Application Example

Tablet Press Lubrication

Introduction

The Coperion K-Tron Tablet Press Lubricant Feeder is an adaptation of Coperion K-Tron's sanitary pharmaceutical design twin screw feeder and features the addition of a specialized gas venturi for aspiration of the lubricant direct to the tablet press .

Lubricants (such as magnesium stearate) are used in tablet press applications to reduce the compression force during tabletting, to avoid product buildup on the tablet press tools (dies as well as punches), and to make the tablet surface smooth. Control of the precise amount of lubricant into the process is critical to the overall product quality. If too much lubricant is added the tablet can often become softer than required. This becomes critical in the making of effervescent tablets, where excessive magnesium stearate can actually cause the tablet to repel water, thus affecting the dissolution into water.

When mixing the lubricating agent directly into the mixer, a higher percentage of lubricant is often utilized than is required for the end product quality. As an alternative, when spraying this lubricant directly into the tablet press tooling, the overall consumption is reduced drastically, sometimes by as much as 97%!

The introduction of the lubricant directly to the press tooling ensures that not only is there less sticking of the product to the tablet press, but also that significantly less lubricant is used overall.

Tablet applications can be found in many industries, such as: pharmaceutical, biotechnology, food, animal feed, chemicals, detergents, ceramics, powder metallurgy, nuclear fuels, etc.

Process

Lubricants are fed continuously by means of a twin screw feeder directly into a gas injector. Twin screws are used due to their suitability to convey cohesive materials, and the consistency of feed without buildup in the screw trough. The gas in the pneumatic conveying line conveys the lubricant to a nozzle which is fixed to a tablet press. The nozzle is mounted on the press in such a way that all surfaces of the tablet press tools that are in contact with the granulates or free flowing bulk solids (the dies as well as the punches) are uniformly coated with lubricant. Any dust created inside the tablet press is usually eliminated by an exhaust air system.

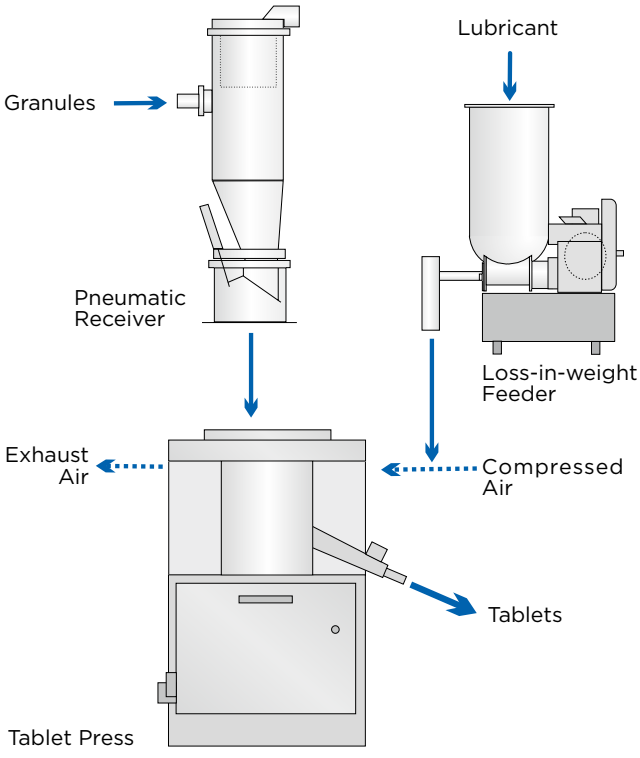
Typical features of this design include:

- Gravimetric or volumetric feeder configurations. NOTE: Use of gravimetric design enables validation of product mass flow and ensures higher accuracy
- Portable cart design complete with independent control panel or separate mount design for integration with tablet press controls
- K-PH-KT20 pharmaceutical feeder design complete with sanitary construction
- All stainless steel material contact surfaces, pharma grade components and polished surface finish throughout
- Totally enclosed motor and instrumentation housing for clear separation between product and technical areas
- Venturi controls include pressure regulator and integral interlocked pressure switch to ensure flow of gas to venturi
- Screw removal and access to venturi from product side
- Typical lubricant feed rates: 0.2 – 2 kg/hr (0.44 - 4.4 lb/hr)

Left: Volumetric Tablet Press Lubricant Feeder integrated on a portable cart

Right: Gravimetric Tablet Press Lubricant Feeder in a separate mount design for integration with tablet press controls

Direct Lubrication of Tablet Press



Tablet Press Lubrication

- Sieve in outlet of screw trough to prevent clumping of product and ensure even distribution of powder to venturi unit
- Advanced SmartConnex controls
- Exclusive Smart Force Transducer (SFT) digital weighing with true 1:4,000,000 in 80 ms resolution

By utilizing the tablet press feeder technology, the Coperion K-Tron Tablet Press Feeder provides accurate delivery of lubricants direct to the tablet press. It meets the pharmaceutical industry's very strict requirements of reproduceability and linearity. Tests on the feeder can be performed on the customer's site or at one of K-Tron's Test Lab facilities.

Volumetric vs. Gravimetric Control:

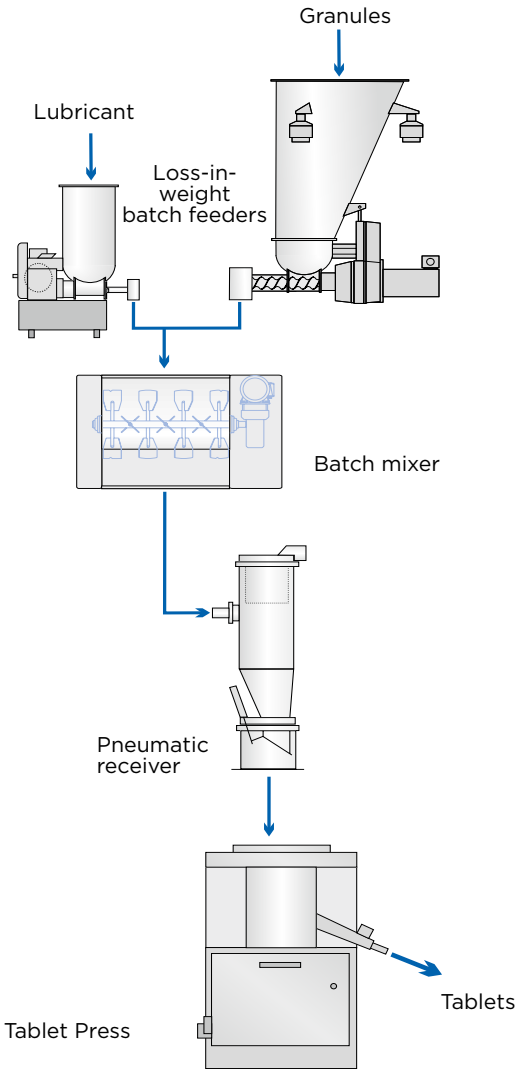
The twin screw feeder can be supplied in either a volumetric or gravimetric configuration. In volumetric mode the twin screw feeder runs at constant speed. Typically with difficult flowing or high cohesive materials (such as magnesium stearate), volumetric screw feeders can have high variations in feed rate because of non constant filling of the twin screws, due to bridging for example. Therefore, when used with volumetric control, the constant mass flow of the lubricant cannot be accurately validated. However, because a load cell or weighing device is not used, this design is sometimes viewed as being simpler and requiring lower investment cost.

By utilizing Coperion K-Tron's patented load cell technology, the feeder can operate in gravimetric mode. Gravimetric mode means that the weight of the lubricant is continuously measured and the controls keep weight reduction per time constant by adjusting the speed of the twin screw feeder. By adjusting speed to maintain a consistent mass flow (or weight per time), the unit can be validated to prove a steady and uniform feed of lubricant to the tablet press. In addition, due to the extremely short time in which the tools can be lubricated (e.g. parts of a second), high short term accuracy which is only available with a gravimetric feeding system is an essential benefit. The increased investment cost is balanced out by the savings in lubricant cost since there is far less waste.

Benefits

- Nearly constant feed rate (twin screw feeder)
- Uniform coating of the tablet tools
- No sticking problems
- Automated, continuous process
- Lower investment and operation costs
- Less stearate consumption

Traditional Process



In a traditional process lubricant is mixed with the granules or free-flowing bulk solids before they are compressed in the tablet press. Because the granules and lubricants vary greatly in particle size and in bulk density, the risk of demixing is very high. That means it is nearly impossible to achieve a uniform mixture. Many manufactures tend to overfeed lubricants because to ensure the lubricant concentration in a tablet is not too low.

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