

Roller Compactors for the Pharmaceutical Industry



Alexanderwerk

Roller Compactors for the Pharmaceutical Industry

Granular Materials in Pharmaceutical Production

75% of pharmaceutical remedies and preparations are administered in the form of solid dosage, a large share of which is in tablets or capsules. In addition to active substances, tablet formulations are composed of a number auxiliary agents and additives such as fillers and flavorings.

In many cases the powder mixtures cannot be processed into the finished form by direct compression in a tablet press because of the poor handling properties of the powder. Segregation, partly filled press dies and inconsistent final product may result.

To economically and gently process such powders into the final product, the powder should be transformed into granular material. This influences the materials physical properties such as particle size, distribution, hardness, bulk density and surface area. Unlike the powders from which they are formed, granular materials are characterized by significantly improved flowability and an increased density. This means:

- Granular materials can be easily and accurately dosed (e. g. when being fed into tablet presses).
- Less dust occurs inside machines or working spaces; resulting in lower OEL's and subsequent reduced health risks to operators. The noticeable reduction in dust also results in extended machine life of the final form machinery.
- Solubility or dispersion rates are often improved by the formation of the compacted granulates.
- Homogeneous distribution of the active substance.



Roller Compaction

From a process engineering point of view granulation through roller compaction is known as dry granulation. No chemical substances other than those present in the final product are used. Usually, no addition of binding agents or liquid is required; rather, the material is granulated through the application of mechanical compacting forces.

The production of granular material is a three stage process:

Feeding

The powder is transferred to the compaction process via a suitable feeding system.

Compaction

The powder is compacted into a homogeneous and solid ribbon between two compactor rollers. The density of the ribbon is clearly higher than that of the powder. Air is displaced during compaction and must be vented from the process.

Granulation

The ribbon produced in the compaction process is initially reduced to a flake and thereafter granulated to the desired size range via appropriate multi staged comminuting machines.

Granulation through

Alexanderwerk Roller Compactors:

Although this process has been established for a number of decades, compacting granulation is still a relatively new technology in the pharmaceutical industry. Recent developments in manufacturing technology have made it possible to produce roller compactors that meet the demanding pharmaceutical requirements. The use of these latest designs facilitates the production of uniform high quality granular materials and as such, dry granulation is becoming the process of choice.

The quality of the finished granular material is greatly influenced by the quality of the compressed ribbon. For optimum conditions, a constant compacting pressure in conjunction with a consistent product in the roller nip area is required. Alexanderwerk's process control system compensates for physical variations in the product feed (e.g. localized nonhomogeneity). Thus, all process parameters (throughput rates, ribbon density, compacting pressure, and linear speed) can be controlled with repetitive accuracy.

The vertical roller arrangement of the Alexanderwerk compactors guarantee product feed regardless of gravitational forces so that any dust passing through the machine can be separated and uncompacted nip leakage is prevented from entering the final product.



The tools used in the pharmaceutical roller presses made by Alexanderwerk are of a cantilevered design. This allows easy and quick dismantling, intense cleaning and product change at short notice.

Alexanderwerk has developed a roller cooling system specifically for use in its pharmaceutical machines. With this cooling system, the cooling water is pulled through the rollers in a partial vacuum (with conventional designs it is pumped through with positive pressure). The vacuum approach avoids any risk of cooling water entering the product. No water can leak, even in the event of installation, operation, or service related errors.

The Patented Combi-Vent-Feeder® Technology: Vacuum supported Feeding

With roller compactors the raw material is generally fed to the machine by means of an auger system. From an economic point of view, mass flow rates as large as possible should be achieved. For this reason, Alexanderwerk concentrated on the optimization of the feed modules. An important event in this development process is feeding via the patented Combi-Vent-Feeder® system.

During the compaction process air is displaced from the powder, and an air flow is generated in the direction opposite to that of the product feed. Since there is no means by which the air should escape via the roller nip area or sealing elements, it exits through the feed hopper. This passage of air prevents raw material from being uniformly fed into the auger. With the Combi-Vent-Feeder®, by Alexanderwerk, an additional "chamber" is arranged adjacent to the raw product hopper. This provides a route for the air to freely escape. As a result of this arrangement the raw product can be fed to the auger in a more uniform manner, back pressure inside the auger is eliminated, and the overall process is both more uniform and efficient.

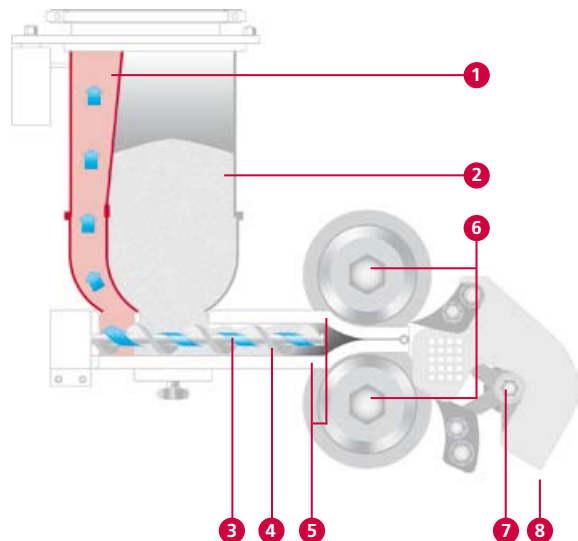
An additional side effect of this arrangement is that undersized material or dust (for example from the uncompacted fines resulting from nip leakage) as well as minor additives, can be introduced via the secondary chamber.

Moreover, the feed unit can be designed as a partial vacuum feed system. Here a vacuum is applied to the auger housing and "forces" the air to return in a defined manner. Thus high throughput rates can be achieved for very light and highly fluidizing raw materials.



Feed hopper in Combi-Vent-Feeder® design as standard.

- 1 Vent for displaced air and feed hopper for undersize and oversize at the same time
- 2 Material feed hopper
- 3 Nozzel for level probe



Optimized feed through the Combi-Vent-Feeder® technology illustrated on the example of a WP 200 Pharma

- 1 Venting of displaced air, simultaneous dosed feeding of undersize, oversize, additives
- 2 Feeder for raw material
- 3 Air flows back across the screw feeder flights
- 4 Horizontal screw feeder
- 5 Optional vacuum unit facilitates enhanced raw material feed
- 6 Compacting rollers
- 7 Flake crusher for pre-crushing
- 8 Transfer of the final compacted product

Examples of Granules



Antibiotics



Riboflavin



Natrium Bicarbonate



Spice extract



Lactose



Flavour

Applications

Pharmaceutical and other companies throughout the world have utilized Alexanderwerk roller compactors for over 50 years in the production of tablets, capsules, Life-Science products, flavorings, instant powders, non-caloric sweeteners and many similar products.



Roller Compactors made by Alexanderwerk



Roller Compactor **BT 120 Pharma**

With its highly integrated design, the extremely compact size and a throughput of up to 8 kg/hr., it is the best machine available to advance into galenics. This machine comes with integrated electrical compacting pressure generation and control.



Roller Compactor **WP 120 Pharma**

With the WP 120 Pharma Alexanderwerk offers a full feature compactor and granulator specifically designed for use in Research and Development Departments. Quantities, as small as five gram (5g), can be successfully compacted into granular form by use of special small batch attachments. Additionally, throughputs as high as 40kg/hr make the WP 120 Pharma suitable for granulation in the lower production ranges.



Roller Compactor **WP 150 Pharma**

With its sealing system customized for containment and a throughput of up to 150kg/hr., the WP 150 Pharma roller compactor is about the finest machine when it comes to compacting or granulating highly efficient preparations.



Roller Compactor **WP 200 Pharma**

The WP 200 Pharma has an optimized design for production facilities. With a throughput range of 10 to 250kg/hr., the compactor is capable of operation for a wide range of applications, be they small batch or full scale production.



Roller Compactor **WP 200 S**

The WP 200S has an optimized design for pharmaceutical production and special requirements. With a throughput range of 10 to 400kg/hr., the compactor is capable of operation for a wide range of applications, be they small batch or full scale production.