

Increasing Tablet Production with Multi-Tip Tooling

Pharmaceutical Technology Europe's Adeline Siew & I Holland's Steve Osborn, June 2015

Multi-tip punches increase the number of tablets produced per turret rotation, which increases production rates of existing presses. Steve Osborn, product design manager at tablet tooling manufacturer I Holland, spoke to *Pharmaceutical Technology Europe* about the key considerations for successful implementation of multi-tip tooling in tableting operations.

PTE: Can you provide an example of how multi-tip tooling increases production capacity and lowers running costs in tablet manufacture?

Osborn: Multi-tips have transformed the production of tablets into a process that allows manufacturers to deliver them quickly, efficiently, and at a lower production cost. For example, a customer wanted to increase their tablet output without investing in additional tablet presses. In this case, the tablet press was a Korsch PH800, 77 Station Press, which used single punches and had a maximum tablet output of approximately 831,000 tablet per hour. After some investigation, we found that the machine was only running at 80% of its maximum speed and the output was actually 665,000 tablets per hour.



To increase tablet output, we suggested the use of multi-tips. Trials were conducted using multi-two tooling (a tool with two tips). During this test period, tablet output was increased to more than 1 million tablets per hour, with the press running at a speed of 60% capacity. The result was a 66% increase in productivity.

Following this trial, we saw a further potential for increased productivity and supplied multi-three tooling to be tested. This resulted in an output of nearly 1.5 million tablets per hour, an increase of 125% improvement on the original figure.

Not only was the output up, but production was also reduced from 14.5 to 8.5 hours. The simple process of adding multi-tips to existing machines can have a huge impact on production through increased output and reduced production time, without the expense of investing in new machinery.

PTE: What are the technical aspects to bear in mind when implementing multi-tip tooling? Can you discuss key considerations in terms of the tablet press, formulation, and tablet design such as size and shape?

Osborn: Almost all presses can accommodate multi-tip tooling, but there is a checklist to consider before investment to ensure production runs smoothly. A quality tooling manufacturer can advise you on how you can bring multi-tips into your production process successfully.

Any press being planned for multi-tip production must be in good working order with no significant wear in the turret area, including punch guides, keyways, and die pockets. The cams should also be replaced if there are signs of excessive wear or degradation to prevent damage to the punch heads.

You must consider compatibility of the press with multi-tips. The upper turret must have a keyway in the guide to ensure alignment with the tooling. Although the lower turret guide does not require a keyway because the tip remains in the die, a keyway on the lower turret is recommended when using a higher number of tips, as it helps in the setting process and avoids damage to the lower tips.

Attention should be given to the feeder paddles as they may have to be modified to ensure the amount of formulation is correct for die filling. Also look at the tablet ejection system as it has to receive larger production volumes.

Press monitoring systems and any equipment associated with them should also be able to provide efficient information and have the capability to be set up for multi tips.

The formulation being compressed must also be investigated as the increased fill requirement and granulation flow are important to take into account. Granulation that does not flow quickly enough can result in problems. A solution is to modify the feeder mechanism to optimize the press speed, or alternatively, reduce the machine speed to allow time for fill to take place.

Particle size is another important factor. The particle size must be within certain limits for the tooling to work effectively; however, with modification of tablet design and working tolerances, there are ways to work around it.

Multi tips can produce most tablet designs, but it is influenced by the press and tool type capabilities. You must look at the tablet size to evaluate the number of tips to fit the punch. Shapes such as ovals can be more challenging to arrange while delivering a robust tool, optimizing die filling, and tablet take-off positions.



As mentioned previously, tooling manufactures will look at all factors of the tablet design to develop a multi-tip configuration that ensures all variables are covered from shape and size, to profile, embossing, and break-line details.

Also important is the use of punch and die treatments and coatings. Using coatings that are correctly matched to the formulation can help to improve corrosion and wear resistance and prevent sticky formulations from adhering to the punch tip faces. When combined with the correct stainless-steel material on the tooling, issues such as corrosion can be prevented.

PTE: How do you set up multi-tip tooling? How long does implementation take, and what sort of time frames are we looking at?

Osborn: The setting of multi-tip tooling is the same as the setting of shaped punches. You should use a fitting tool to ensure that the dies are in the correct alignment and that the guides and die pockets are not out of position or worn. Care must be taken when fitting the tools to the press to avoid causing damage to the tip edges, as this will cause other problems to arise during compression.

Implementation is not extensive; however, you will have to consider the capability of the tablet press, filling, rejection, ejection, and de-dusting. Advice can be sought from your press and tooling supplier.

The design and manufacture of the tooling can be completed in a matter of weeks. Implementation and validation may take longer depending on your process and procedural requirements.

PTE: Do you see widespread use of multi-tip tooling?

Osborn: Pharmaceutical manufacturing is an ever-changing environment, which requires changes to respond to this evolution. To produce tablets cost-effectively, investment in new technologies and processes must be developed, and one of these investments is multi-tip tooling.

Within modern tablet production, the demand for improved productivity, whilst reducing manufacturing costs, is a dominant factor today, and with the growing demand for increased yield, manufacturers must use a method to meet these requirements.

Multi-tip tooling has transformed the way tablets are produced and it is now seen as the most productive form of tablet manufacture. Multi-tip punches allow the number of tablets per turret rotation to be multiplied by the number of tips on the punch. They also require less floor space, because more tablets can be produced with fewer tablet presses, leading to a reduction in overall plant running costs. Ultimately, the development of a technology like multi-tip tooling is beneficial to many end users, and its potential is being increasingly realised with the demand for multi-tip tooling increasing year on year.