TRI-CHOP
GRANULATING MIXER

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with you, step by step

TRI-CHOP FOR LABORATORY

MGR-1, MGR-5 & MGR-1/5

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TRI-CHOP granulating mixers have been developed to optimise the processes of mixing, granulation, and drying of powder solids in a clean and tamper-free environment. We offer two models, both suitable for small batch productions or for product research in R&D laboratories, which can later be scaled up to industrial granulators.

Their main advantages include: a short mixing time (less than 3 minutes) and that all processes are integrated in a compact, easy-to-clean unit.

We manufacture a third duplex model, which allows the assembly of two bodies of different capacities, providing the possibility of producing two different batches in the same equipment.

Optionally, they may incorporate a fluidisation system at the bottom by means of dry air, which helps to speed up the drying process.

MGR-1 TRI-CHOP granulator installed in a clean room

MGR-1/5 TRI-CHOP Duplex granulator

Technical Data

Model	Volume (L)		Three-blade power (kW)	Chopper Power (kW)
	Useful	Total		
MGR-1	0.5 - 1.5	2.5	0.37	0.37
MGR-5	2 - 7	10	0.75	0.75
MGR-1/5	0.5-1.5 / 2 -7	2.5 / 10	0.37 / 0.75	0.37 / 0.75

INDUSTRIAL EQUIPMENT

MGR TRI-CHOP granulators have been developed to optimise the mixing, granulation and drying processes of powdered solids in a clean environment, without manipulations and in a single manufacturing process. In one operation, the TRI-CHOP mixes (with an accuracy of up to 1:100,000 parts); moistens solids by means of binding liquids; granulates, and dries.

These machines are designed and constructed with materials in compliance with GMP and FDA regulations.

TRI-CHOP granulators are particularly suitable for the granulation of pharmaceutical products with binding liquid (organic/inorganic), the granulation of effervescent products, and for the homogenization of batches.

MGR-150 TRI-CHOP granulator in a monobloc cabinet with the cover raised

THEORETICAL PRINCIPLES OF WET GRANULATION

The objective of this process is to increase the size of solid particles, whether they are pure products or mixtures. The most common reasons to carry out a granulation process are:

» To prevent the segregation of components in a powder mixture.

» To homogenise the particle size to ensure uniform content in the mixture.

» To improve flow properties.

» To enhance the compaction characteristics of the mixture.

» To reduce risks in case of hazardous products.

» To reduce issues associated with hygroscopically.

» To increase density.

The most common steps in the granulation process are:

» Mixing of the primary powder particles with the granular mixture.

» The granular mixture should contain a volatile liquid to be removed during the drying process and may also contain a binder ensuring adhesion once the granulate is dry. The adhesion improvement is due to the formation of solid bridges between the particles through solidification or crystallization of the binder.

» Vacuum drying.

Components

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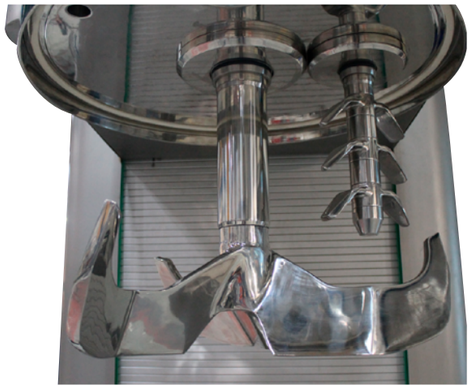
THE COVER: Mounted in a fixed position, it is designed to achieve excellent vacuum sealing, ensured by the pressure exerted by the hydraulic lifting system of the vessel. It is equipped with different accessories that allow: the introduction of solids; the admission of granulating liquids; connection and control of vacuum; and process visualisation through a light point with a halogen lamp.

THE PROCESSING VESSEL: It is attached to the bedplate by two lateral supports that keep it aligned with the equipment and allow it to be raised and lowered to be coupled to the top cover. For drying processes, it incorporates a double cooling or heating jacket. In smaller models, the vessel is emptied by hydraulic tilting. In industrial ones, the tank has a tangential valve at the bottom that allows emptying with the triple-blade agitator in operation. Optionally, a fluidisation system can be installed at the bottom of the tank for drying with gas.

DOUBLE COMBINED AGITATION SYSTEM: Designed for mixing and granulation operations. It is installed on the cover and has a clean design, without any internal screws or potential contamination points, ensuring quick cleaning and compliance with FDA regulations and GMP recommendations.

» **Triple-blade agitation:** The mixing operation is carried out by means of a triple-blade agitator that cover the entire inner diameter of the tank, with a minimal clearance to the flat bottom. Its robust design and construction, with inclined faces and a slow movement, facilitate the product to move towards the lump breaker.



Detail of the triple-blade and the chopper shaft

On request, the triple-blade design can be adapted according to the product.

» **Chopper agitation:** The granulation operation is achieved with the chopper shaft, which is equipped with a set of high-speed de-lumping blades. During the wetting of the product, this agitation breaks up the clumps that tends to form, thus facilitating granulation in conjunction with the drying process. Inside the chopper there is a probe that monitors the product temperature, as this is a critical point where a great deal of energy is generated. This probe allows for temperature control, preventing the thermal degradation of some ingredients, such as active pharmaceutical ingredients.

Optional accessories

SUPPORT SYSTEM: Lleal offers two types of structure depending on the equipment's placement: a metallic structure where all the mechanical, hydraulic elements, and services are installed, protected by a stainless steel fairing, with access doors and access to the electrical panel, forming a monobloc cabinet. The other option is a panellised structure for clean room placement, where all mechanical elements and services are integrated into a technical area.

MGR-200 TRI-CHOP granulator with monobloc cabinet and transport hand-truck for the process vessel

View of a MGR-1200 TRI-CHOP with panelled bedplate, installed in a clean room of a pharmaceutical company

DOSING OR PERISTALTIC PUMP: Used for the addition of liquids through a spray type injector that vaporises the binder into micro droplets, enhancing the granulation process.

VACUUM SYSTEM: TRI-CHOP granulators are designed to work under vacuum. This is used to facilitate product drying and prevent adverse reactions of some components. Additionally, the vacuum system can also be used for automatic loading of solids, by optionally installing solenoid valves in the vacuum circuit and a programmer in the electrical panel. Lleal can optionally supply the most suitable vacuum unit for your equipment, as we work with highly prestigious brands.

AUTOMATION AND CONTROL: In order to provide maximum versatility to the TRI-CHOP granulators, Lleal offers a wide range of automation and control options, adapting the equipment to each customer's needs.

- BASIC: Simple controls using push buttons and frequency inverters installed on a control console.
- ADVANCED: Semi-automatic function control by HMI + PLC.
- PRO: Industry 4.0, installation with Audit Trail recipes, etc.
- PHARMA: 21 CFR 11 compliant according to GAMP-5 guidelines.

Lleal's technology is offered with upgradable systems, allowing the evolution of the equipment during its lifespan according to the customer's needs.

Optional accessories

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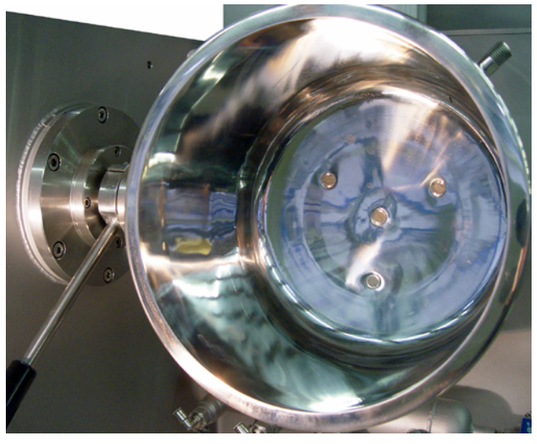
WATCH VIDEO

CIP (CLEAN IN PLACE): The vessel can be cleaned independently of the equipment by filling it up to one- third of its capacity with washing and rinsing solutions. Upon request, cleaning balls can be installed and connected via automatically operated valves to an external CIP or WIP cleaning unit.

AIR FLUIDISATION SYSTEM AT THE VESSEL BOTTOM: The dry and clean gas fluidisation system is designed to accelerate the drying process. After the wetting phase, the product must be dried. This is done by providing heat through the double jacket and applying a vacuum inside to lower the solvent's vapour pressure. By injecting gas with regulated pressure and flow rate, this air (or inert gas) is saturated to carry away moisture and speed up the drying process.

3D view of a CIP cleaning unit



VESSEL HAND-TRUCK: In order to facilitate unloading and moving the tank, a tank hand-truck can be provided. It is made of stainless steel and equipped with conductive or PTFE wheels with brakes.