



MCV-NS/MCV-NCS

Conical vacuum dryer



E. BACHILLER B.S.A.
Mixing and drying technology





MCV-NS and MCV-NCS

Conical vacuum dryer

Generalities

The **MCV-NS** conical vacuum dryer in cantilever execution is an equipment of high performance qualities, specifically designed for the processing of moist crystalline solids in pharmaceutical, cosmetics, chemical and food industry, where the ease of cleaning and/or process sanitary guarantees are fundamental.

Its vertical conical configuration fits it with a great heating surface, since the conical shell is totally heated by means of jacket or half coil (in relation to the machine size), which confers the greater surface ratio per liter of product that a vacuum dryer can have.

Moreover, its special agitating system smoothly removes the product, so that it is specially indicated in applications with products of fragile character. The agitating system, by means of an inclined worm screw in cantilever execution (without lower support), that is displaced in rotation by the cone generator, raises the product that is surrounding it, so that the power requirement is very reduced in this machine. Therefore, the energy input received by the product is very limited, so that also the system is totally indicated for labile and heat-sensitive products.

The equipment incorporates a sleeve filter in its upper part for the vacuum application and dust retention during the process. This filter can be of textile sleeves, of synthetic or metallic cartridges. The cleaning of the filtering elements is made by means of temporized counterpressure gas shot, during the drying.

BACHILLER provides totally automatic drying installations, including the necessary instruments for the control of all the process parameters: vacuum, temperature, drying time, etc. Moreover, under requirement we can provide all the auxiliary and peripheral equipments of a drying system, such as heating, condensation units, vacuum pumps, etc., as well as the electric panel and the control system of all the installation.

Cantilever execution. GMP and EHEDG execution

With the purpose of avoiding a lower supporting bearing on the agitating system, and avoiding of that way all its disadvantages (watertightness submerged in the product, product degraded in contact with the bearing, etc.) all the drive system has been oversized in order that the mixing screw is completely supported by the transmission arm.

The design of all the mechanical assembly is completely watertight, thanks to that its frame is mechanized and protected with double security joint. The sealing of the trunions is made by means of pressurized lip seals, or by means of mechanical seals. In this way, any accidental lubricant overflow in the product, or any other external contamination type is totally avoided.

Thanks to the agitator cantilever design, it is possible to realize the unloading by the lower vertice, by means of special semispherical valve. The semispherical valve can be of metal to metal sealing, or by means of inflatable elastomer seal. Either of the two solutions guarantees a total watertightness, even in the presence of product, and totally avoids the losses of vacuum during the process.

This solution guarantees a total product discharge, and eliminates any deadlock, turning this equipment design totally according to the GMP and EHEDG recommendations.



Heat transmission. Tolerance between agitator and shell

A key point for the dryer efficiency is the capacity of the agitating worm screw, to renew the product in contact with the vessel hot walls. This capacity totally determines the equipment real heat exchange factor, and is consequence of how close the agitator passes to the dryer wall.

For this reason, our **MCV-NS** dryers have been designed with the aim of minimizing, within what is the technically possible, the resulting light between the agitator and the dryer shell. This value varies in function of the equipment size, the smaller it is the smaller is the model.

This point, of special importance, is verified during the construction of each equipment with the maximum accuracy, verifying in all the rotating points of the shaft, as well as in all the dryer height.

Applications

The vacuum drying prevents any type of oxidation or contamination caused by the air, in addition to avoid risks of explosion and/or combustion during the process. Moreover, the operating temperature is sensibly reduced, so that it is an ideal application for heat-sensitive products. Here are some typical applications examples:

- ✓ In pharmacy it is widely used for the drying of any solid type, specially crystallines: antibiotics, migraines, penicilinic complexes, ampicilines, intermediates, etc.
- ✓ In food industry, it is usually used in the processing of vitamins complexes, dietetics, flavours, etc.
- ✓ In chemistry, it is used very commonly in the drying of pigments and colorants.

Construction materials

BACHILLER constructs the **MCV** dryer in its workshops of Parets del Vallés.

The typical construction materials are:

- ✓ Ferritic stainless steels.
- ✓ Austenitic stainless steels, type AISI-304L or AISI-316L.
- ✓ Super austenitic stainless steels, type 904L, 254 SMO, etc.
- ✓ Duplex and super duplex steels, type SAF-2205, SAF-2507, etc.
- ✓ Nickel and chromium alloys, such as Hastelloy C-276, C-22, etc.
- ✓ Titanium.

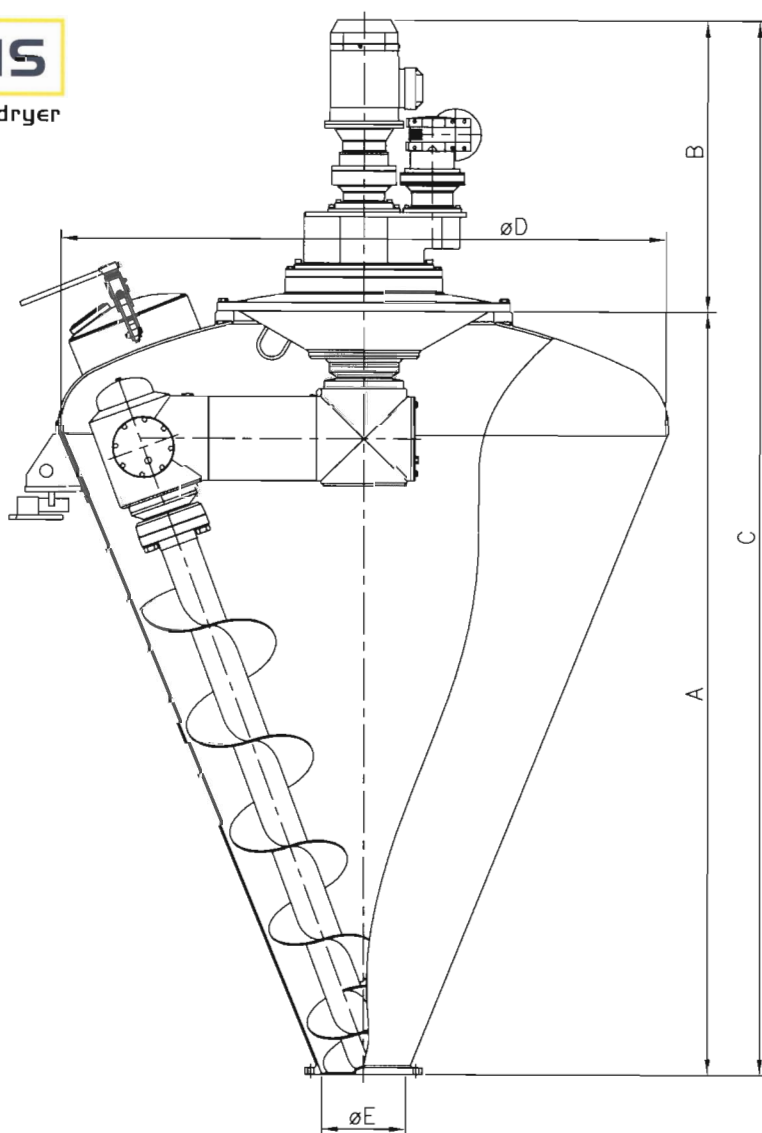
Finishing

The range of the equipment internal finishing can vary from the simple pickling and passivating, to the mechanical polishing in different grades to mirror finishing (maximum Ra < 0,2 micron) and electropolishing. Externally, the insulation can be protected by a stainless steel fairing, totally welded and watertight, and the finishing can be from mate polishing (typically Ra < 1,2 micron) to mirror polishing. Optionally, the motors and gearboxes can be faired too in stainless steel.



MCV-NS

Conical vacuum dryer



MODEL	Useful Volume (litres)	Dimensions (mm)				
		A	B	C	ØD	ØE
MCV-100-NS	100	1.250	675	1.925	1.000	250
MCV-300-NS	300	1.610	675	2.285	1.300	250
MCV-600-NS	600	1.775	710	2.485	1.600	250
MCV-1.000-NS	1.000	2.130	710	2.840	1.800	250
MCV-2.000-NS	2.000	2.900	1.150	4.050	2.300	300
MCV-3.000-NS	3.000	3.200	1.180	4.380	2.120	300
MCV-4.000-NS	4.000	3.450	1.080	4.530	2.280	300
MCV-5.000-NS	5.000	3.650	980	4.630	2.800	300
MCV-6.000-NS	6.000	3.900	1.260	5.100	3.100	300

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Complete drying installation

A drying installation is completed with a serie of peripheral elements, that optionally can be provided with the **MCV-NS/NCS** dryer..

Dust safety filter:

Element connected on the dryer, in order to obtain an efficient separation of the solid particles during the vacuum generation.

Main characteristics:

- Filtering elements of high efficiency, textiles, membranes, sinterized metal or multilayers.
- Sleeves cleaning systems by means of time-lag air or nitrogen shot, or by mechanical shock of the sleeves.
- Heating of the shell by double jacket.
- Totally watertight insulation.
- Easy dismantling of the filtering elements, by means of upper or lateral doors of easy opening, depending on necessities.

Vacuum unit:

The aim is to obtain a high degree of vacuum in the dryer chamber (up to 1 torr) and subsequently to condense and to collect the evaporated liquid, obtaining very low levels of emissions to the atmosphere. The system, that normally is provided mounted on skid, is made up of:

- Vacuum pump of one or two stages, in relation to the liquid to evaporate. The vacuum pump can be liquid ring type, oil or dry type, and can be combined with Roots type blower.
- Tubular condenser for the evaporated liquid recovery, connected to the buffering tank. These elements are sized in relation to the process. Assembly of second atmospheric stage can be provided, to improve the condensates recovery.

Heating or refrigeration unit:

For the optimal working temperature control in the drying phase and following cooling in necessary case.

- Vessels, pumps and exchangers sized according to the available services and the working conditions.
- Proportional-control and temperature-regulating valves.

Electric and process control panels:

Designed according to the system exigencies, from totally manual operation systems, with visual indication of the process variables, to totally automatic systems, validable according to FDA 21 CFR Part. 11, for the creation, modification and file of the information.



CODES AND STANDARDS:

BACHILLER have the following certifications:

- ✓ ISO 9001.
- ✓ HP-0 stamp by TÜV, according to AD-Merkblätter 2000.
- ✓ U stamp of ASME
- ✓ H1 Certification, according to European directive of pressure equipments PED.
- ✓ Homologation of the dryer according to ATEX95 category 1 GD 2 GD and 3 GD.
- ✓ Our sanitary equipments comply with the GMP and EHEDG standards.✓
- ✓ We prepare the equipments for validations by FDA.



MCV-NCS

Conical sanitary dryer



MCV-NCS

Conical sanitary dryer

MCV-NCS. Free fat transmission

The **MCV-NCS** dryer is an equipment designed and specially conceived for the pharmaceutical and fine chemistry industry, where the products value justifies a design that disables the accidental contamination of themselves. To all the characteristics and advantages described until now for the **MCV-NS**, the fact that our **MCV-NCS SANITARY** dryer does not use fat in its transmission system to the mixing screw is added. This guarantees that, until in the case of a catastrophic breakdown, like the transmission arm breakage, the risk of any lubricant discharge in the product is eliminated.

In fact the raised hypothesis is extremely improbable, not to say impossible, since the **BACHILLER** conical dryers are very widely sized, which confers them an extraordinary mechanical reliability. Nevertheless, in severe accidents prevention, and as answer to the pharmaceutical industry demands, we have created the **MCV-NCS**.

The transmission to the mixing screw is made by a special belt, widely oversized, and of lubricant free operation. This execution is the excellence with regard to mechanical design, and absolutely assures the discharge impossibility, even accidental, of fat in the product. The belt working life is in relation to the efforts to which it is submitted, which is directly related to the process and the phases that the product acquires during its drying, but surpasses as a minimum the 10,000 running hours.

The **MCV-NCS** incorporates as watertightness of the main shaft, pressurized lip seals in standard execution. In the mixing screw shaft, a mechanical seal also pressurized is installed. As a special execution, both shafts can be tight with mechanical seals, even in sterile execution.

Heated shaft. Cold points absence

As an answer to exigencies in very specific processes, we can even heat the agitator shaft, by means of a novel conduction system, also designed against the heating fluid accidental discharge.

CIP cleaning and SIP sterilization

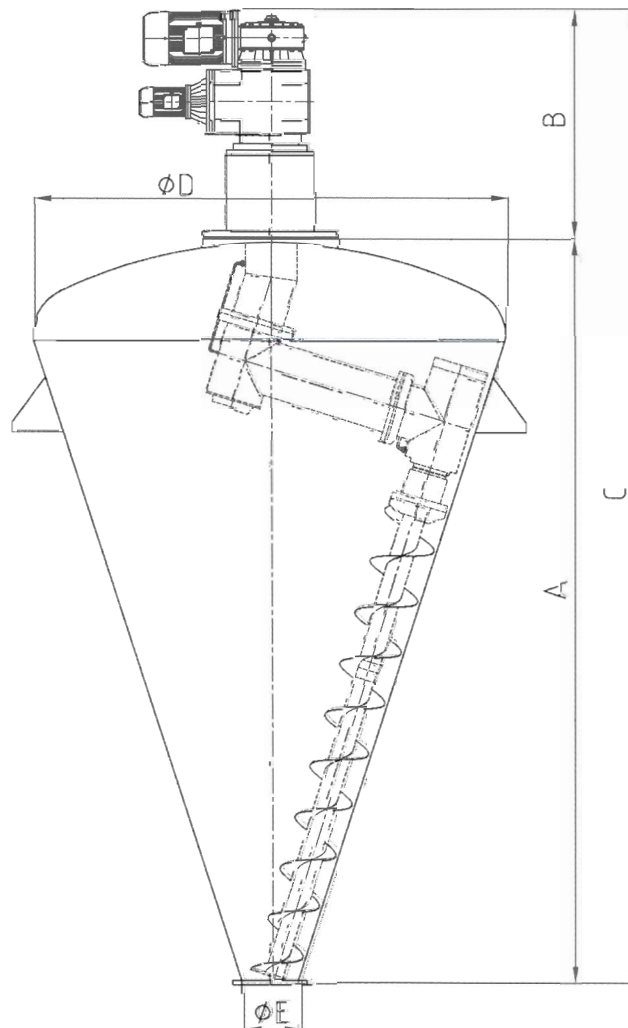
Our **MCV-NCS** sanitary equipments are provided with cleaning systems in CIP position, by means of the spraying from strategic points of the washing solution, and its following piping. This system includes cleaning in the vacuum filter, transmission arm upper parts and the discharge valve lower part.

For the SIP system, the same strategy as in the CIP is used. Nevertheless, a sterilization system of the mechanical seals as well of the main shaft, as of the mixing screw is included. The system sterilizes from the outside of the mechanical seal fretting faces.



MCV-NCS

Conical sanitary dryer



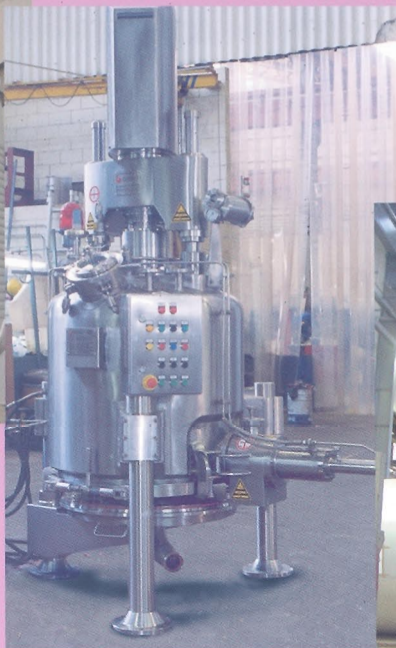
MODEL	Useful volume (Litres)	A	B	Dimensions (mm)		
				C	ϕD	ϕE
MCV-100-NCS	100	1.475	700	2.175	950	250
MCV-300-NCS	300	1.976	700	2.676	1.250	250
MCV-600-NCS	600	2.385	1.150	3.535	1.600	250
MCV-1.000-NCS	1.000	2.785	1.100	3.885	1.806	250
MCV-2.000-NCS	2.000	3.558	1.525	5.083	2.132	300
MCV-3.000-NCS	3.000	4.250	1.270	5.520	2.670	300
MCV-4.000-NCS	4.000	4.476	1.270	5.746	2.790	300
MCV-5.000-NCS	5.000	4.640	1.250	5.890	2.795	300
MCV-6.000-NCS	6.000	4.960	1.350	6.310	3.200	300

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REACTION



FILTRATION / DRYING



DRYING



MIXING



HOMOGENIZING / DRYING



BLENDING



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