







## WHO

### About us

We provide thermal products and services in all their forms, our management team have over 150 years experience.



WHO

WHAT

- Our products have been developed and mastered in the ceramics and metals industries for nearly 50 years.
- The 50 years experience has made the transsion to the new battery materials market easy
- Turnkey supplier of CAM / Anode projects





WHO

WHAT

WHERE



**HENGLI**  
Hengli Eletek Co.,Ltd

**Technical  
Memorandum of  
Understanding (MOU)**



**THERSER UK**



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling

# THE PROCESS



Raw material  
Powder  
discharge

Mixing slurry  
process

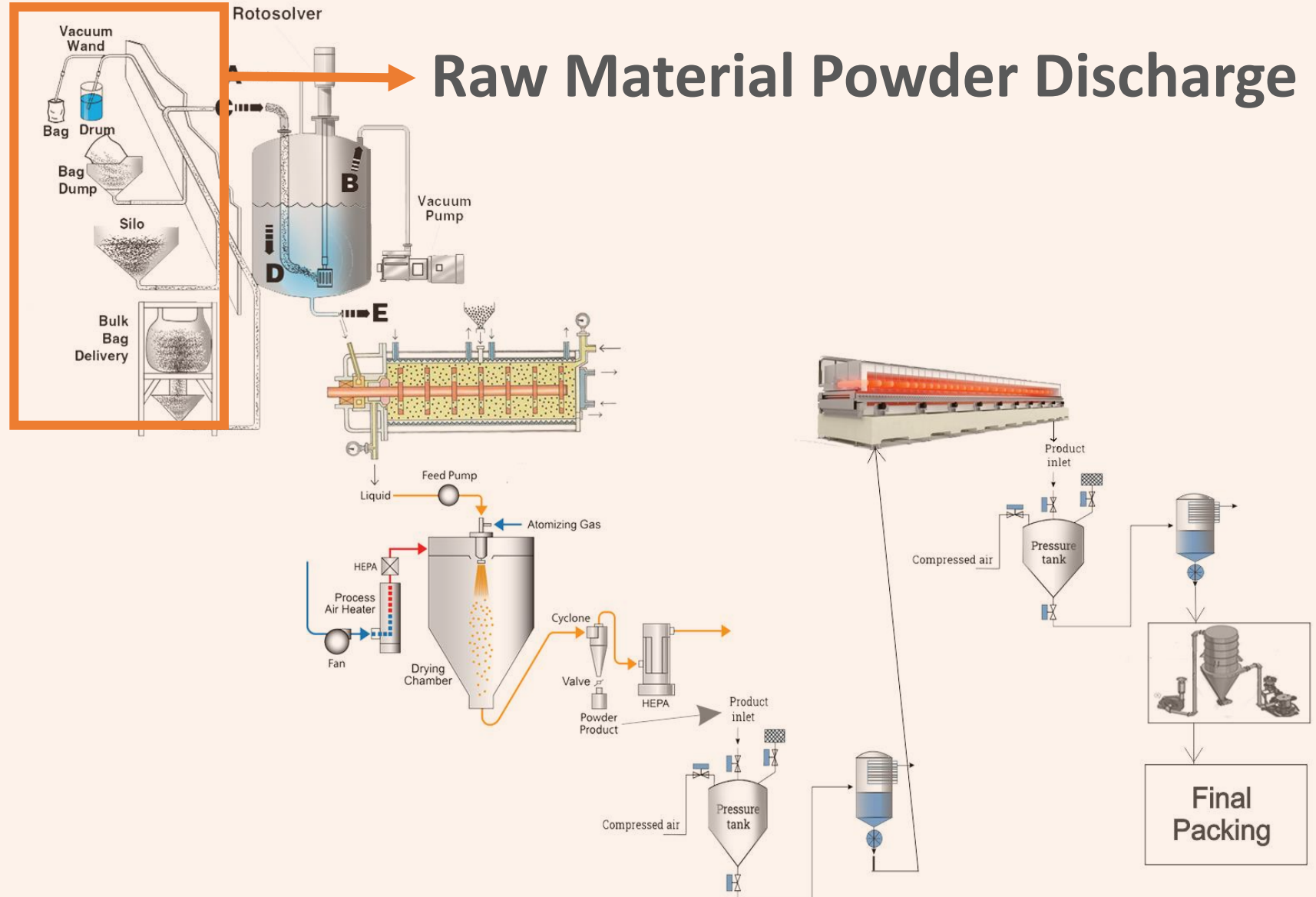
Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling





Raw material  
powder  
discharge

Mixing slurry  
process

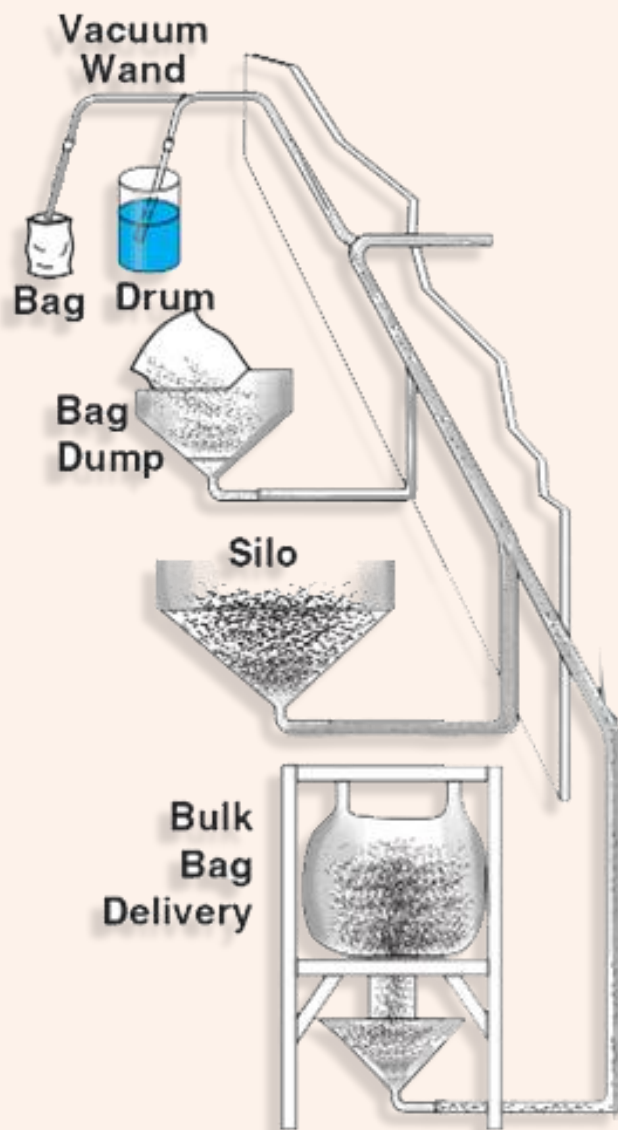
Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling



Raw material discharge

CAM

NMC

LFP

Sodium Iron

ANODE

Grafite pitch

Silicon-Carb



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

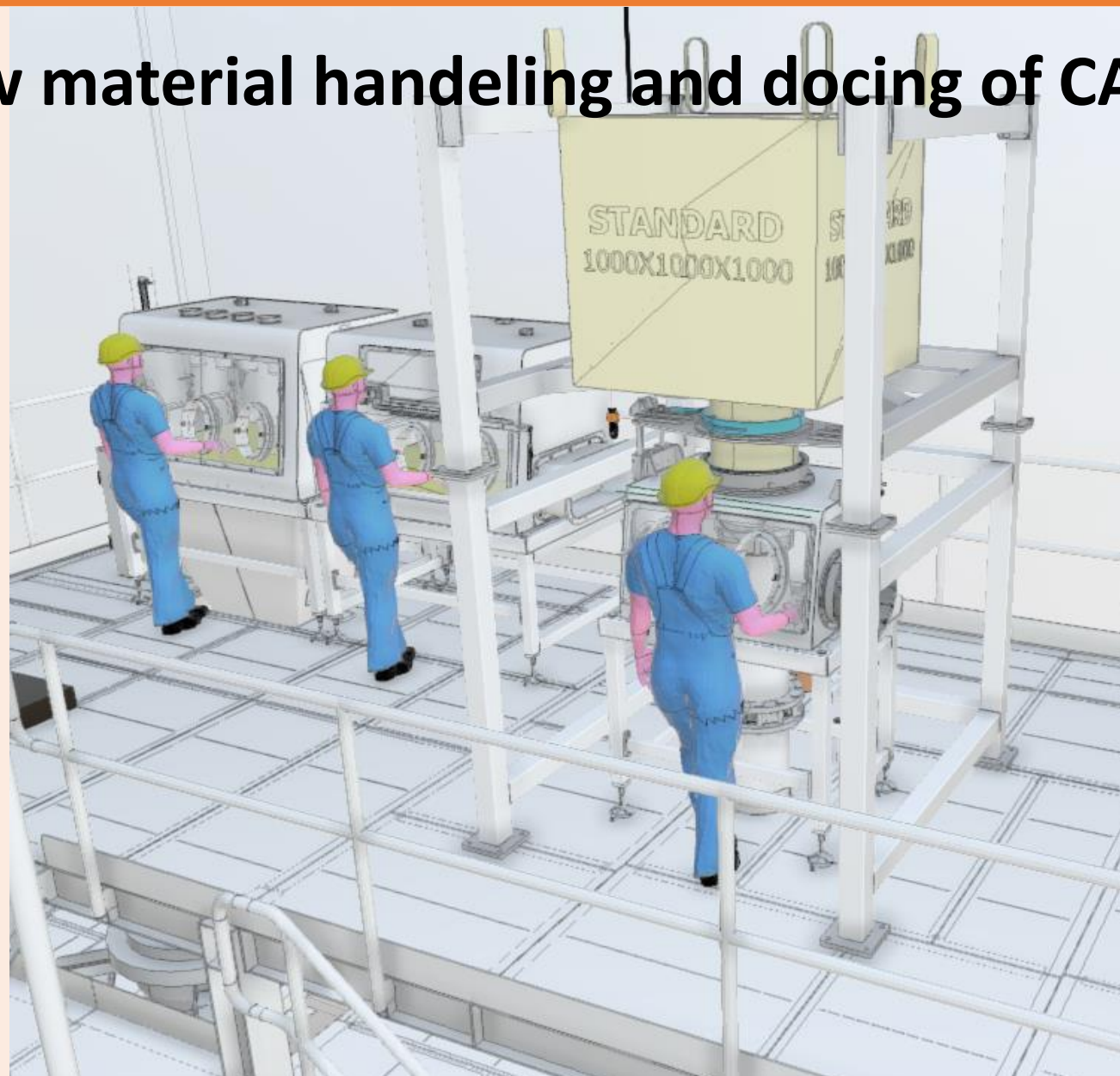
Spray drying

Calcination

Power  
handling  
solutions

Dry milling

## Raw material handling and dicing of CAM



**Raw material  
powder  
discharge**

**Mixing slurry  
process**

**Wet milling**

**Spray drying**

**Calcination**

**Power  
handling  
solutions**

**Dry M  
milling**





Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling



## VacuShear®

**Vacuum conveying & mixing  
from bulk source to mix  
station.**

A fully integrated, full-featured  
pilot or production scale liqui-  
processor combining rapid  
conveying and blending of  
powders.

Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling

# Mixing slurry process





Raw material  
powder  
discharge

Mixing slurry  
process

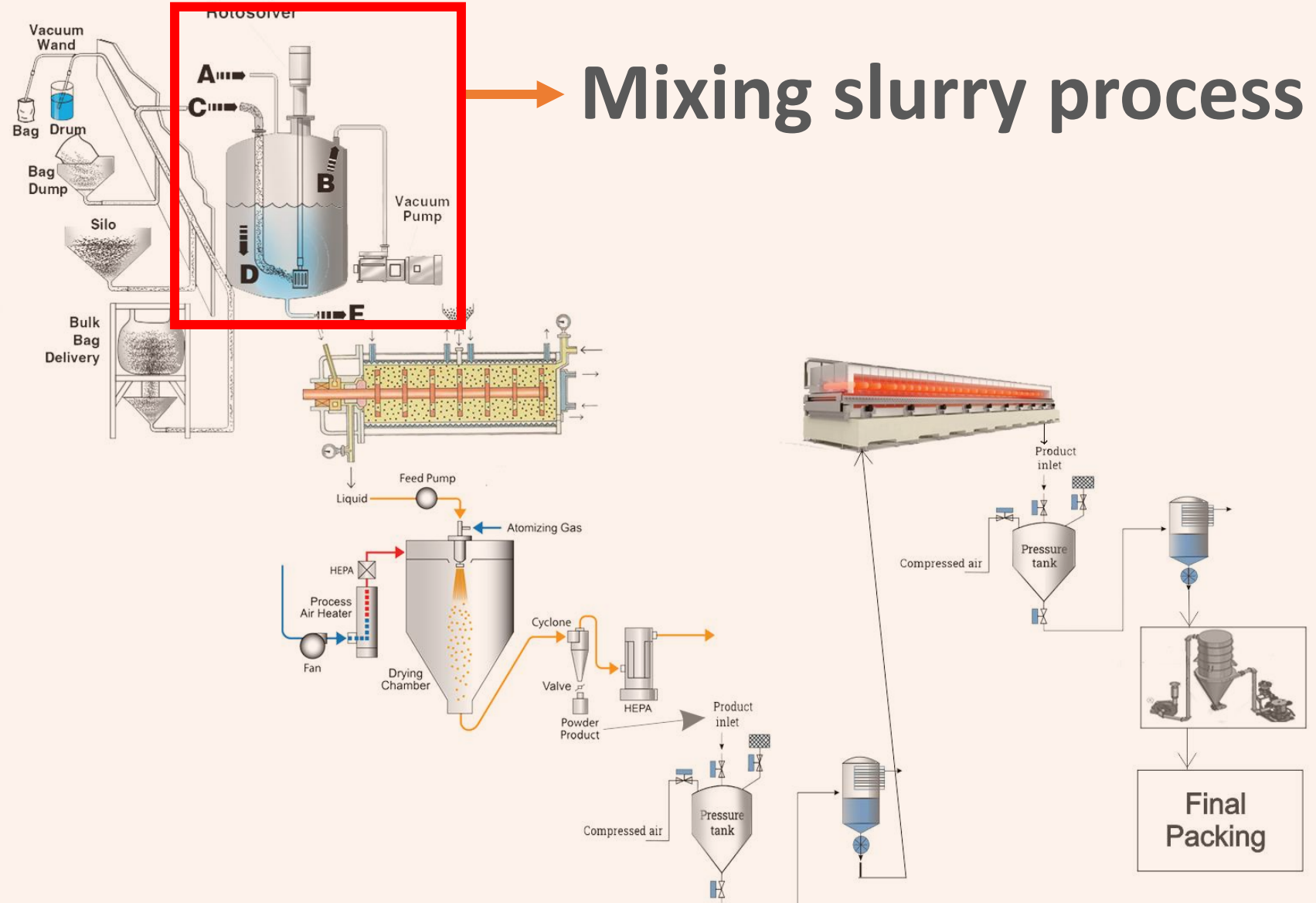
Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling



Raw material  
powder  
discharge

Mixing slurry  
process

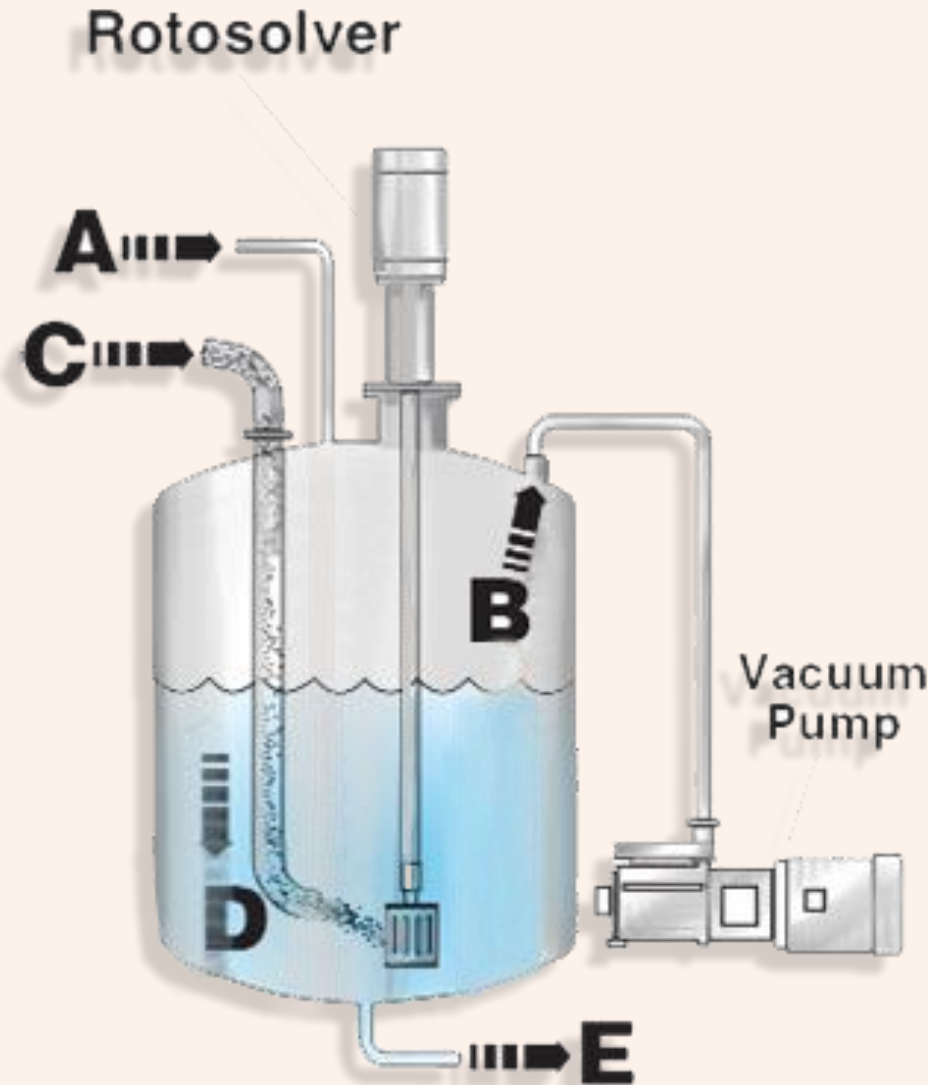
Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling



## VacuShear®

Eliminates entrained air  
and foaming while  
mixing

Eliminates bottom seal

Dust free features

reduce safety hazards

Ergonomic, efficient and  
sanitary

Eliminates manual  
delivery of powders



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handeling  
solutions

Dry milling

Raw material  
powder  
discharge

Mixing slurry  
process

**Wet milling**

Spray drying

Calcination

Power  
handling  
solutions

Dry milling



Raw material  
powder  
discharge

Mixing slurry  
process

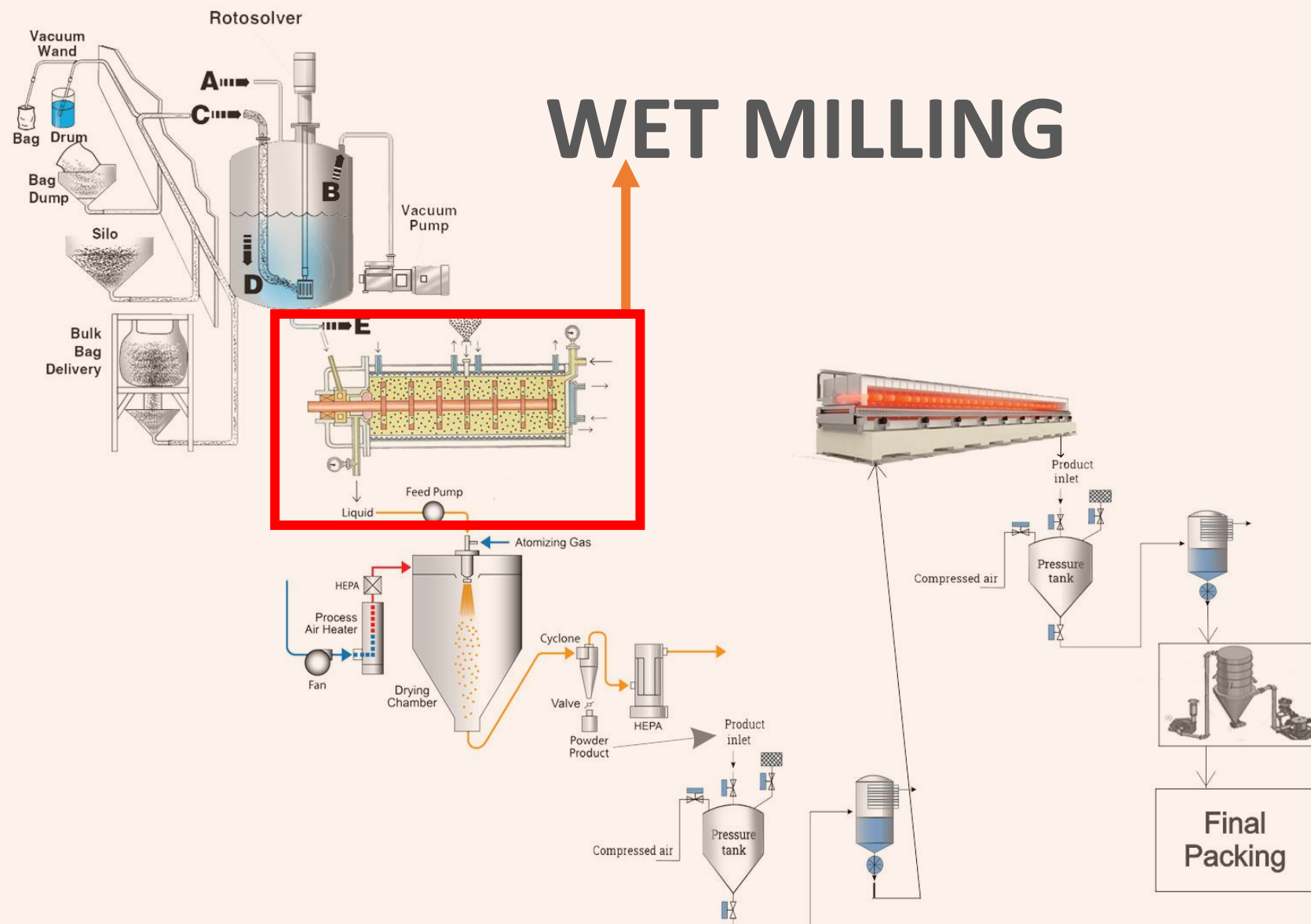
**Wet milling**

Spray drying

Calcination

Power  
handling  
solutions

Dry milling





Raw material  
powder  
discharge

Mixing slurry  
process

**Wet milling**

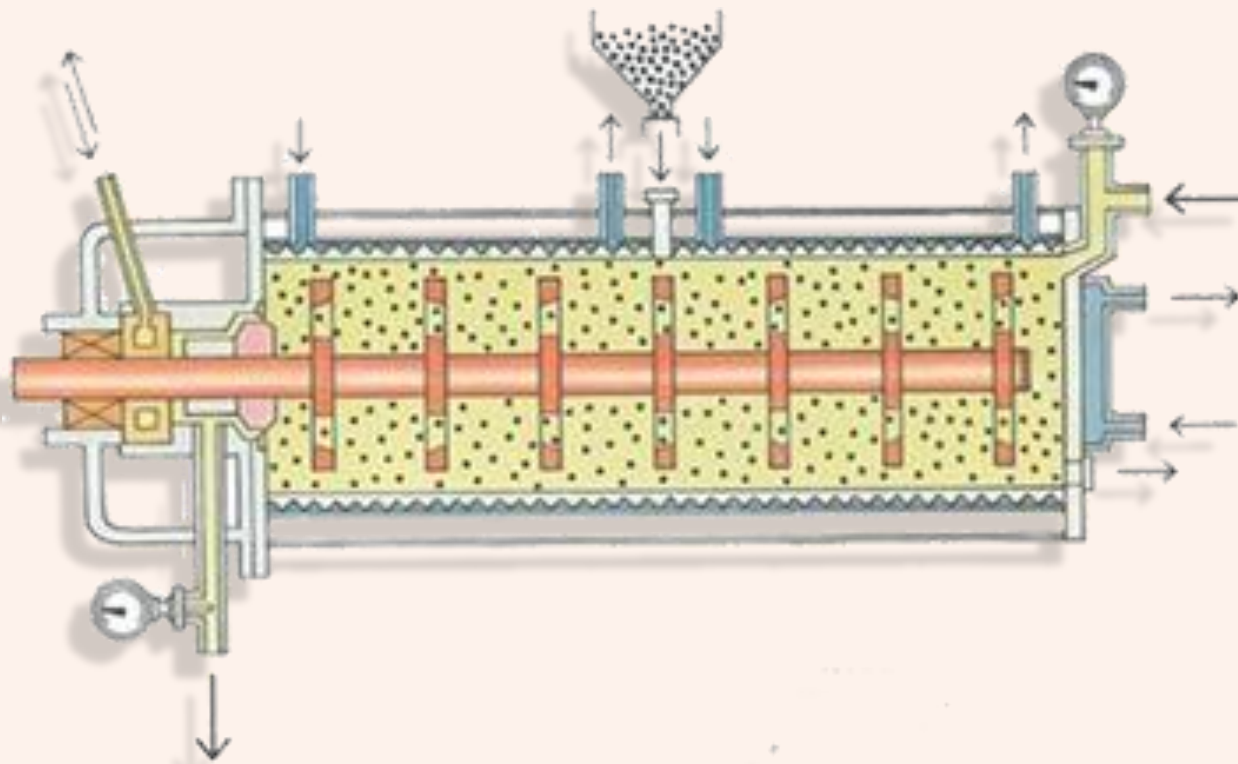
Spray drying

Calcination

Power  
handling  
solutions

Dry milling

# EXPLANATION.....



Raw material  
powder  
discharge

Mixing slurry  
process

**Wet milling**

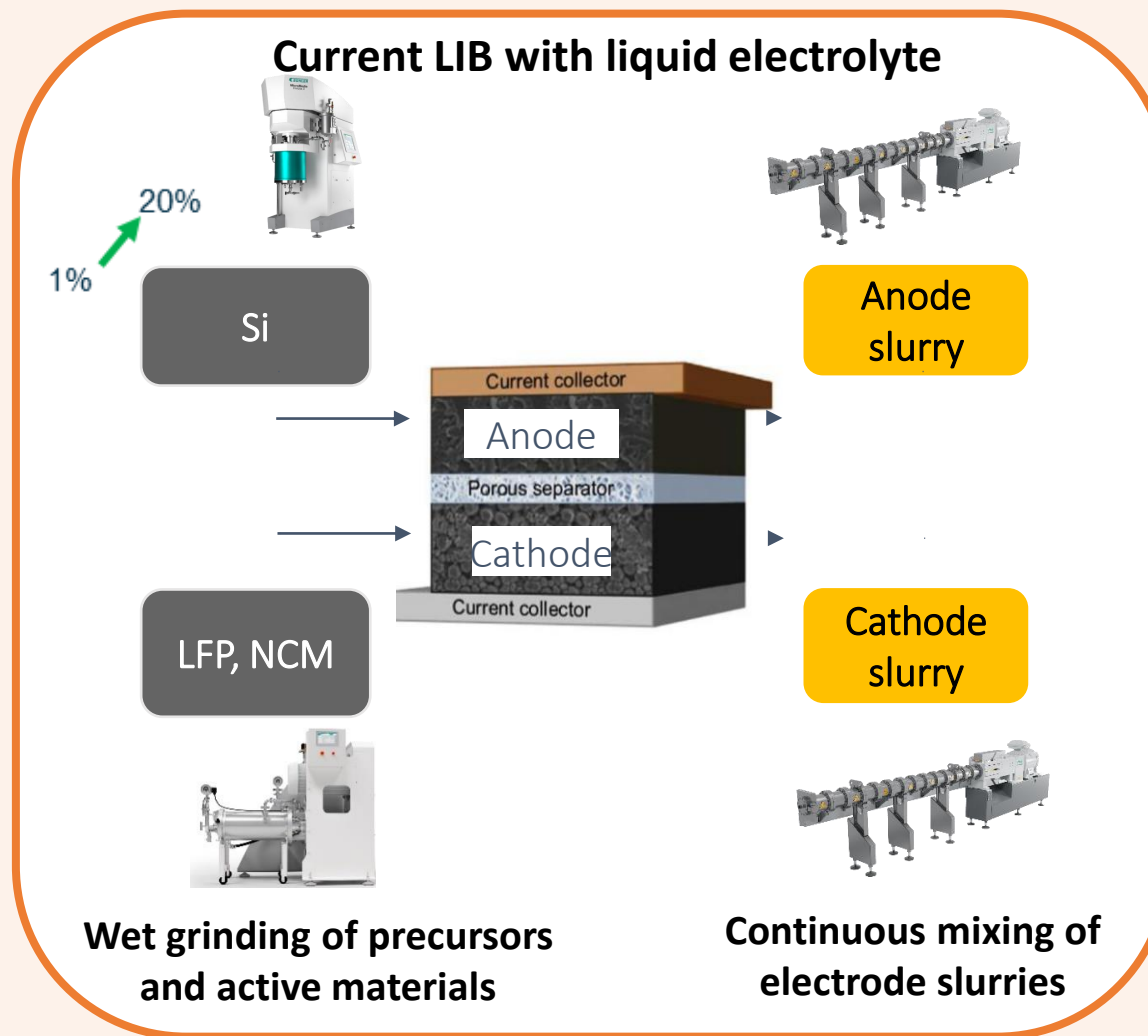
Spray drying

Calcination

Power  
handling  
solutions

Dry milling

## Wet grinding and mixing solutions for LIB material processing.



1%  
20%  
Si

LFP, NCM

Anode  
slurry

Cathode  
slurry

Wet grinding of precursors  
and active materials

Continuous mixing of  
electrode slurries



Grinding equipment required



Mixing equipment required

## Additional opportunities for solid state batteries.

Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling

### Solid state electrolytes (SSE)

#### Oxides

Sintering of nano-micrometer sized oxide particles.

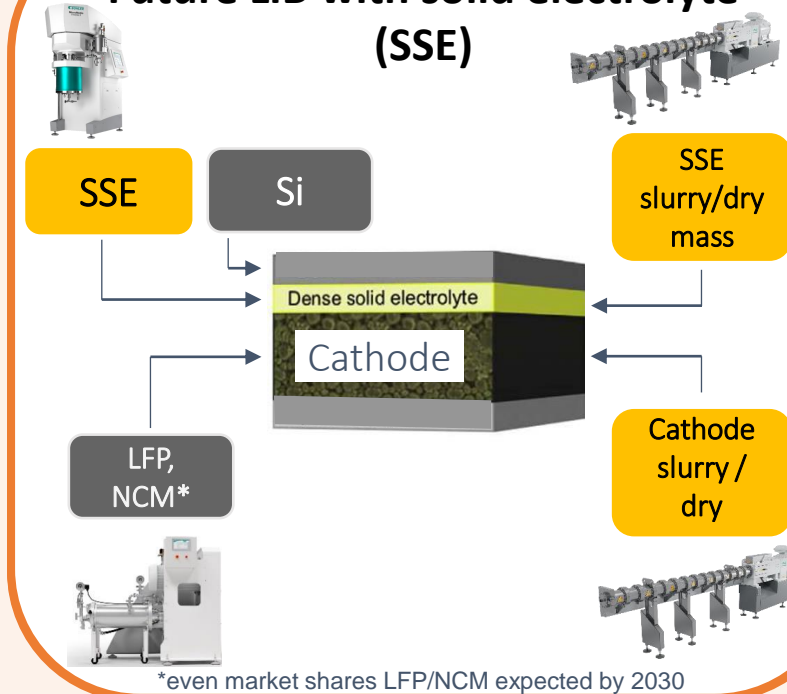
#### Sulfides

Compression of nano-micrometer sized sulfide particles.

#### Polymers

Extrusion of polymer melts mixed with inorganic fillers.

### Future LIB with solid electrolyte (SSE)



### Dry Battery Electrode (DBE)





Raw material  
powder  
discharge

Mixing slurry  
process

**Wet milling**

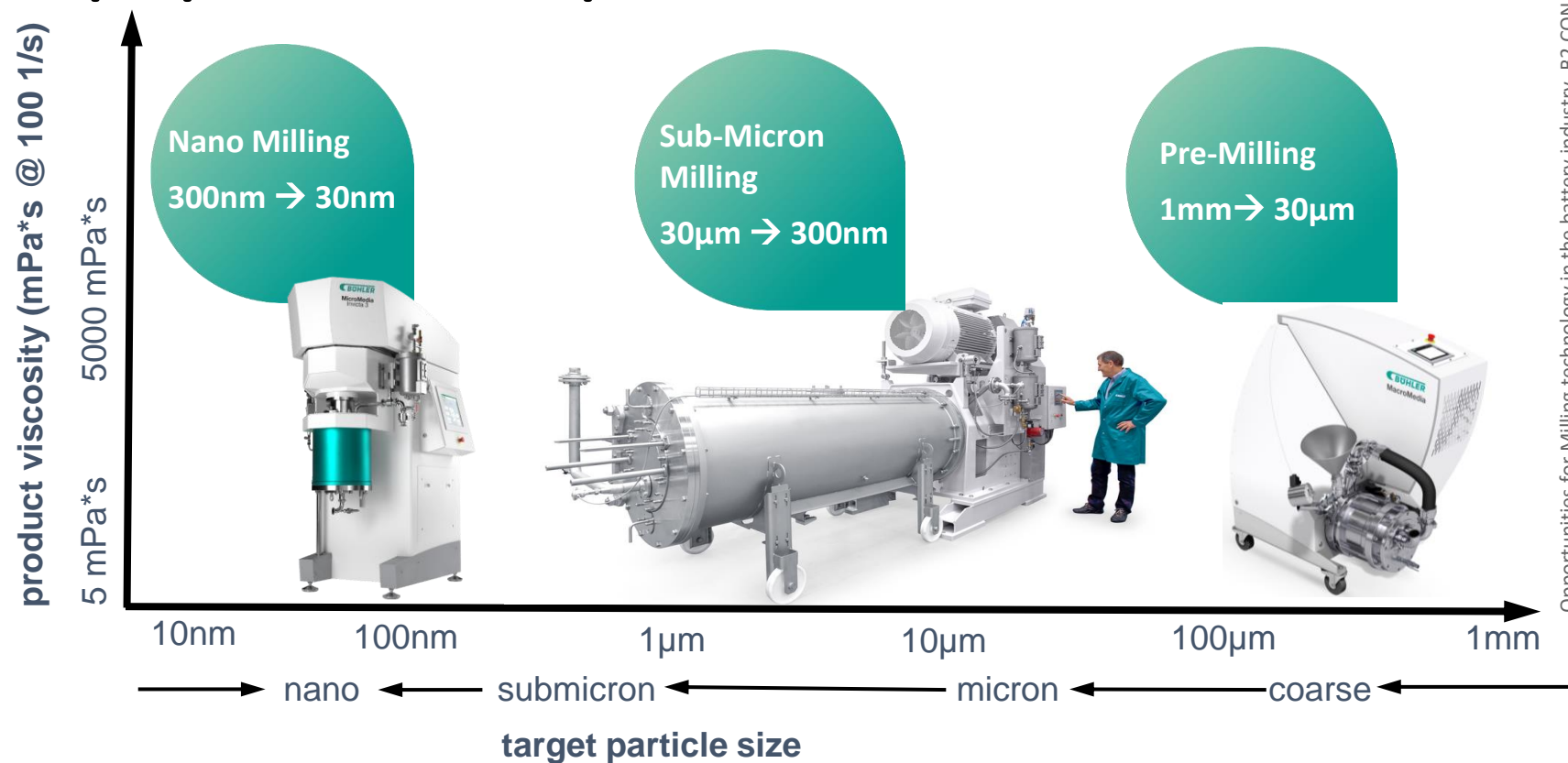
Spray drying

Calcination

Power  
handling  
solutions

Dry milling

# Equipment Map.



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

**Spray drying**

Calcination

Power  
handling  
solutions

Dry milling



Raw material  
powder  
discharge

Mixing slurry  
process

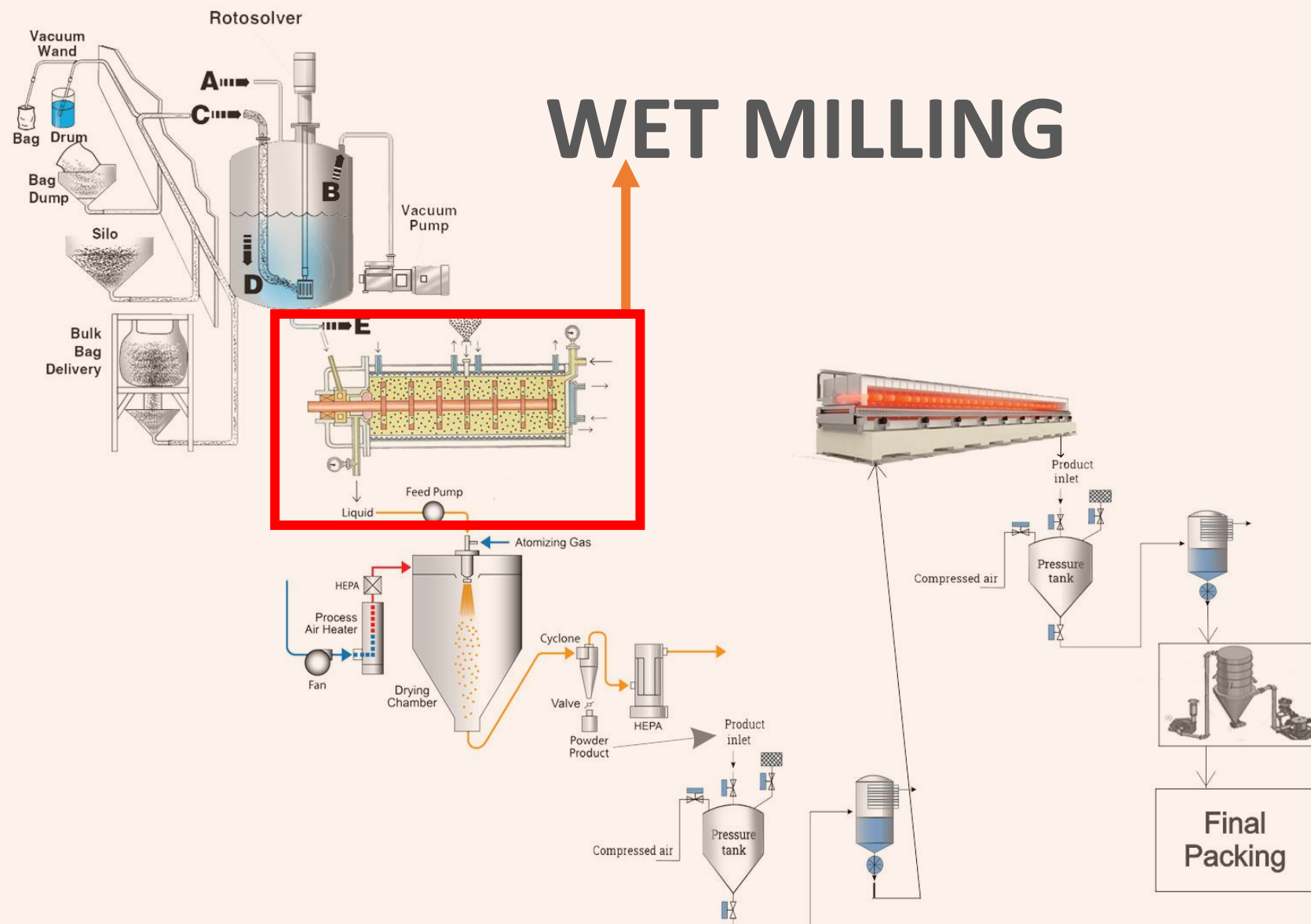
**Wet milling**

Spray drying

Calcination

Power  
handling  
solutions

Dry milling





Raw material  
powder  
discharge

Mixing slurry  
process

**Wet milling**

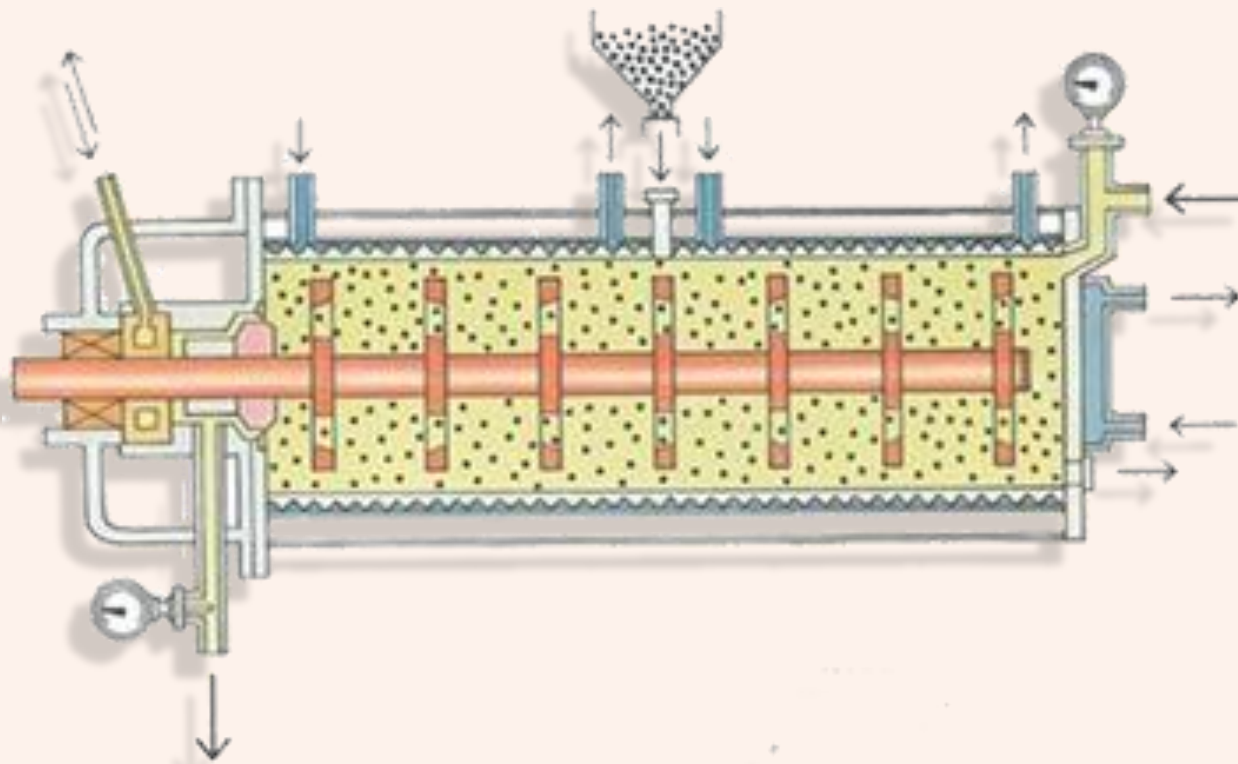
Spray drying

Calcination

Power  
handling  
solutions

Dry milling

## EXPLANATION.....



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

**Spray drying**

Calcination

Power  
handling  
solutions

Dry milling

# Spray drying



**PRODUCTION SCALE  
SPRAY DRYERS**

**PILOT SCALE SPRAY  
DRYERS**

**LABORATORY SCALE  
SPRAY DRYERS**



UK



USA



EURO



GLOBAL

Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

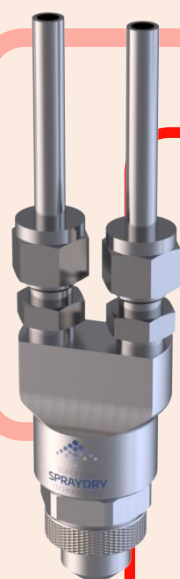
**Spray drying**

Calcination

Power  
handling  
solutions

Dry milling

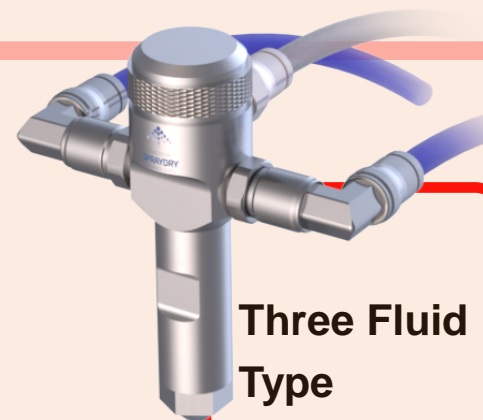
## NOZZLES



**Two Fluid Type  
Atomisation  
Nozzles**  
(Internal/External  
Mix)



**High Pressure  
Atomisation  
Nozzles**



**Three Fluid  
Type  
Atomisation  
Nozzles**



**Rotary  
Atomisers**

Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

**Spray drying**

Calcination

Power  
handling  
solutions

Dry milling

## SPRAY DRYING





Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

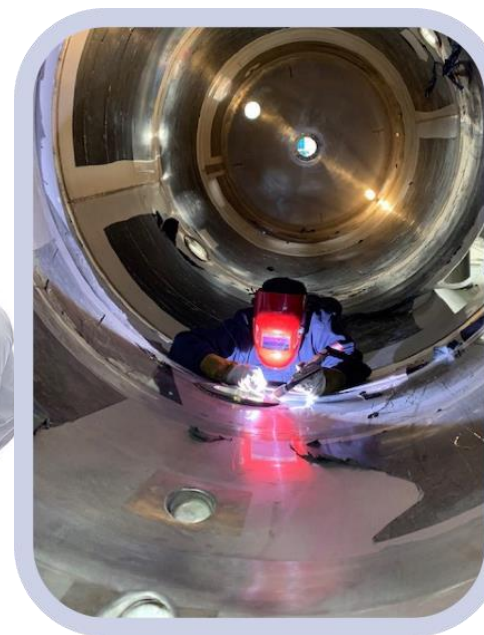
**Spray drying**

Calcination

Power  
handling  
solutions

Dry milling

## GALLERY





Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

**Calcination**

Power  
handling  
solutions

Dry milling



Raw material  
powder  
discharge

Mixing slurry  
process

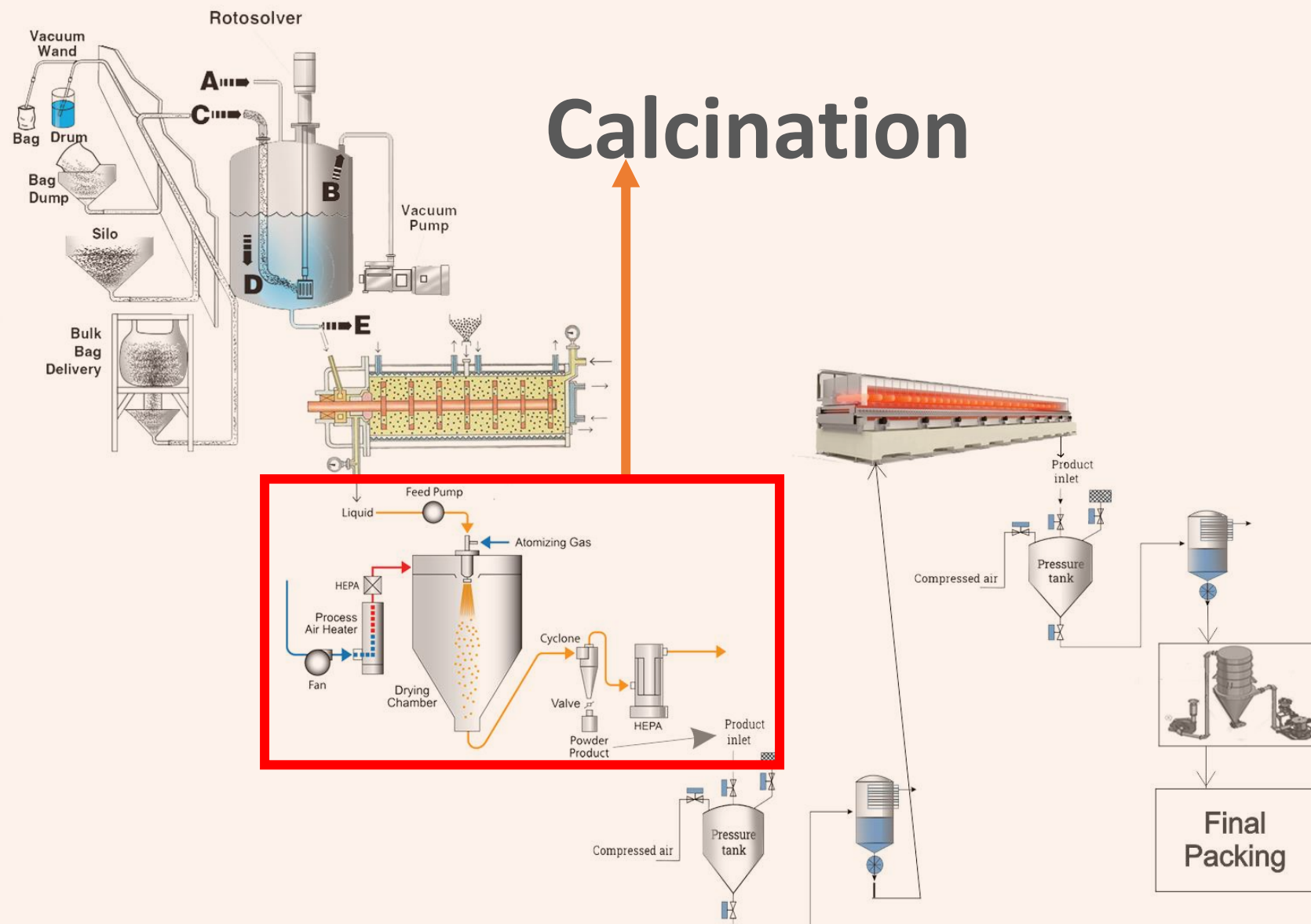
Wet milling

Spray drying

**Calcination**

Power  
handling  
solutions

Dry milling



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

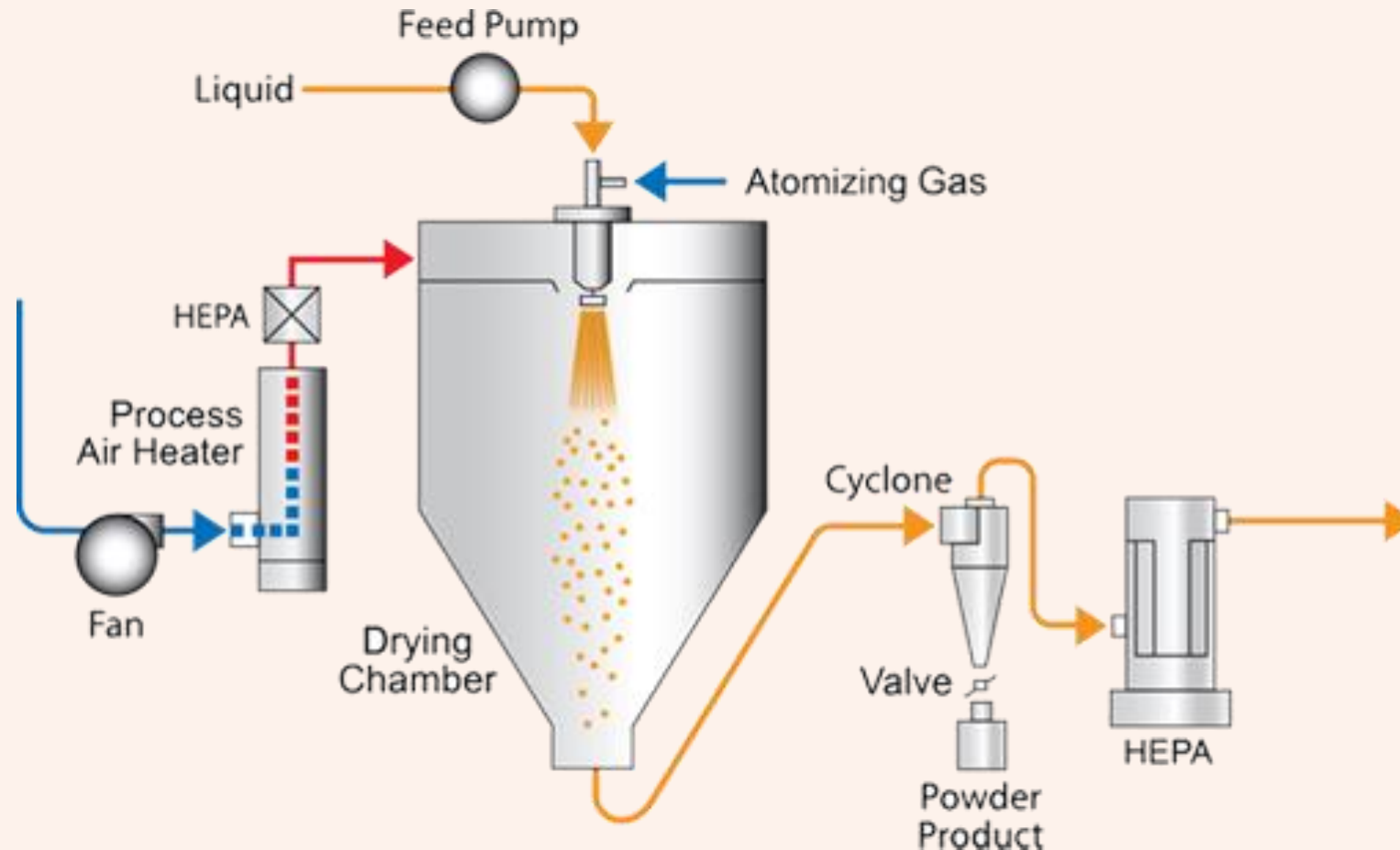
Spray drying

**Calcination**

Power  
handling  
solutions

Dry milling

## EXPLANATION.....





Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

**Calcination**

Power  
handeling  
solutions

Dry milling

Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

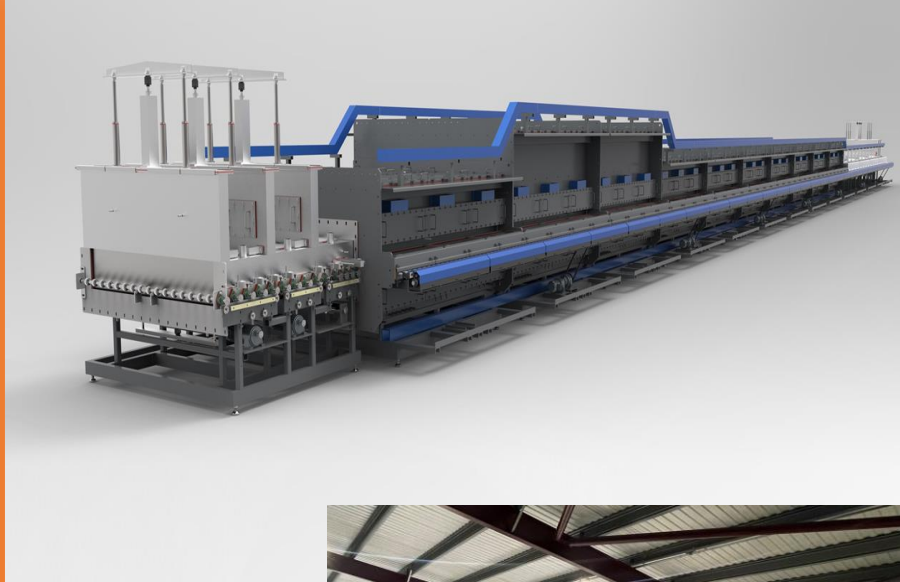
Spray drying

**Calcination**

Power  
handling  
solutions

Dry milling

## TURNKEY BATTERY MATERIAL SOLUTIONS



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

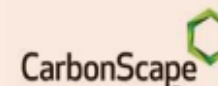
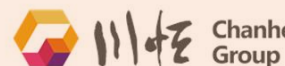
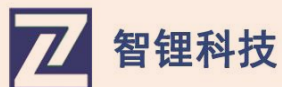
Spray drying

**Calcination**

Power  
handeling  
solutions

Dry milling

# Customers





Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handeling  
solutions

Dry milling



Use our  
knowledge  
expertise during  
the  
development  
and optimization  
of thermal  
processes



Optimize your  
production  
processes



Continuous  
development  
and  
improvement of  
our products



Investment and  
reduction of  
operating costs  
by optimizing  
systems for a  
better-quality  
product



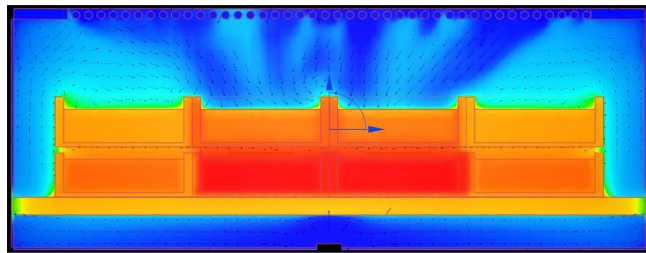
Risk reduction  
by pre-tests  
with original  
parts



Customer trial  
tests for  
optimising of  
products and  
processes



Building  
relationships  
throughout the  
process



**Box Furnace & Pilot Production Line**



Mainly used for process testing and small batch production of battery cathode materials.  
High precision: effective temperature difference  $\pm 3^{\circ}\text{C}$ , high material consistency;  
Flexibility: small temperature zone design, flexible curve and convenient adjustment;  
Atmosphere diversity: applicable to a variety of atmosphere fields such as air, nitrogen, oxygen, etc.

Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

**Calcination**

Power  
handling  
solutions

Dry milling



### Automatic Loading & Unloading Cycle Line

Fully automatic loading and unloading system for sintering equipment.

High accuracy: vertical/horizontal loading sagger structure, loading sagger accuracy  $\pm 50g$ ;

High efficiency: adoption of series/parallel connection to maximize capacity beat;

Hi



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

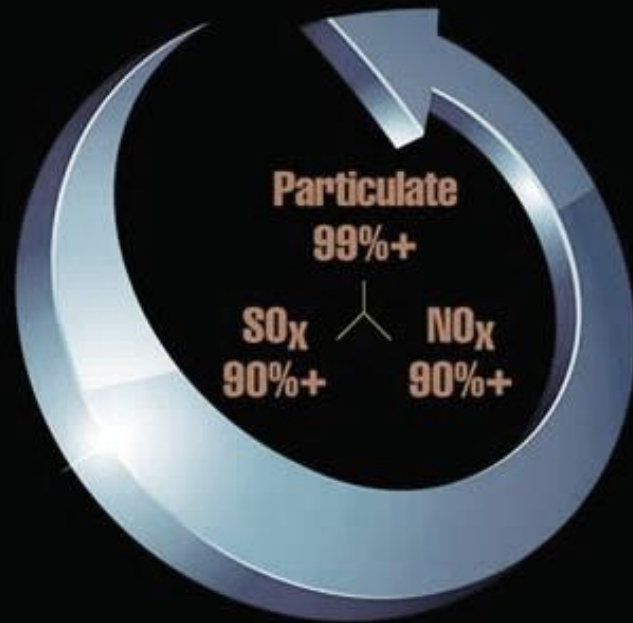
**Calcination**

Power  
handling  
solutions

Dry milling

# Air Pollution Control

**PM, SO<sub>x</sub>, NO<sub>x</sub> in ONE System**



**CERAMIC CATALYST  
FILTERS FOR  
MULTI-POLLUTANT  
CONTROL**

Such as:

CO

Pb

VOC

Se

Hg

Dioxin

and other materials



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

**Power  
handling  
solutions**

Dry milling

# Power handling solutions



Raw material  
powder  
discharge

Mixing slurry  
process

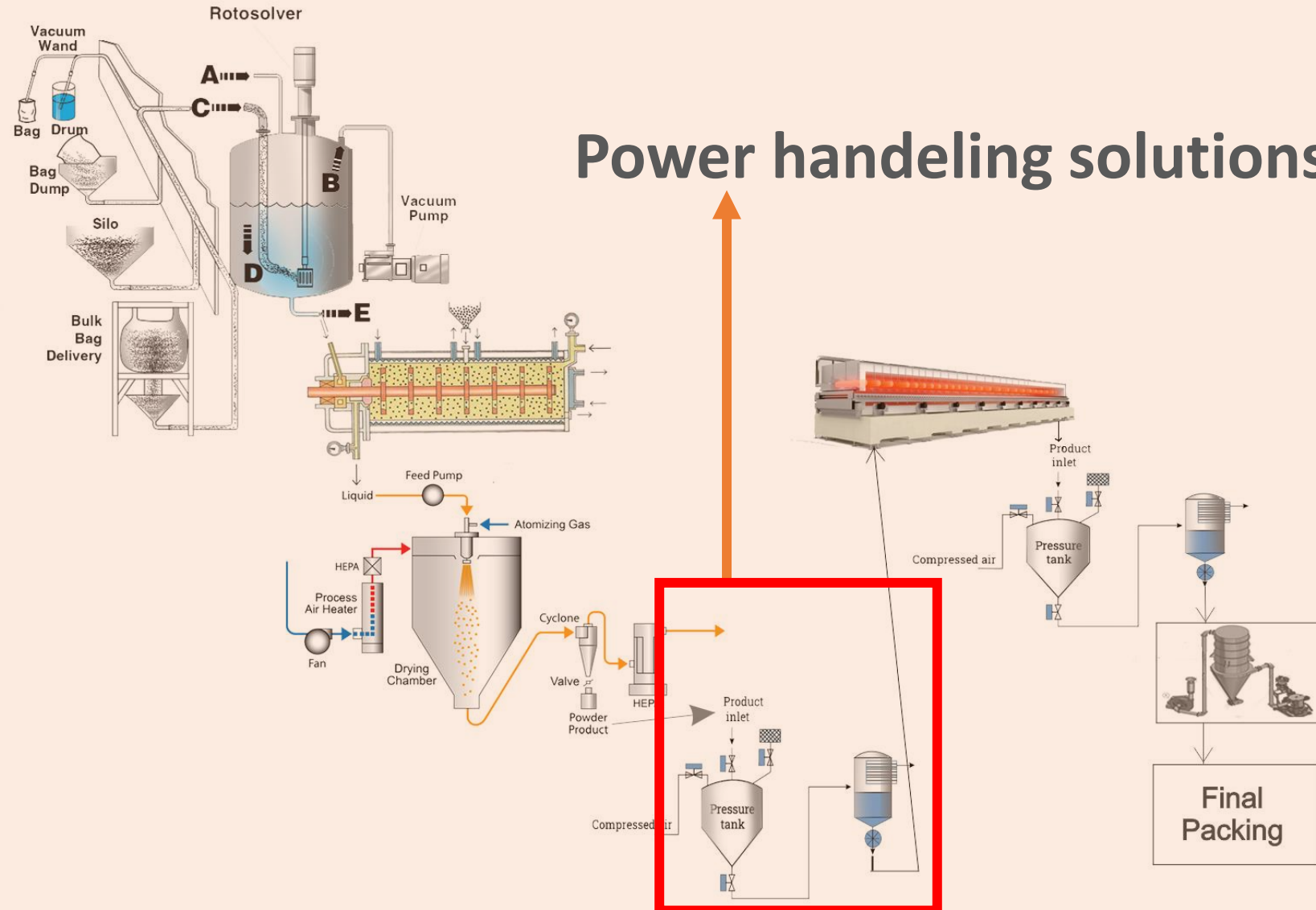
Wet milling

Spray drying

Calcination

**Power  
handling  
solutions**

Dry milling



Raw material  
powder  
discharge

Mixing slurry  
process

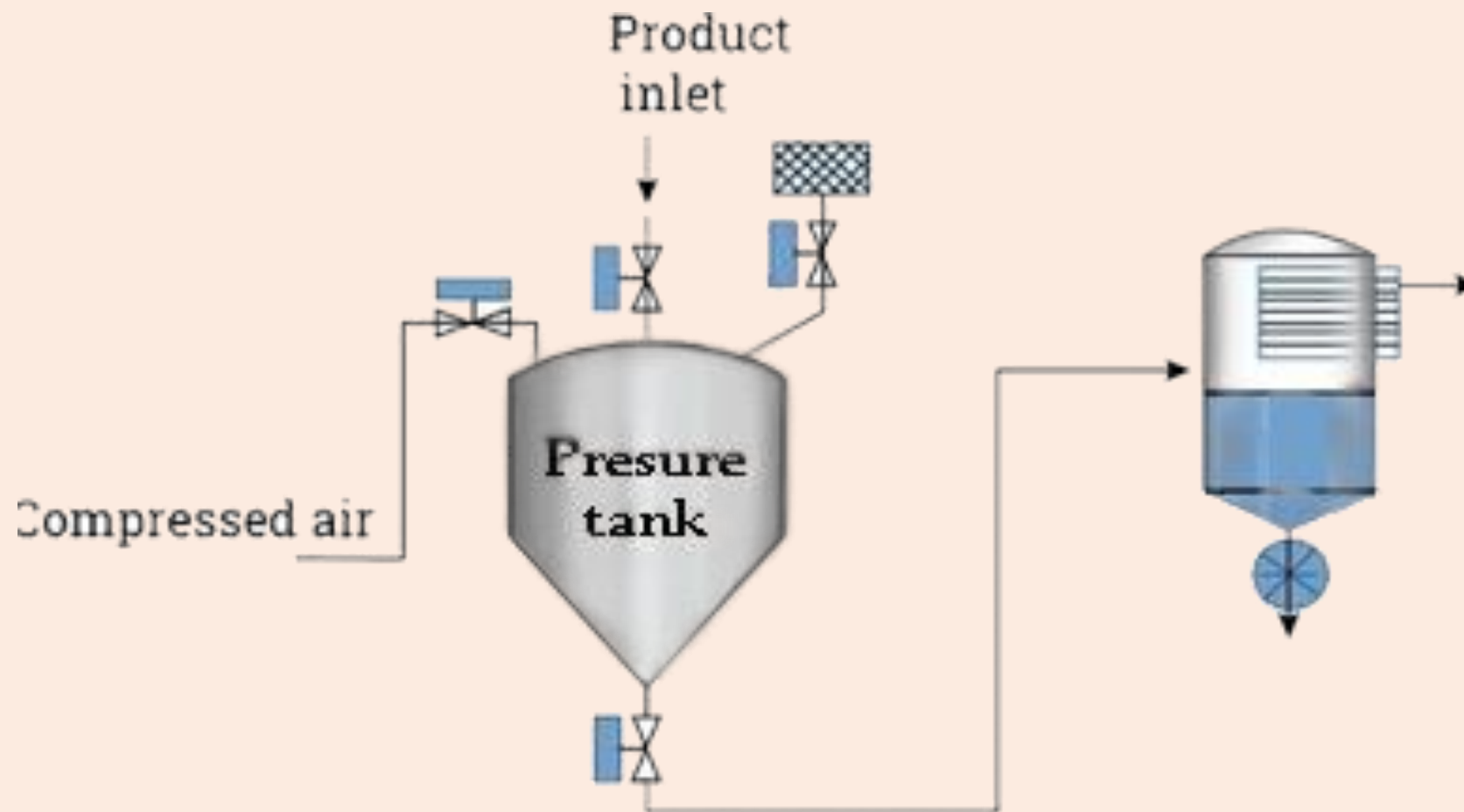
Wet milling

Spray drying

Calcination

**Power  
handling  
solutions**

Dry milling





Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

**Calcination**

Power  
handling  
solutions

Dry milling

## Dense phase conveying of NMC/LFP

Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling



## Jetmixer<sup>®</sup> Lab Unit M537

Raw material  
powder  
discharge

Mixing slurry  
process

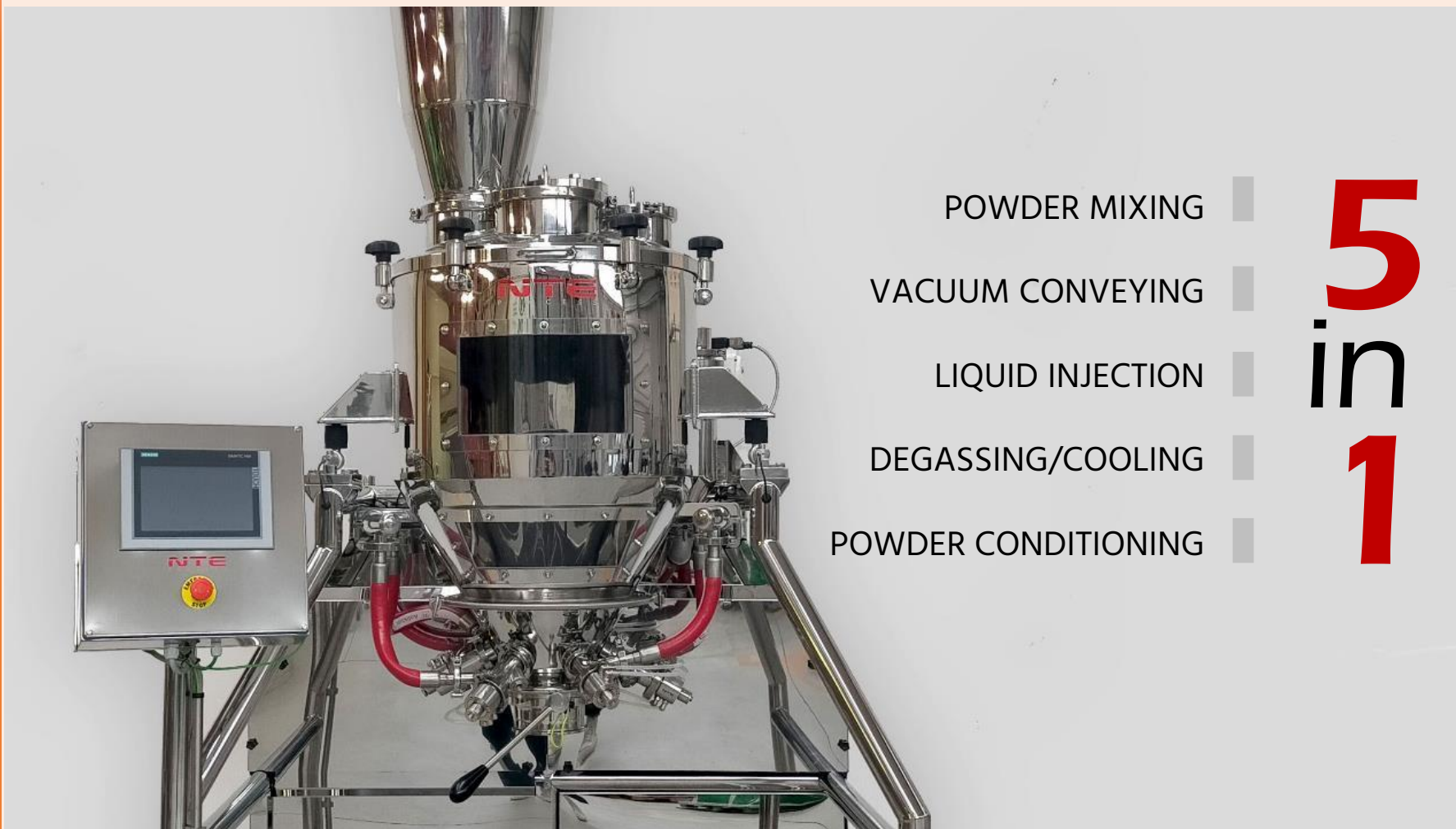
Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling



POWDER MIXING

VACUUM CONVEYING

LIQUID INJECTION

DEGASSING/COOLING

POWDER CONDITIONING

**5**  
*in*  
**1**



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

**Power  
handling  
solutions**

Dry milling



**Mixing of Graphite and  
pitch**

**Large batch mixing of  
NMC/LFP**

Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

**Power  
handling  
solutions**

Dry milling

# Process Control



Complete range of control solutions tailored to any specific application.



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling

## Process Control & Site Assistance

MES Systems

Software design and development for PLC,  
Operator Panels and Supervision System  
(SCADA)

Functioning Specification of System and  
Operator Manual

Remote Assistance 24/7

Technical Assistance all over the world, also on  
systems by others

Process Consultancy

Electrical Panel with PLC

Electrical Panel with motor starting

Electrical Plants



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

**Dry milling**



Raw material  
powder  
discharge

Mixing slurry  
process

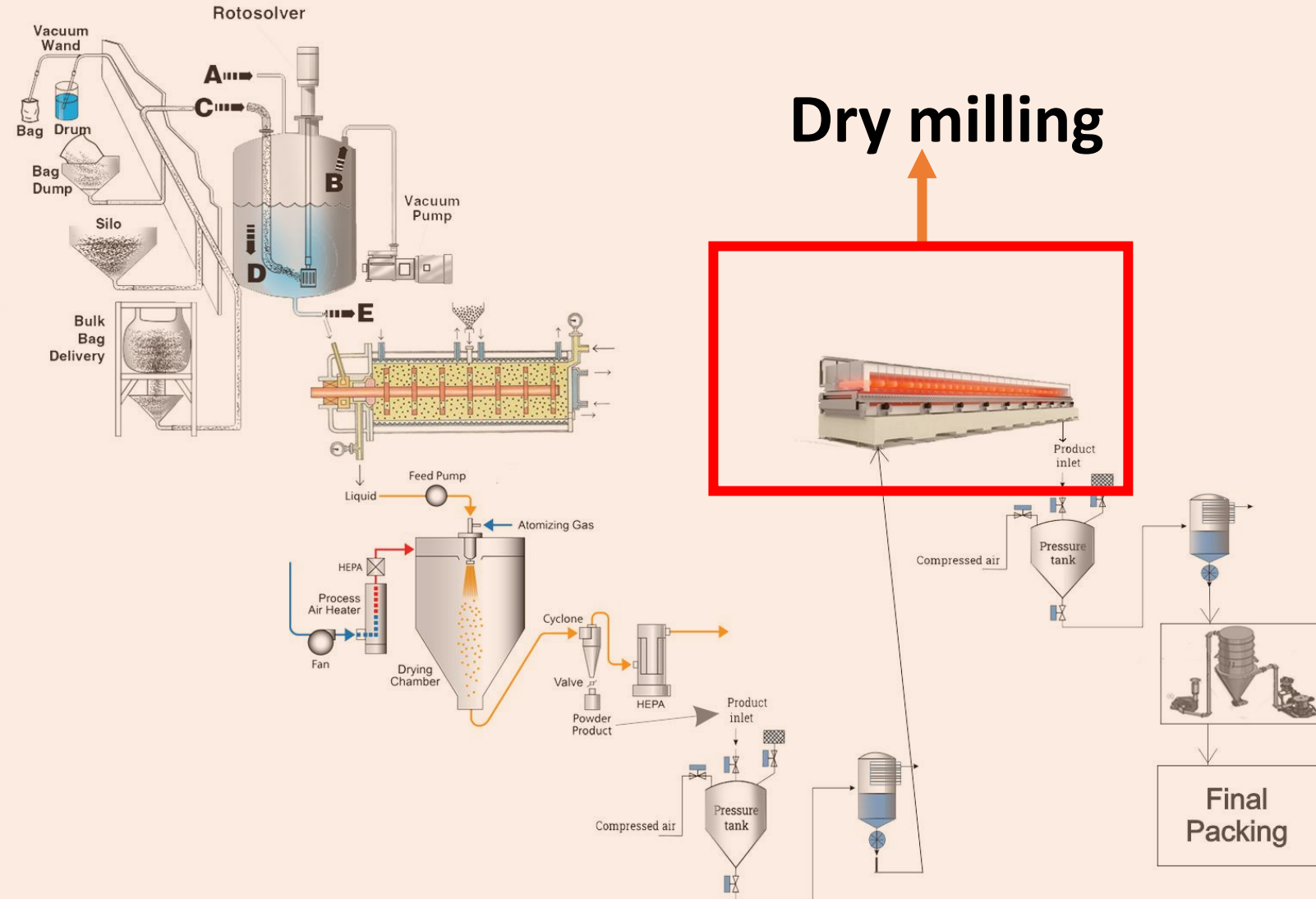
Wet milling

Spray drying

Calcination

Power  
handling  
solutions

**Dry milling**





Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

**Dry milling**



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

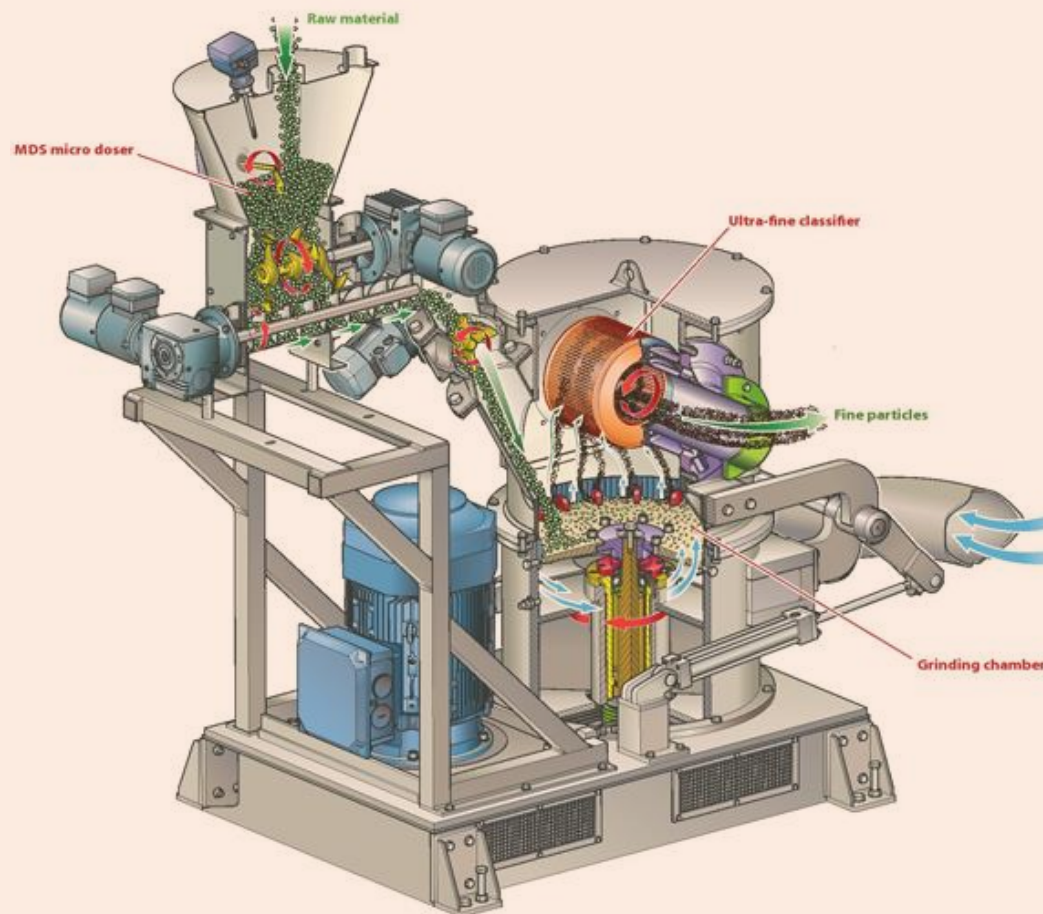
Spray drying

Calcination

Power  
handling  
solutions

**Dry milling**

## Air Classifier mill For Battery Materials



The **JCF** series grinding mill is a new combined system, consisting of a horizontal grinding unit and a selection drum, in a single compact machine. JCFs can be combined to give maximum flexibility and equipment modularity to serve different industries, with the very latest electronic systems, user friendly and really simple to interface.

**PRODUCT**

Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

Dry milling

# Impact Mill series JCF F

The grinding and selection mill of JCFF series consists of:

- Grinding part with horizontal layout
- Screening basket built into a single compact machine.

Input particle size 15 mm,

Output fineness d.97:  $8 \div 150$  micron

System suitable for hard products.

3.5 Mohs

Optional anti-wear materials to withstand hard products

6.0 Mohs

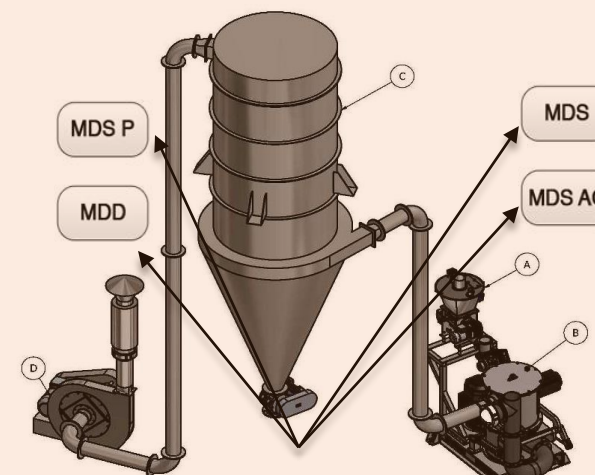
- Versatile and modular system
- Storage downstream of the system.

- Ideal for multi-pipe propelling.

- Suitable for different dosing systems
- Integration into a single grinding machinery.

Complete machine:

- Dosing system (A)
- Grinding mill (B)
- Micronized material dedusting unit (C)
- Suction fan (D)
- Micronized product propelling





Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

**Dry milling**

## Impect Mill series JCF F



Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

**Dry milling**

## Ultra fine Air Jet Mill series MJS

Fluidized bed jet mill with counterposed air jets, consisting of:

- pulverization unit that uses gas at high pressure,
- classifier with variable rotation that allows setting the size
- The high impact speed and accelerated air flow from the nozzles produces a high collision speed,
- High grinding performance, energy savings up to 30 – 40%.
- The key feature is the reciprocal impact between the particles,
- Particles at high speed very rarely hit the walls,
- Suitable for the pulverization of extremely hard, abrasive substances.
- The unit is fitted with a turbine classifier for ultra fine powders,
- Automatic operation allows the grinding and selection machine be used in full safety and without the need
- for constant supervision.

Ultra-fine particles:

Products with hardness up to Mohs 10,

Fine and ultra-fine powders d.98: 2 ÷ 80  
micron.





Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

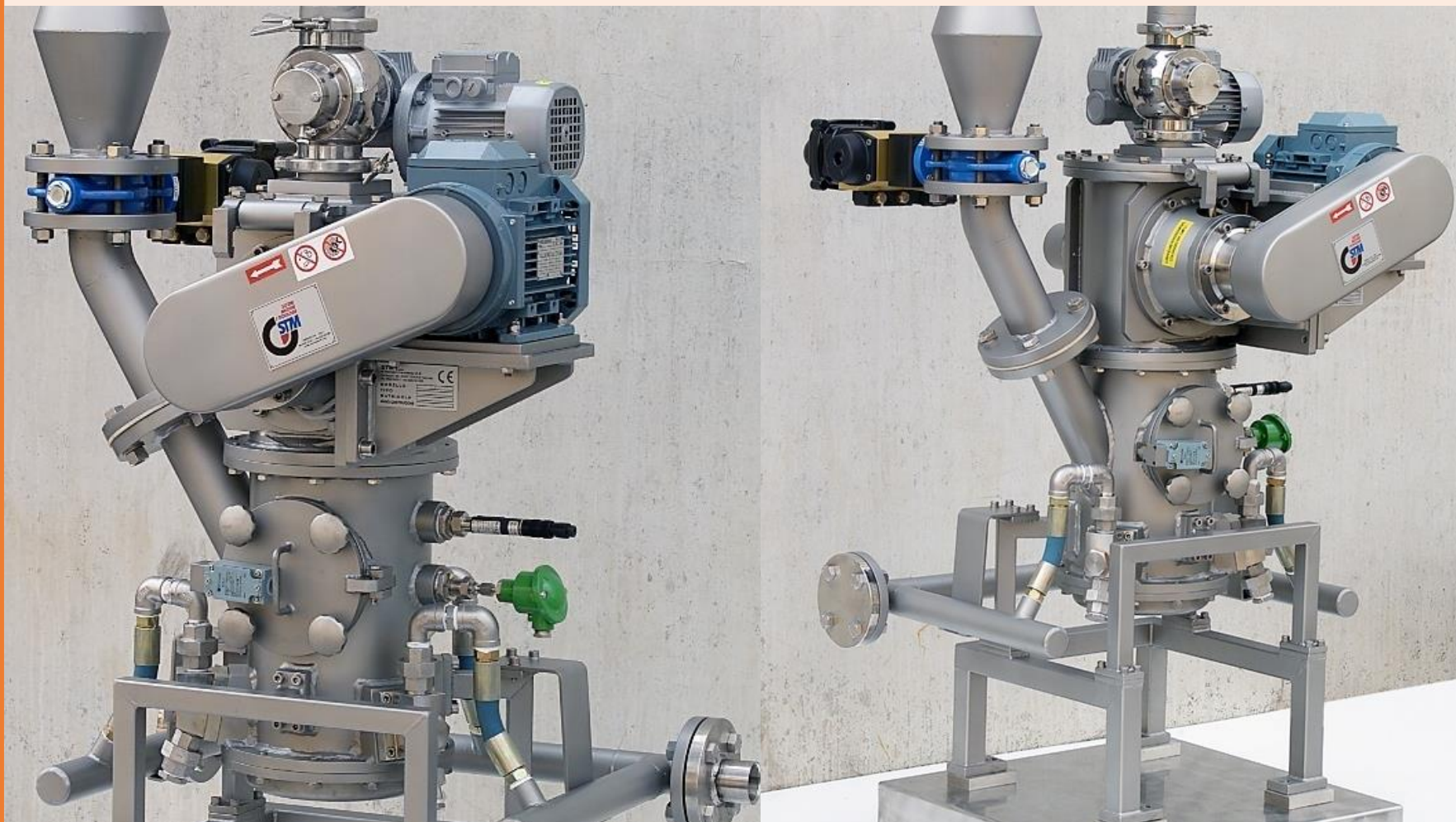
Spray drying

Calcination

Power  
handling  
solutions

**Dry milling**

# MJS 200





Raw material  
powder  
discharge

Mixing slurry  
process

Wet milling

Spray drying

Calcination

Power  
handling  
solutions

**Dry milling**

