
Keine Schwächen

Mehr Betriebssicherheit beim Tablettencoating

No weaknesses

Increased operating security during tablet coating

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In the pharmaceutical industry, flat jet two-substance nozzles are used in coating drums for the coating of pharmaceutical products. If possible, the coating process should not be interrupted for economical reasons. In addition to the geometry of the coater, the drying air and the spraying liquid, the nozzles play a particularly important role in this process. A new nozzle with an antibearding cap meets the requirement for operating security and improved handling during coating.

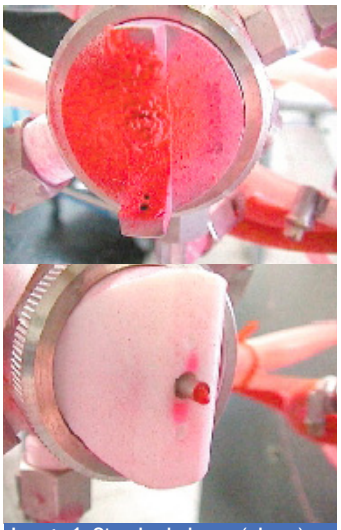
Image 1: Standard air cap (above) and anti-bearding air cap (below)

During coating, the HPMC and Eudragit coatings are finely atomised, formed into a jet and channelled towards the tablet bed. The movement of materials in the coater means that tablets can repeatedly fall evenly through the nozzle spray. The small coating drops ideally meet on the tablet surface, blend with the neighbouring drops, the liquid evaporates and a closed film is formed with the required properties.

Indispensable: A jet made up of even drops

The user has very specific requirements for the atomisation nozzles: They must have a hygienic design, i.e. contain a low number of corners, dead spaces, threads, clean passages and surfaces as well as pneumatic notching up/targeting of the liquid with the cleaning needle. Product build-up or bearding in the front area of the nozzle may have an impact on the spray or may even block the nozzle.

The spray with small, evenly reproducible drop size should be able to be set flexibly to a particular drop size in order to avoid spray drying of the drops before they reach the tablet cores and, on the other hand, to prevent excess moisture on the surface due to atomisation being too coarse.

Further features include the option of altering the width and height of the spray jet formation (ellipse) and even distribution of liquid across the spray width. No excessively large impulses should be produced on the tablet bed. Based on these requirements, a new nozzle has been developed with an anti-bearding air cap, which provides high operating security.

As each batch in the coating drum often represents a large amount of money, it is important that the coating process should not need to be interrupted. In fact, it is often not even possible to intervene during the process with the result that a poor spraying pattern or a blockage of the nozzle due to caking frequently leads to the loss of the entire batch. It is true that there are devices used for mechanical cleaning of the front of the nozzle, but this means more machines, increased amounts of supply media, a more cumbersome construction and, to a large extent, contradicts the idea of a hygienic design.

Robust air cap holds its own

It is not just the type of nozzle and the nozzle parameters which influence the process. There are a number of parameters which also influence the final result - from the coater geometry, to the drying air, right through to the spraying liquid. A "robust" air cap, which can stand its ground even under the most adverse environmental conditions, i.e. ultimately guarantee that there will still be a clean spraying process, is therefore all the more important.

Image 2: Dust particles are kept away from the new air cap, instead of adhering to it

As a result, tests were carried out both in the visualised flow pattern on the dual PDA laserand on the coater drum to find the optimum design for air caps which is resistant to bearding and product build-up. Previous calculations for prototypes were optimised with regard to:

– „horn-free“ design;

– size of the centric bore;

– angle of incidence of the forming air;

– air cap flank angle;

– side air hole/central hole size ratio; and

– distances between the holes etc.

over the months in the test field. The new cap can be made from different materials, primarily stainless steel and plastic. In comparative worst case investigations between a conventional air cap and the new patented anti-bearding cap, extreme build-ups and bearding were produced on the standard cap, but none were seen on the new cap (image 1). The inlet temperature on the coater was 75 °C, the outlet temperature was 50 °C and the coater air flow rate was roughly 850 m3 when the coater drum diameter was 600 mm. 100 g/min "Opadry pink" at 16% concentration was processed in each nozzle. After a spraying duration of only 45 min, the standard cap was so blocked that only coarse drops could be produced. In the flow pattern (image 2) it is easy to see that the new design is much better at keeping the circulating dust particles, which inevitably circulate in the surroundings of the nozzle during use, away from the new air cap instead of letting them adhere to the air cap.

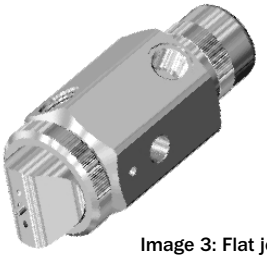

Image 3: Flat jet two-substance nozzle

In the meantime, very positive results have been achieved with this new air cap at well-known companies in Germany and abroad both in pilot plant test and in production facilities. Even in those cases in which the old air cap failed after only a short time and the coating process had to be stopped, the new development did not display any weaknesses. The new air cap displays a very even distribution of liquid, as well as a flexibly adjustable drop size; this was confirmed in various measurements on dual PDA.

Compact

Nozzle with anti-bearding air cap

High requirements are placed on flat jet two-substance nozzles during tablet coating. A new nozzle with an anti-bearing air cap withstands the most adverse operating conditions and when used does not display any build-ups or bearding which occur quickly with the standard air caps. Circulating dust particles in the surroundings of the nozzle are kept away from the air cap better than before, instead of adhering to it. The new air cap is available both for the newly-developed flat jet two-substance nozzle and for the professional coating arm.

Spray arm rules out nozzle spacing errors

This new air cap technology is available both for the newly designed flat jet two-substance nozzle (image 3) and for the newly completed professional coating arm (PCA). The series S 35 nozzles are considerably lighter and have a finer and tighter drop distribution than conventional nozzles; they are made up of seven individual parts and three O rings. No special tools are needed for assembly and dismantling. The connection threads are parallel threads, which make cleaning easier. Air consumption is reduced by approximately 20% in comparison to conventional nozzle models. This reduces the operating costs and also results in lower speeds and a gentle impulse. In the case of the spray arm PCA manifold system for existing and new coating systems, the modular construction means that is it possible to vary the number of nozzles. The fixation means that the operator cannot make spacing errors. The fact that hose couplings and fittings have been left out means that there are no longer dirty corners. Flat jet caps and cleaning needles are integrated into the nozzles. The system includes a control air, atomising air and liquid connection. The connection block can be adjusted to all fastening systems; the titanium connection pieces mean that the weight of an arm with five nozzles is roughly 15 kg.