

# Powdering while Drying

**CRIOX System: the unique rotary vacuum dryer/pulverizer with electric lump-breakers.**

**C**RIOX System, a milestone of Italtvacuum product range, is the ideal rotary vacuum dryer/pulverizer for drying humid material after centrifugation or filtering processes. It completely removes all types of solvents and crushes any residual lumps. A mix of power and intelligence to ensure maximum quality and productivity.

CRIOX System is multi-product, suitable for the widest range of crystal or amorphous products, whether they are intermediates, fine chemicals, finished products, active pharmaceutical ingredients or chemically reactive.

CRIOX System is multi-purpose. It can be used as an effective fast blender or homogenizer, as well as a granulator, limiting the subsequent use of the mill as much as possible.

CRIOX System is versatile and profitable for it minimizes time required to re-establish the line, wash, clean and inspect the plant prior to product change.

CRIOX System is safe for operators, the environment and the product, because it is designed and manufactured in compliance with European Union ATEX Directives and CE marking requirements, as well as with the increasingly stringent US FDA Standards and cGMP Current Good Manufacturing Practice Regulations.

Thanks to its bi-conical revolving chamber, CRIOX System allows the total and continuous revolution of the mass to be dried and an extremely homogeneous mixing. The chamber rotation speed is adjustable so that the agitation can be controlled, ranging from very gentle to moderate. This permits to treat even thermo-sensitive products, without modifying their molecular structure.

During the drying process, CRIOX System crushes the possible blocks inside the mass and breaks the lumps that could be formed. At the end of the process, this allows to obtain dry powders with a

controlled final particle size distribution, ready to be riddled and packed.

The bi-conical shape of the rotating chamber by itself could not lead to these results if it wasn't for two powerful electrical lump-breaking blade sets, that are the peculiar characteristic of CRIOX System, permitting to increase the surface of the product exposed to evaporation and the mixing effectiveness. By acting on the core of the product, the electric lump-breaking units considerably reduce drying time, ensuring extremely low moisture levels, that cannot be achieved with other systems. Furthermore, they permit to operate at low working temperatures, for the benefit of the most delicate products, as it avoids their degradation.

CRIOX is the only rotary vacuum dryer on the market equipped with electrical lump-breakers. Advantages of lump-breakers operated by electrical motors:

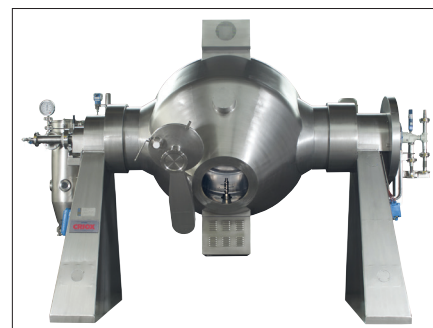
- Rotation speed control
- Programmable working cycles
- Constant torque at different speed
- Power absorption control
- Cooling by ventilation.

Furthermore, electrical lump-breakers ensure:

- Reliability and long life even with heavy use
- Low maintenance.

Last but not the least, the absence of pneumatic circuits prevents leaks of pressurized air inside the chamber and the surrounding area.

Regarding constructive materials, for the parts in contact with the product, the standard version is made of stainless steel AISI 316L (1.4404). Moreover, on request, CRIOX System can be made of other weldable materials, such as ALLOY C-22 (2.4602) and AISI 904L (1.4539). The particular shape of the CRIOX System, characterized by soft lines without edges and sharp corners, also allows to realize



*CRIOX Front View*

successful versions with internal coating made of particular fluorine-polymer materials, characterized by a high resistance against products containing extremely corrosive substances (acids and bases). The success obtained by these manufacturings led Italtvacuum to even realize versions with enamelled drying chamber, in which the application of alkaline boron silicates on the steel support, makes the CRIOX chemically inert inside.

CRIOX System has efficient filtering systems. In vacuum drying processes, the filtering unit must keep all the powder inside the chamber, letting only the solvent vapours pass through. At the same time, it has to ensure the lowest possible pressure drop, in order to achieve very low final pressure values. Italtvacuum offers special filtering systems, placed inside the drying chamber, in order to meet all process requirements: metal sintered cartridge filters or PTFE filters, suitable for very fine powders. Filter effectiveness during the process is ensured by an automatic CIP system for nitrogen back-flow washing.

CRIOX System is designed and manufactured for fast and thorough cleaning. An important feature for any machine, but crucial for a dryer elected by customers all over the world on account of its versatility and suitability to multi-product processing. Cleanability means easy and simple interior washing, removal

of internal components, inspection and external cleaning.

Concerning internal cleaning, thanks to the rotation of the drying chamber and the combined action of the lump-breaking units, only very few rinses, with small quantities of fluid, are necessary to achieve the ppm values required by FDA Standards to consider a plant as clean (hence reducing the quantity of wastewater to be disposed of). Furthermore, inside the chamber, a CIP device can be applied, able to spray the washing fluid in all the directions. Fast and complete internal cleaning permits to rapidly shift from one product campaign to another.

With reference to internal parts removal, the lump-breaking units blades can be easily disassembled. Also, the filtering system can be dismantled from the outside by using a special stainless steel key, without difficulty for the operator.

Internal inspection is facilitated by the opening manhole port lid and the loading hopper. Moreover, in order to perform the SWAB test, required by the FDA Standards for the validation of the washing procedures, Italvacuum designed and patented a large hatch that permits to completely open the machine and carry out all the required operations with extreme ease and safety.

Also, external cleaning is very easy and effective. The sealed external cladding (particle-free configuration) covering insulation, electrical, hydraulic and pneumatic circuits avoids product deposits in recessed areas. This feature also allows the "partitioning" solution, which permits to separate the clean room from the machine room.

CRIOX System is designed to fulfil the widest possible range of needs, being manufactured with capacity from 55 to 12,000 litres. The maximum load level depends on the product to be processed. Conversely there are no constraints on minimum batch size, since the mechanical action of the lump breaker units is effective even with few litres of product.

### Turn-key Systems

In addition to the dryer, Italvacuum is the only manufacturer in the world that can design and produce internally all the auxiliary units – vacuum system included – ensuring that they are sized to meet any processing requirements:

- Saurus939 high vacuum pump
- Vacuum condensation unit for drying time reduction and extracted solvent recovery
- External cyclone filter, designed in order to prevent pressure drop and condensation, for full vacuum line protection
- Heating/cooling units for system temperature regulation
- PLC control system with CFR 21 Part 11 certified software, able to guarantee reproducible dried batches and interface with centralized control systems.

From the lab to the installation: the best way to choose the right industrial system: Italvacuum has a range of pilot systems which allow to carry out semi-industrial and laboratory scale drying tests on customer's products.

During pilot trials, product samples can be taken for analysis without breaking the vacuum and the process parameters can be modified at any time in order to reach the ideal drying process.

In this way customers can choose the Italvacuum system that best meets their needs in terms of both size and performance. At the same time, Italvacuum acquires important information to correctly size the industrial systems.

A full report containing process parameters graphs and conclusive comments is issued at the end of each trial.

### Advantages

- Perfect homogeneity and uniformity of dried batch free from product deposits
- Adjustable product powdering during drying cycle
- Reduced drying times thanks to lump-breakers action which increases the surface of the product exposed to evaporation



CRIOX Clean room installation (partitioning)

- Very low final moisture values far within pharmacopeia requirements for residual ppm limits
- Low operating temperatures for the benefit of most delicate products
- Extremely high final vacuum values
- Fast and complete product unloading thanks to the bi-conical shape and the Easy Unloading system
- Easy internal and external cleaning with simple access for inspection and SWAB test
- Wide availability of weldable materials and internal coatings
- Total automation of the system to guarantee process reproducibility for all batches

**Criox System will be exhibited at ChemTECH 2015 (Mumbai, January 28-31) in Booth D11A placed in Hall 1.**

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