

Improve Tablet Production Efficiency of Veterinary Medicine with Key Methods

Improving the production of pharmaceutical tablets is extremely important within conventional medicine, with companies going to great lengths to ensure they have production running efficiently. The same is true with the manufacture of animal dosage forms. As time and capital implications become drivers within the production of veterinary tablets, investigation into improving production methods is taking place and the knowledge of tooling manufacturers is being called upon.

Efficiency in solid dose manufacturing can be improved at the earliest stages of the tablet design process, by utilising precise tooling specifications. The design and material selection can have a major influence on the final product.

Tablet tooling manufacturers can optimise the design and material selection to allow the best possible productivity for the tablet tooling in the press. This is done by obtaining clear basic information on the product. It is important to firstly look at the formulation being used, as this can have a significant influence on tablet design, tool material selection and coating. Animal solid dose forms tend to have high drug to-excipient ratio. Elements like this must be considered when at the drawing board and before putting designs into production. Understanding the formulation and any potential problems during production is key.

Some formulations can cause adverse effects on the punch tips when under compression, causing abrasion, pitting or corrosion. Although tools are manufactured from hardened and tempered tool steel, the demanding processes can lead to deterioration if the tool material is not optimised to suit the formulation being compressed.

Issues You Might Encounter



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Free & Tooling
Details
Information
about your
equipment

70
YEARS
1944 - 2014

Figure 1 - Issues you might encounter (Sticking, Pitting, Corrosion, Wear)

These effects can be reduced by understanding the nature of the formulation to be compressed and carefully selecting a tool steel and/or tool coating to resist this at the

earliest stage of the tool specification process.

Take Time to Dwell on it

Dwell time is the time that the punch head remains in contact with the compression roller and is another important factor to be considered when initiating good tooling set-up.

Many tablet formulations are dwell-sensitive and require more time under compression to guarantee they come off the press without any faults. Some granules are extremely difficult to compress effectively and require extended time under peak compression to obtain the required tablet hardness and prevent any problems.

Slowing the tablet press down to achieve an increase in dwell can eradicate these issues, but this leads to a reduction in tablet production. With the help of a tablet tooling expert who has innovative tooling solutions, it is possible to increase the dwell time without slowing the press speed.

Let the Tablet Take Shape

The correct tablet shape and profile are key in finding a successful tooling specification. The choice of shape and profile is critical as different tablet shapes and profiles can present different challenges. There are two basic tablet shapes; round and non-round – however, the complexity of non-round shapes is extremely varied, and many complex designs may require specialised tool manufacturing capability.

Once the shape has been decided, the next thing to consider is the tablet profile. The type of profile required is influenced by several factors; the granule, embossing requirements, coating process, packaging and the company's branding.

If the design is to be heavily embossed with a lot of characters, it is important to avoid tablet profiles with a deep cup, as they can cause a softer core which can lead to sticking. It will also reduce the available space for the embossing itself; the use of a profile that is shallower with a reduced cup depth will allow for a larger embossing area.

PROFILE

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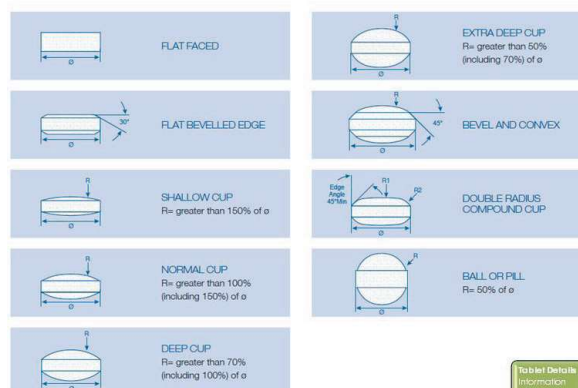


Figure 2 - Tablet Profile Don't Let Sticking Stop

Tablet Details
Information
about your
product

70
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Don't Let Sticking Stop Production

When considering the visual appearance of the tablet, it is crucial to think about the type of font and logo. Typefaces and designs must take into account practicality of tablet manufacture.

Tablet designers need to consider how the identification will scale up and down according to the size of the tablets being produced.

There should also be focus on the correct font style to avoid tableting problems such as 'sticking' and 'picking'. Sticking occurs when particles of the tablet formulation adhere to the punch face. It has a negative effect on appearance of the tablet and can become so serious that production can be interrupted, and in extreme cases the punches may have to be removed to be cleaned. This is disruptive, labour-intensive, reduces yields and increases production costs.

Picking is another problem directly linked to tablet design. Picking is compressed granule that has adhered to the detail on the punch face, resulting in 'picking out' of parts from the tablet face. To reduce picking, the best practice is to design font styles that have large open counters and no sharp corners, which could act as a trap for granule. Selection of the right font style can also help to avoid coating problems, tooling failures and lack of distinction. Failure to consult with an expert tablet design team could result in a product that looks good on paper but is not practical to produce.

WHAT'S THE DIFFERENCE BETWEEN STICKING & PICKING?

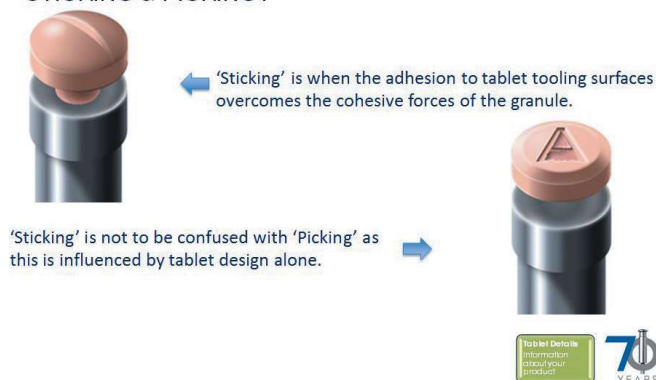


Figure 3 - Sticking v Picking

To Coat or Not to Coat?

Consideration should be made as to whether the tablet is to be coated. Successful coating is dependent on tablet cup profile and its ability to roll to ensure even coverage. Applying a double radius profile would help if the product is to be coated as it allows the tablet to roll better in the coating pan. If a flat bevel profile, for example, was applied, the tablet would just skid in the pan and not roll, leading to a number of problems including twinning, when tablets stick together. This is normally caused by the flat surfaces of the tablets coming into contact and adhering to each other. To avoid this, a slightly curved surface can be applied, which reduces the contact area and eliminates the problem.

The process of defining the best shape and profile for the coating process can be addressed easily if an effective tooling specification is implemented. Problems like twinning will have a major effect on tablet waste, however they can be avoided with the expert knowledge of the tooling supplier.

Complicated Designs and the Outcome to Tooling

Tablet tooling must combine intricate design and functional requirements to ensure productivity and durability are at their maximum in manufacture. To follow this important process, tool coatings are commonly used to offer a solution to tablet punch and die wear and solve sticking issues. It is important to remember that punches and dies are the most critical interface with the tablet, so using the correct material and coating is imperative.

COMPLEX DESIGNER SHAPES



Figure 4 - Complex Designer Shapes

Put Systems in Place

In the manufacture of animal solid dose, the importance of efficiency and accuracy in managing and monitoring tooling is paramount. Without a system that controls the procedure effectively, there can be adverse effects to the bottom line.

Installing a system that allows tablet manufacturers to keep a record of the tablets being produced from the quantity to batch information, production can run efficiently. There are innovative systems out there that can incorporate this whilst including in-depth guides to tooling specification and troubleshooting, so any problems are flagged up and rectified quickly, resulting in increased productivity, saving both time and money.

Implement Analysis

Stress and fatigue analysis of a punch tip should be considered by using finite element analysis (FEA) to identify areas of high stress concentration which can lead to breakage.

An expert tooling designer will be able to add appropriate strengthening features such as blended lands and profile changes and ensure embossing detail is not in direct proximity to the high-stress areas.

One of the most important features of any tablet design is the blended land. Often, tablet manufacturers elect not to apply a land as it may not be visually acceptable on the finished tablet. Lands that are applied incorrectly, either unevenly or made too large, can present a range of issues, including flashing or lamination during compression, chipping of the land during take-off, or build-up of coating on the edge of the tablet which will eventually chip.

When a blended land is applied correctly, it will optimise tablet and tooling strength and performance. An appropriately selected and applied blended land provides benefits to handling, loading, setting, tooling strength, the visual appearance of the tablet and ultimately, your brand.



Multi-tip Tooling

With productivity and volume becoming an increasingly key requirement, investigating ways to improve output is essential. This is something that can be considered once the desired design and tooling information is decided.

The most effective way to fulfil this requirement is through multi-tip tooling, which offers a number of benefits, including greater productivity, owing to the increased number of tablets per turret rotation, and a reduction in run-time per output of tablets, leading to less maintenance per batch and reduced press set-up time. Multi-tip tooling also reduces the press set-up time for the quantity of tablets produced. There should be no requirement to purchase a new tablet press to increase production when a multi-tip solution is adopted, therefore there is no capital outlay on new tablet presses and fewer presses are required to satisfy production levels.

MULTI-TIPPED TOOLING



Figure 5 – Multi-tip Tooling

With the combination of correctly designed tablets and multi-tip tooling manufactured using the correct raw

material and coatings, the use of multi-tips is the obvious answer to greater productivity.

Conclusion

We have seen that to improve the production efficiency of solid dose forms for animals, it is imperative to implement an effective tooling specification. In order to find the correct design for the product being produced, consultation with an expert tablet designer should take place in the early stages of the process to ensure the product is robust and producible in a rigorous tablet manufacturing environment.

Working closely with a tablet tooling expert will help in addressing specific product challenges and prevents non-conforming products. By divulging information on the company and the product being produced, the tooling manufacturer can put all the pieces of the puzzle together by introducing a QbD concept, and offer the expertise and knowledge to eliminate downstream problems, which will result in a reduced time to market and improved costings.

Laurence Mead



Laurence Mead has been with I Holland for 10 years. He joined as an apprentice Mechanical Engineer and trained in every area of the punch and die manufacturing process, before settling on tablet and tool design as his specialism. Laurence now works as part of I Holland's Customer Support Group, delivering expert advice and quality designs to I Holland customers around the world.

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