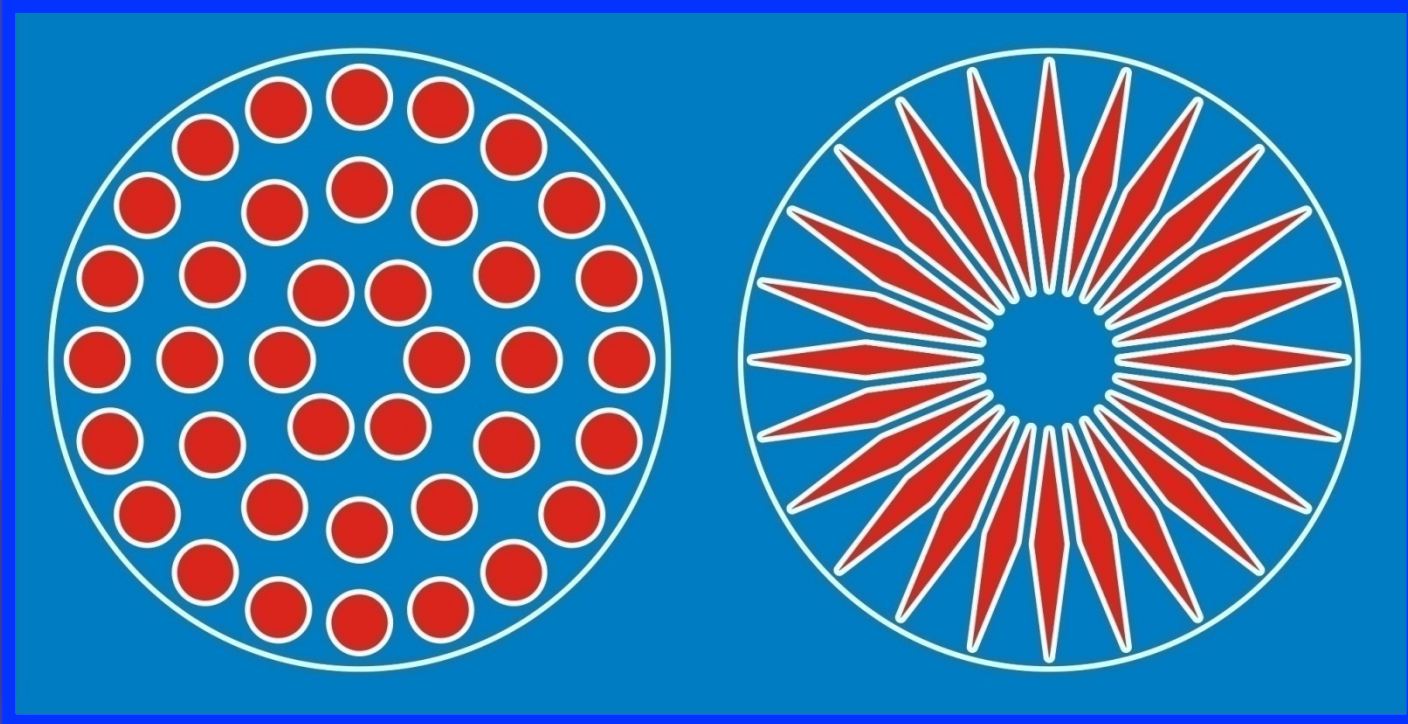


Filter bag complete

INNOJET SEPAJET除尘过滤系统和传统除尘过滤系统性能分析：

过滤面积

(过滤器直径：1000 mm / 过滤器高：800 mm)

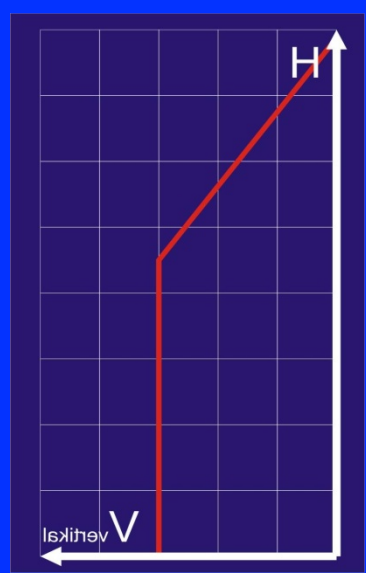
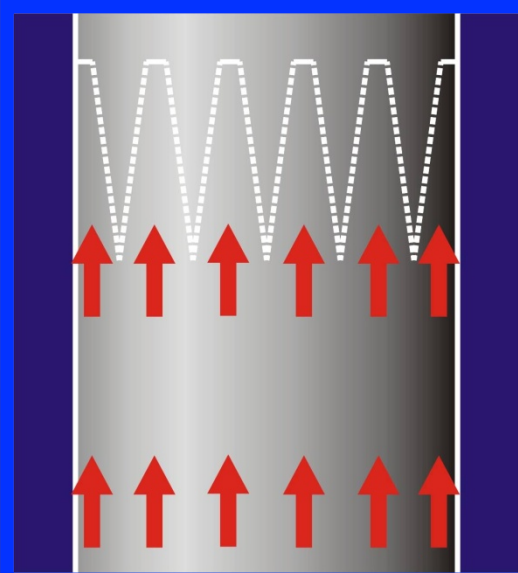


桶形过滤布袋
表面积：9,5 m²

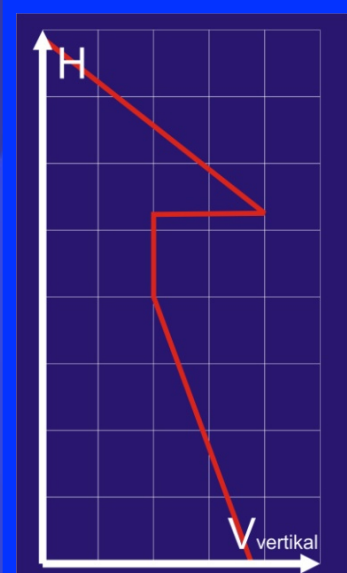
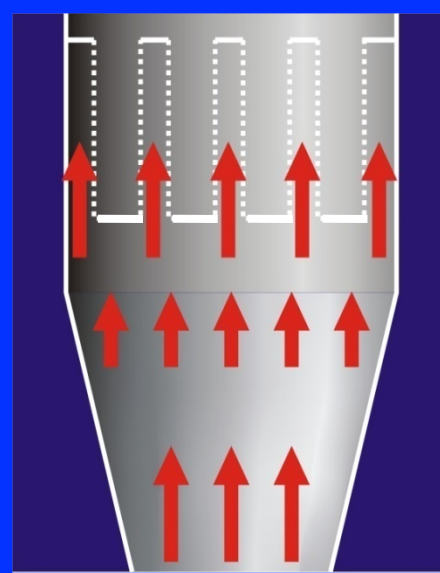
SEPAJET 过滤器
表面积：15,5 m²

INNOJET SEPAJET除尘过滤系统和传统除尘过滤系统性能分析：

气流形态：



SEPAJET 除尘过滤系统和圆柱形
物料容器



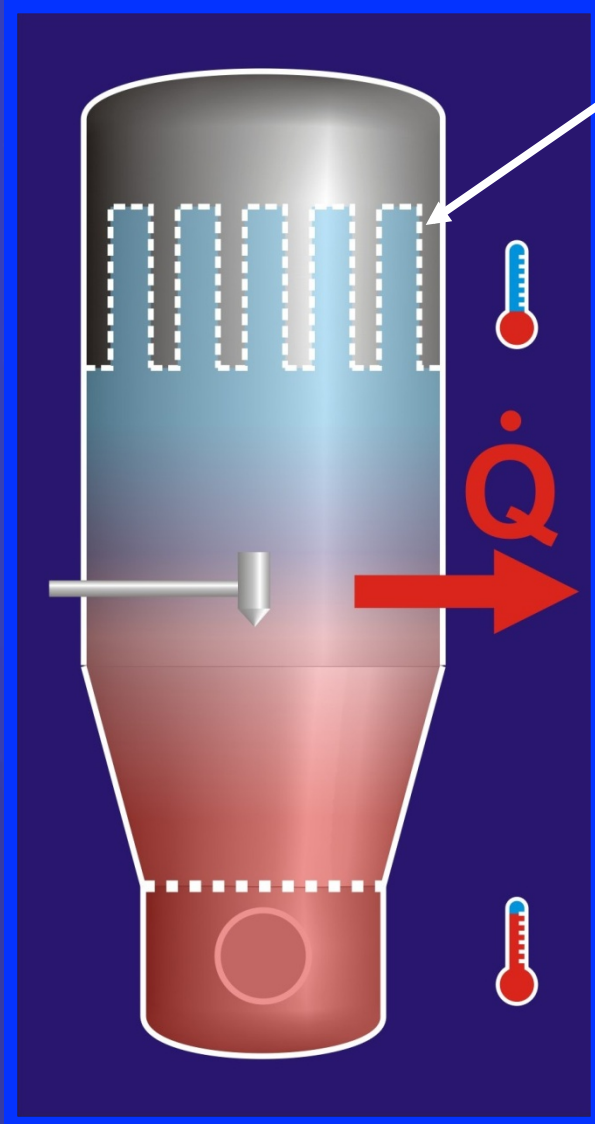
传统除尘过滤系统和锥形
物料容器

气流在进入传统过滤系统过滤器截面时会被加速，使轻细物料积存在过滤器上。

Ventilus标准设备设计 - 双层机壁:

INNOCET[®]
HERBERT HÜTTLIN

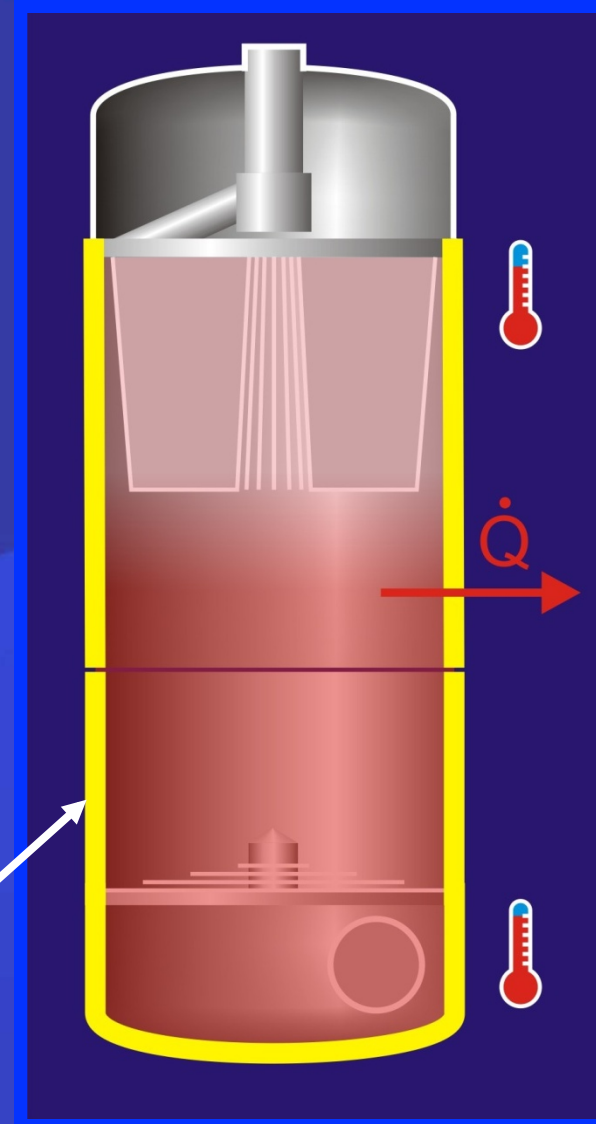
传统设计



温度可低至露点
以下!

物料容易粘在机
壁和过滤器表面
上

Ventilus设计



热和噪音绝缘

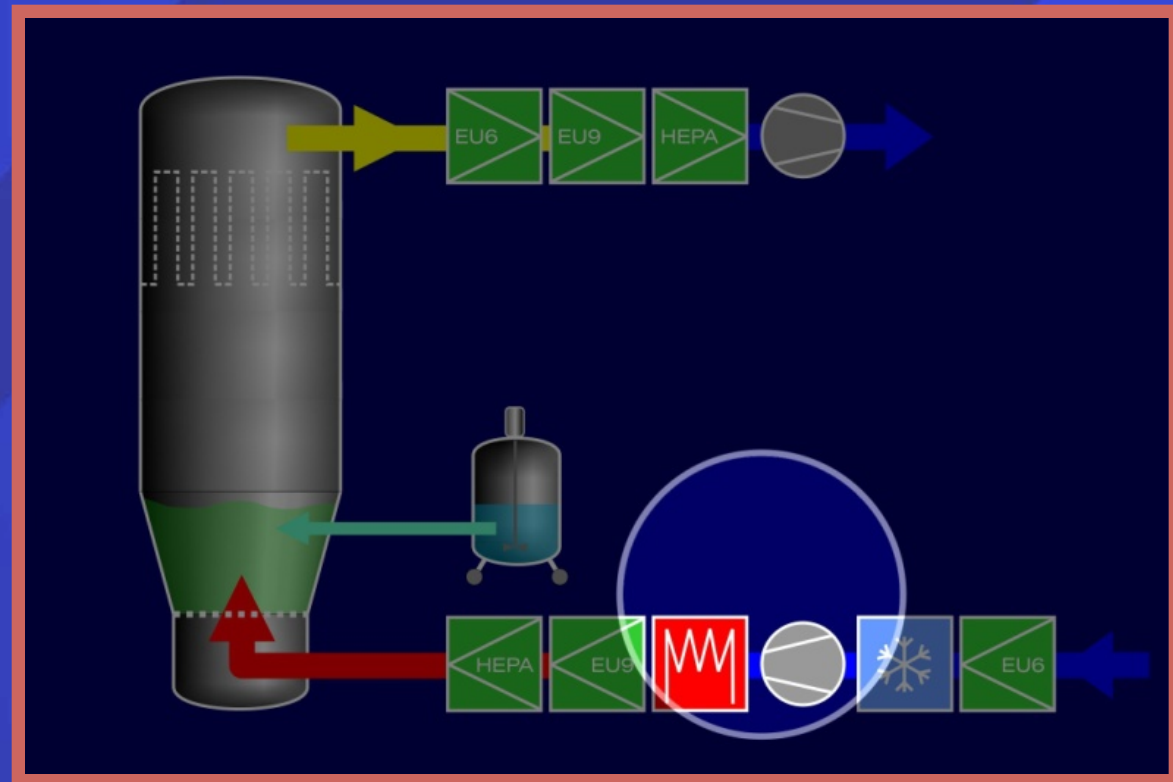
INNOJET VENTILUS 800

INNOJET[®]
HERBERT HÜTTLIN



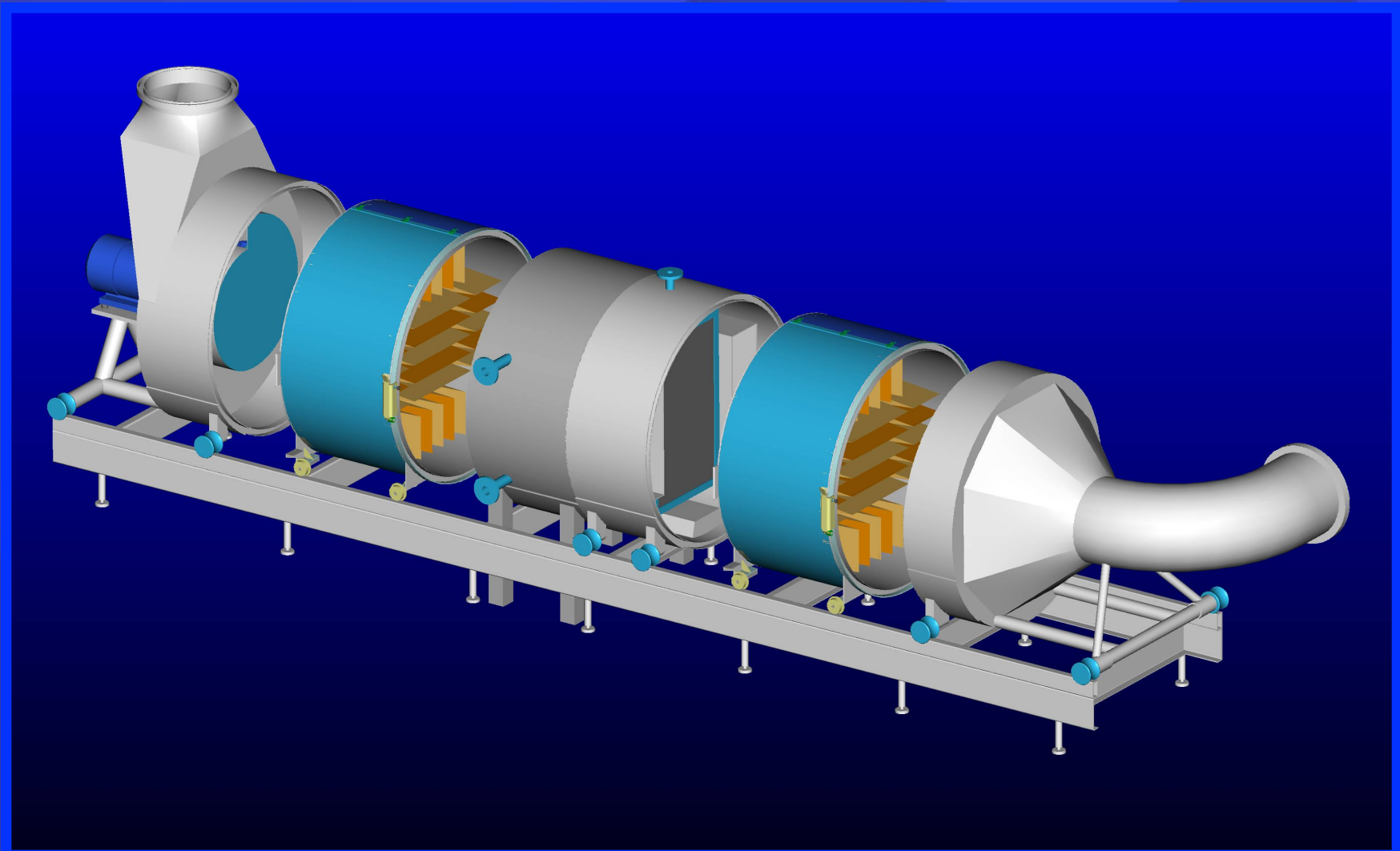
Zuluft Monobloc Systeme TUBUS

Inlet Air Monobloc systems TUBUS



INNOJET Monobloc TUBUS Type IMT

INNOJET[®]
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INNOJET Monobloc TUBUS

Inlet air handling system – high hygienic design



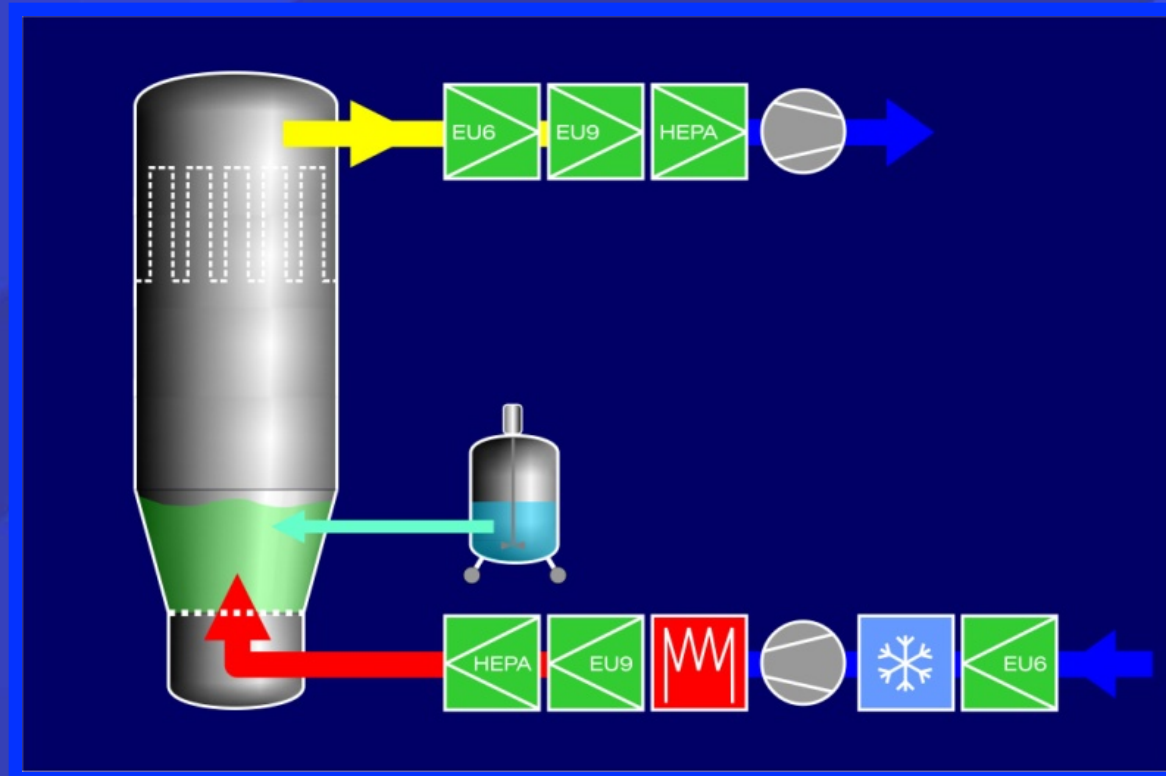
INNOJET Monobloc TUBUS

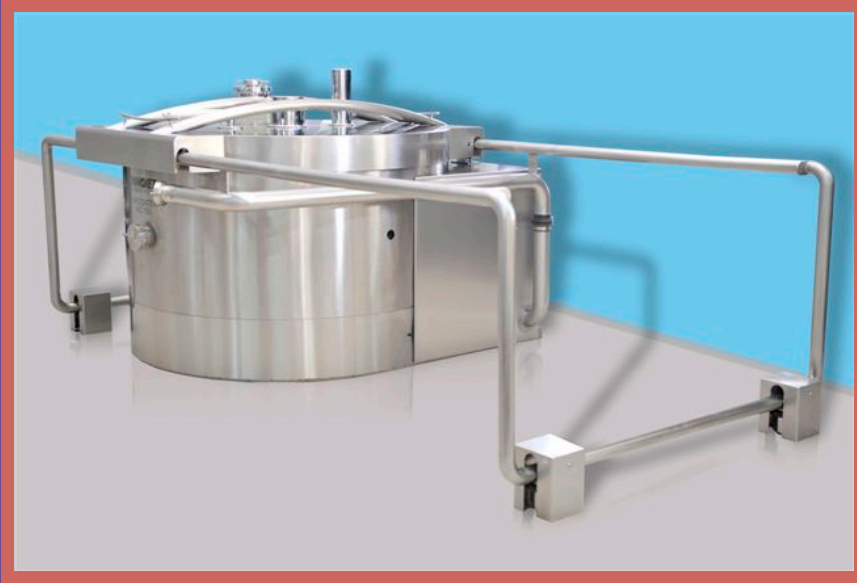
Inlet air handling system – high hygienic design



INNOJET AirCoater – Effizientes Filmcoating

INNOJET AirCoater – efficient filmcoating





Side view



Machine closed



Standard operation mode



Discharging mode



AirCoater IAC 20 - Tablet movement



AirCoater IAC 20 mixing >>> Start



AirCoater IAC 20 - Pellet movement

INNOJET AirCoater IAC 150 - Produktionsmaßstab



INNOJET AirCoater IAC 150 - production scale

Beschichtung von Partikeln
und Tabletten >2mm
bis max. 30mm, 150kg

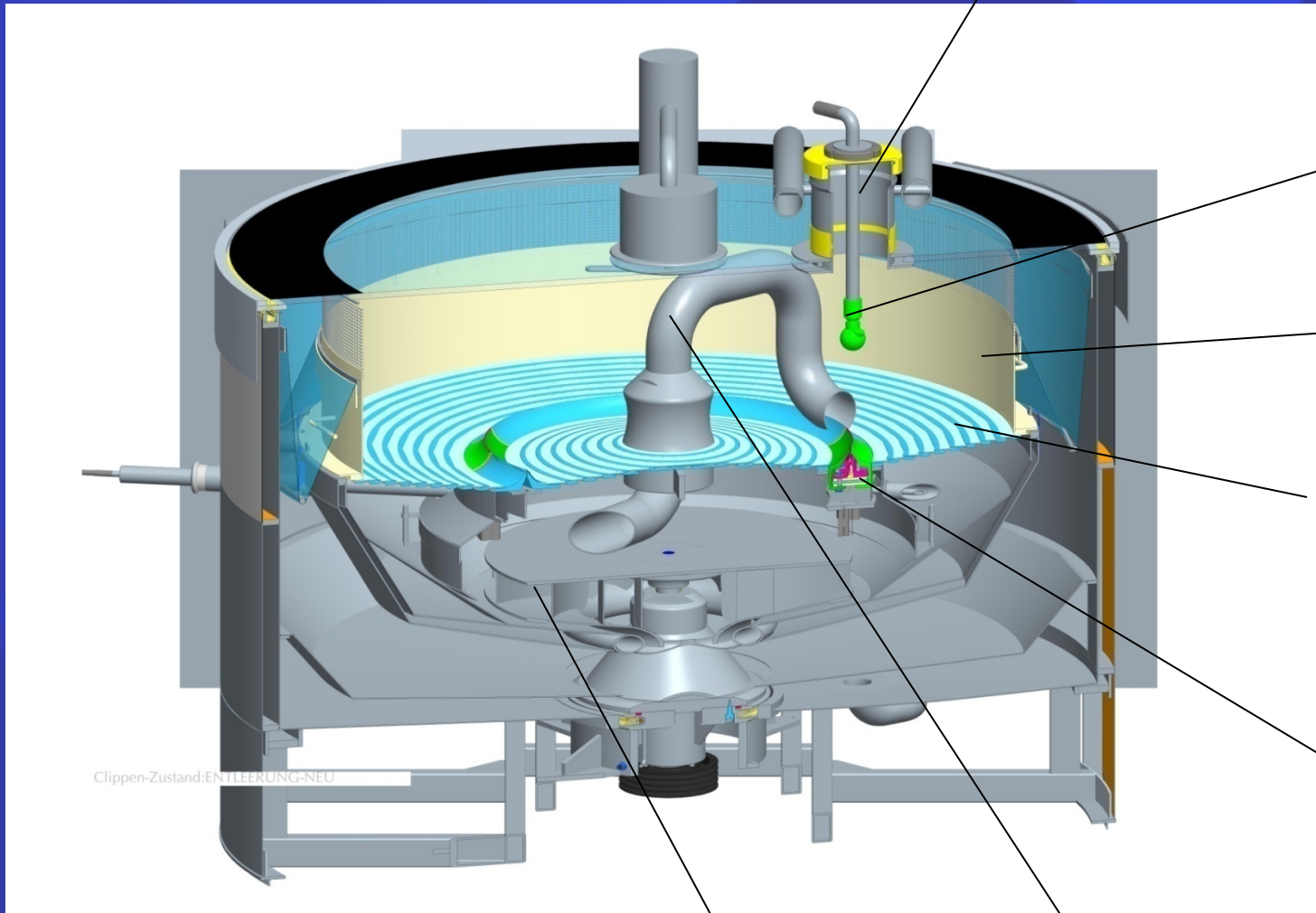
Coating of particles
and tablets 包衣范围>最小
2mm up to max. 最大30mm,
150kg



1.Preis: Innovativstes Produkt
"Pharmazeutische Technologie" ACHEMA 2009
1st.Price: Most innovative product
"Pharmaceutical Technology" ACHEMA 2009

IAC 150
100 -150 kg

Filling by gravity



WIP Nozzle

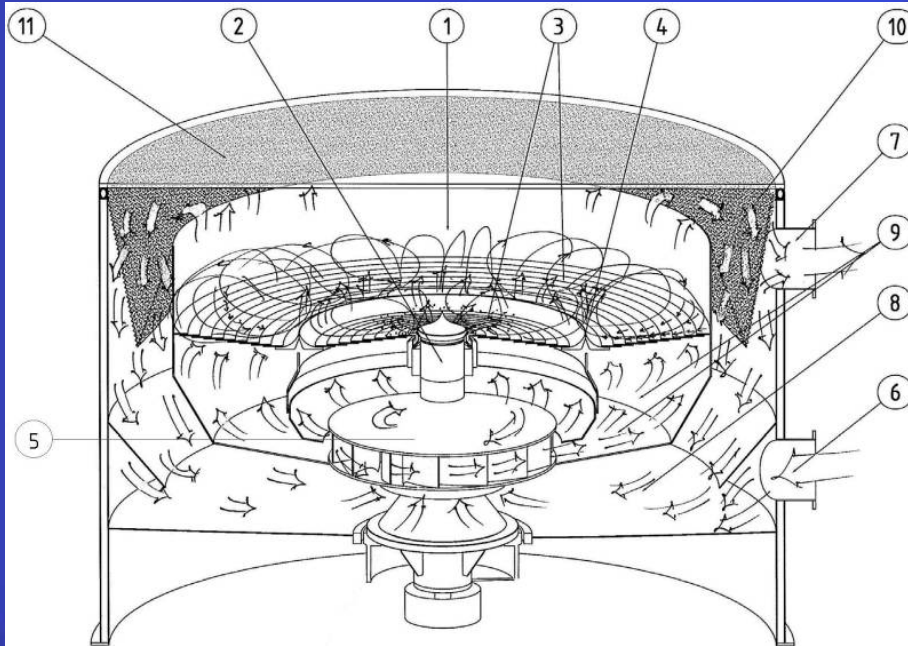
Product Container

Innojet AIRCRAFT BOOSTER

INNOJET LINEA Nozzle

Product mover

Discharge suction tube



1. Product-container / with housing
2. Spray nozzle *Lineajet*[®]
3. *Booster Vulcano*[®]
4. Product vertical break up zone on the half-booster-diameter
5. Ventilator-wheel with bearing and motor
6. Process-fresh-air-inlet (conditioned)
7. Process-fresh-air-outlet
8. Process-air-fusion-zone (with fresh-air-circulation-air fusion-zone)
9. Process-air-chamber (Circulating-air and conditioned fresh-air)
10. Circulating air pre-filter (V-ring)
11. Horizontally movable safety-industry-glass-cover (transparent)





Pneumatische Entleerung über ein zentral
im AIRCRAFT Booster angeordnetes
Saugrohr

Pneumatical discharg via a rotating suction
tube arranged centrally in the AIRCRAFT
Booster.



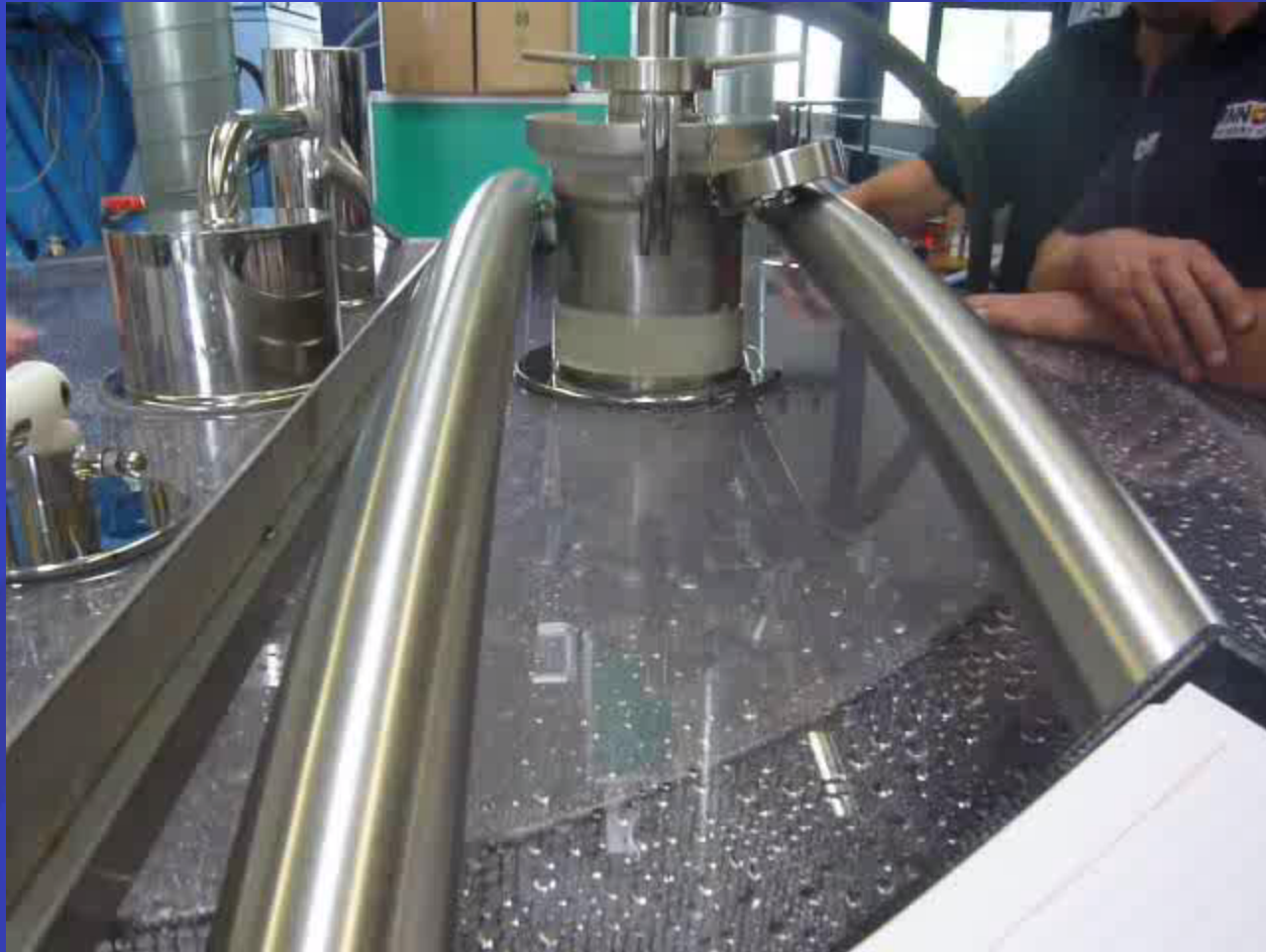
Entleersystem
Discharge System



INNOJET AirCoater A-150

Washing process

INNOJET[®]
HERBERT HÜTTLIN

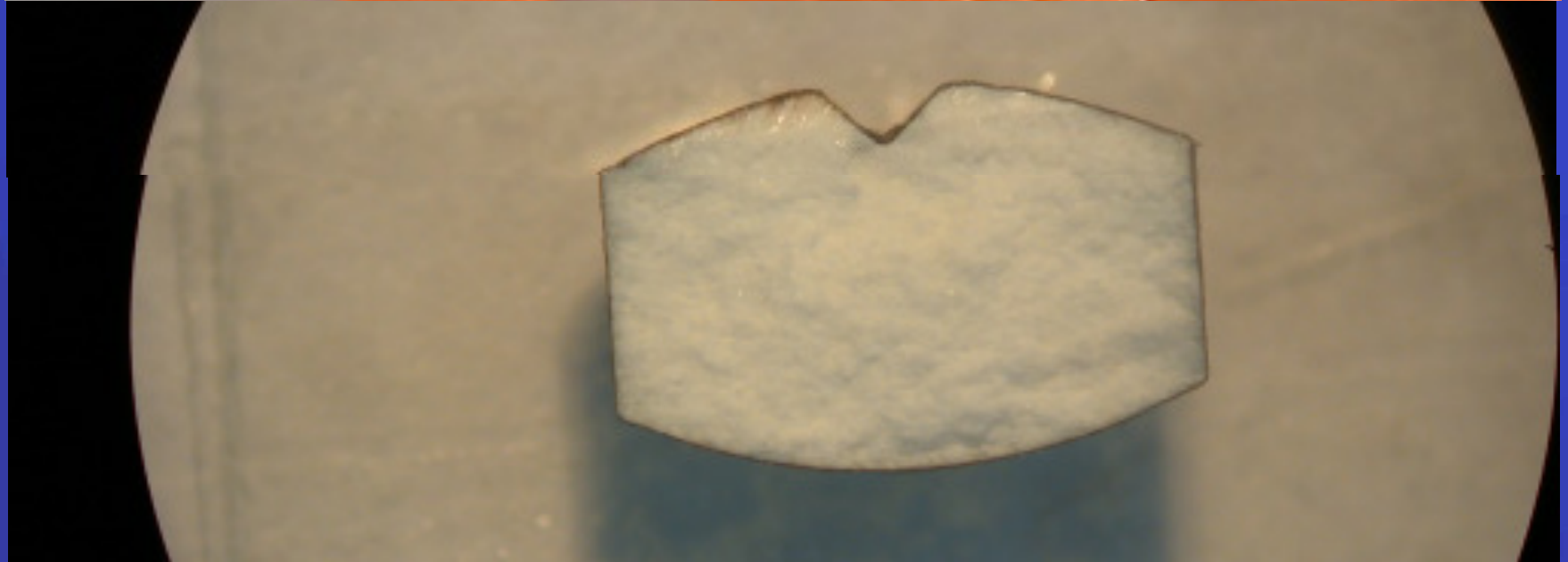


Cleaning with Washing-head



Performance datas IAC 150

Batch size 批量	150	kg	
Charging 投料	4	min	
3% coating Opadry aquaous 包衣	45	min	
Discharging 出料	7	min	
WIP cleaning – drying 清洗干燥	25	min	
Total batch time 批处理时间	56	min	不含清洗时间
Total batch time 批处理时间	81	min	含清洗时间





Advantages of the Innojet AIRCOATER system

- Shorter process times (than in a pan or drum)
intensiv, homogenous product movement
high spray rates
high drying capacity
- No measurable and visible spray losses
under bed spray system
- Less friction – less abrasion
complete batch is fluidized - defined interstice between the particles
- Homogenous coating
spherical caps, edges, sides, printings

Produktbeispiele – Anlagengrößen

Product Samples – Plant Capacity

									
Powder / Crystals	Small Granules	Large Granules	Small Pellets	Large Pellets	Micro Tablets	Small Tablets	Large Tablets	Gelatine-Capsules	Special forms
2 - 20 µm	20 - 50 µm	50 - 200 µm	0,1 - 0,4 mm	0,4 - 1,2 mm	1,5 - 2,5 mm	3 - 7 mm	8 - 30 mm	10 - 30 mm	2 - 30 mm

Production size Equipment

Ventilus Fluid Bed Systems (IEV 100 - IEV 800)

Special edition

SEPAJET Filter required

AirCoater (IAC 50 - IAC 150)

Lab- and pilot size Equipment

Ventilus Laboratory system (IEV 1)

Ventilus Lab- and Pilot Scale Systems (IEV 2,5 - IEV 25)

Special edition

SEPAJET Filter required

Special edition

AirCoater (IAC 025 - IAC 20)

中国独家代理：中翔技术有限公司

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