Choosing A New Tablet Press

Understanding the relationships between the press, tooling and granulation is crucial in selecting the best press for a tabletting application.

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Deciding which tablet press to buy can be a challenging process – there are a variety of manufacturers, options and sizes to choose from. Before jumping right in, there are a few crucial things to consider about the tabletting process which can greatly improve the value of your final choice. It will also be helpful to be aware of some common misconceptions about tablet presses so as to avoid the pitfalls that they bring. An understanding of the primary components of tablet production and how they affect one another is critical, and will make the selection process much easier.

THREE MAIN COMPONENTS OF TABLET PRODUCTION

A tablet press does not live in a world of its own. It is one of the three key components involved in producing a compressed tablet: presses, tooling and granulation. Any discussion of tablet presses would be faulty if press tooling and granulation were not considered. These three components are intertwined in any production process and each directly affects the others.

The tablet press is usually viewed as the largest part of the production process because of the cost and the fact that everything comes together in the press to produce the final tablet. The size and capabilities of the press will determine what size of tools can be used and how much compression force can be applied to produce the tablet. A variety of press sizes and features are available – all with different advantages. For example, a press with an interchangeable turret (Figure 1) can speed up changeovers and give extra flexibility.

Granulation flow, press speed, pre-compression capabilities, layer capabilities and compression tonnage are all critical factors in determining what can be done with a press and how well it suits the needs for which it was purchased.

Granulation is the next component involved in the tabletting process. It will flow from the supply hopper through the press and be compressed into tablets by the tooling; it will also have specific requirements for compression in order to achieve the hardness desired for a tablet. In turn, these compression requirements have a direct correlation to what size tooling can be used and, in turn, what press capabilities are needed to run them.

The flow characteristics of a granulation will dictate feed system needs and affect the speed at which the press can successfully produce tablets. How well does a granulation flow through the press and into the dies? Any reactive properties of the granulation will directly affect the tooling and its life-span. A reaction between the granulation and the tooling can lead to tooling with corrosion and abrasions, as well as tablet problems such as ‘sticking’ where granulation is adhering to the punch face.

It is extremely important to learn as much as possible about a granulation during the R&D stage, so that this information can be transferred over when it comes time for production.

The final component of tabletting is the press tooling. Once the granulation is fed into the dies, the tooling compresses it and creates the tablets.

The design of the tablet being produced will play the largest role in determining the tooling requirements. In order to avoid potential production problems, it is very important to work closely with the tooling vendor to create the optimal tablet design. Press tooling comes in a variety of sizes and materials, and many factors involved in their production will affect the tablet they can produce.
Various grades of steel, carbide tips and coatings all offer advantages depending upon the properties of the granulation that the tools will be used to compress, the tablet design and the type of press on which they are run. Different tools can handle different amounts of compression force depending upon the press and the speed at which the press is run.

These three components of tabletting are all tied closely together in the production process. It is very important to consider the interaction between them in order to choose the tablet press best-suited to a particular application. The more specifics that are known about a granulation, and what it takes to make it into tablets, then the more successful the choice of press will be.

COMMON PRESS MISCONCEPTIONS

There are many misconceptions about presses and their abilities. Below is a brief list of the most common press misconceptions, which can cause problems in the tabletting process. Hopefully, correcting these misconceptions will aid in choosing the best tablet press for the job.

1.) *A granulation developed and run on a laboratory press will produce an identical tablet using the same parameters on a production press.*

- FALSE

It is critical to always take into account the differences between the R&D development process and the final production process. Any differences in these presses or tools can potentially cause problems.

Due to production needs, the speed at which the press is run when in R&D can often be very different from the speed at which the press needs to be run in production; the difference in these speeds can lead to tablet hardness and compression issues. Once in production, the approach often is to increase compression to solve any problems, but this in turn can lead to tool fatigue and capping of tablets.

A difference in tooling size or tablet shape will also contribute to compression issues. A ‘B’ size R&D tool run in the same model ‘D’ size tool will have very different compression parameters.

It is very important to always examine the difference between the R&D laboratory environment – press, compression rate, speed, tool size and tablet shape – so as to avoid problems at the production stage.

2.) *If a tablet press is rated for a high mechanical RPM, then a specific granulation will run at the press’ maximum speed.*

- FALSE

All granulations are unique and will have different compression needs and flow characteristics. These factors directly determine the speed at which a press can be run when producing a tablet for any given granulation. A tablet needing a higher amount of compression may require the press to run at a slower speed and may also require the use of pre-compression. The compression needs of a granulation must be carefully examined in order to determine how it will affect the speed at which the press can be run.

Additionally, the tool size will also be a factor in the speed at which the press can be run. A ‘D’ size tool has a longer dwell time than a ‘B’ size tool. This will give greater tablet hardness in the final tablet, while running at the same speed when using the ‘D’ size instead of a ‘B’ size.

Throughout the R&D process, there is much to be learnt about a granulation, its characteristics and its compression needs. This is critical in determining the speed at which a production press can be run.

3.) *All tablet presses feed the same.*

- FALSE

Different presses use different feed systems; the feed system directly affects how the granulation flows into the dies for compression. An inconsistent flow is the number one factor which can limit the speed at which a press is run.

It is important to be aware that there are three types of feed system:

- **Open feeders** In a basic open feeder, granulation is gravity-fed from the supply hopper to an open feeder on the die table. Exposed powder can be seen as it passes over the die table and into the dies. This method relies on gravity and the flow characteristics of the granulation to control the weight of the tablet.
**Closed, recirculating feeders** Here, the powder flows in a closed environment, often controlled with electronic sensors; powder not entering the die is then re-circulated. The density of the flow is better than with open feeder systems, but is not completely controlled and can fluctuate with electronically created surges. These surges occur when the feeder has detected a low level of powder and drops a large amount back in. The weight of the newly added powder compresses the powder underneath more than the powder on top. This in turn can lead to tablet weight variation.

**Closed, non-recirculating feeders**

All granulation is captured in the feed shoe and enters directly into the die; there is no re-circulation of the granulation (see Figure 2). The granulation is fed through a variable speed feeder in two stages. A computer monitors the level of granulation in the feed shoe, and replenishes it at exactly the same rate as it is being used by the press. This system ensures a consistent density of granulation in the die, minimising tablet weight variation.

Once a press is purchased and installed, a key factor to remember is that extra help will be needed from the press vendor for validation and technical service. A solid partnership with the press vendor will be critical to success.

Companies must perform a validation process on their new press, and a key factor to consider when selecting a press is the level of validation services available from the press manufacturer. Assistance from the press vendor can help reduce validation time from weeks down to days. Pharmaceutical companies cannot start their tablet production on a new press until the validation process is complete. To what level is the vendor prepared to be involved?

Additionally, the quality and availability of follow-up service and spare parts from the press vendor will be critical to ongoing success. What is their reputation in the market for providing good timely technical support?

A problem during tablet production can bring an operation to a screeching halt. That is when a fast knowledgeable service will be needed, along with quick delivery of spare parts.

**CONCLUSION**

When buying a new tablet press, there is a variety of manufacturers and a wide range of sizes and options to choose from. Which ones will suit best? An understanding of the relationship between the press, granulation and tooling will aid greatly in making the right choice.

Above all, it is important to consider production requirements carefully, as well as a tablet’s specific characteristics. These are critical because if a tablet can’t be made successfully at the time it is needed, then nothing else is going to matter.

The tablets being produced will play a large role in determining what press features are most needed. The characteristics of the tablets and, more specifically, the characteristics of the granulation should be carefully examined in order to determine which press is the most suitable.

If a new product is being run, it is important to work closely with the R&D team and tooling vendor in order to make a smooth transition into production. Differences between the production environment and the R&D environment must be taken into consideration in order to avoid problems.

A good relationship with press and tooling vendors can bring a wealth of knowledge on the subject. Their expertise and service can help avoid problems and keep production running smoothly. The chances are that they have already dealt with the problems likely to be encountered, and so it is best to work closely with them throughout the entire process.

Deciding which tablet press to buy can indeed be a challenging process, but now you should be feeling a bit more prepared. Understanding the relationships between the press, tooling and granulation is crucial in selecting the best press for an application!

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