

ORAL SOLID DOSAGE: THE TABLET PRESS

NEW AND INNOVATIVE TECHNOLOGIES INCREASE THE YIELD OF A TABLET PRESS BY 40%

As a means of administration, the tablet compares well with other methods of delivering active agents. As the demand for medication rises in countries and regions where the infrastructure is underdeveloped and logistics are poor (electricity supplies that are inadequate or non-existent, cold chains that are not guaranteed, high humidity and temperature), growth in tablet use can be expected.

The efficiency of a tablet press in a production process is measured by (at least) three parameters:

1. the tablet yield per unit time,
2. the quality of the manufactured tablets and
3. the plant availability.

Progress is being pursued in all three of these areas by plant operators and by tablet press manufacturers, often working in close partnership.

How can the tablet yield and the plant availability be optimized further while retaining high tablet quality? This is the question that is pushing machine makers forward.

In this paper, two simple examples of German engineering demonstrate how creativity and experience can bring innovative advances to tablet presses. The technologies described here demonstrably bring a valuable increase in efficiency to tablet production, and do so with all due pharmaceutical reliability.

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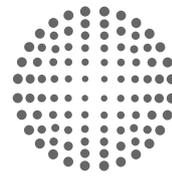
Old technology:

The EU19 tablet punch

New technology:

The FS12 tablet punch

The benefit

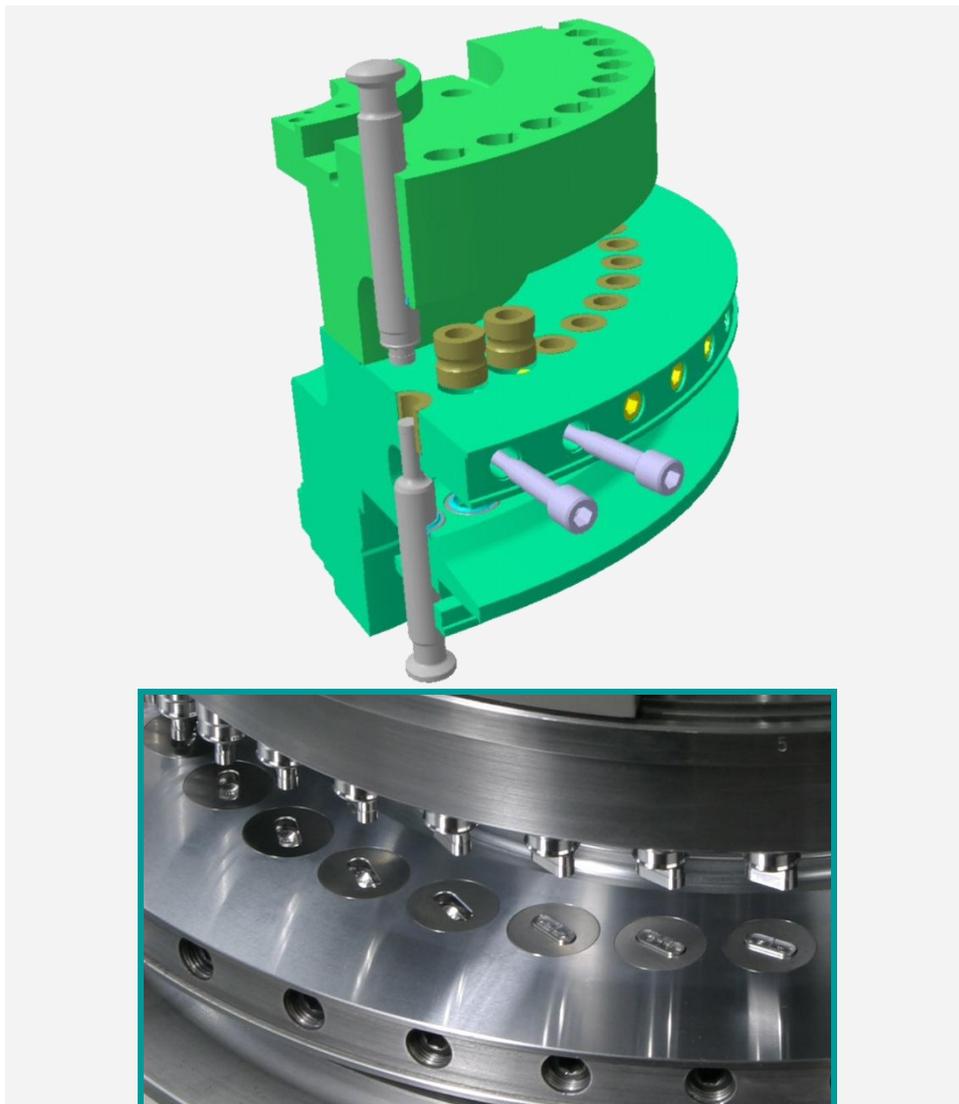


THE TABLES: AN INNOVATIVE CONTRIBUTION TO IMPROVED EFFICIENCY

Old technology: the die table

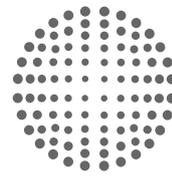
Tablet presses traditionally work with die tables permanently mounted in the turret. The tablets are formed in individual dies. Each of these dies must be fitted accurately into a die hole and screwed into place.

This acutely increases the parts count, and therefore also the times needed for product change-over and cleaning. The precision of the machine is, moreover, affected unfavorably by the accumulation of the individual tolerances.



A conventional die table with dies (inserts) and fastening screws.

Detail of a conventional die table with the inserted dies and fastening screws visible at the edge.

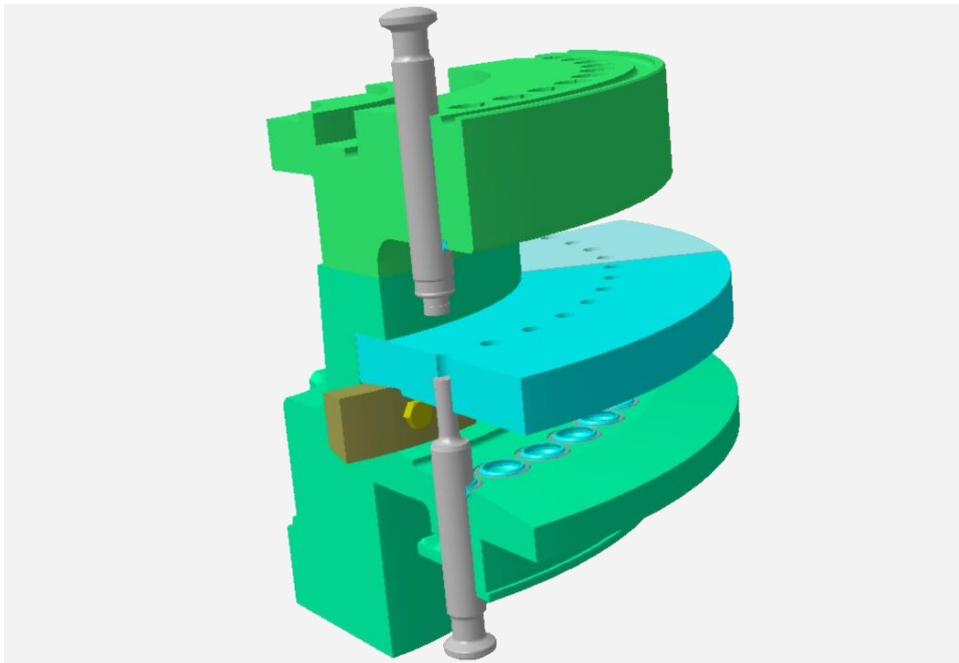


New technology: The segment table

Segment technology eliminates all these problems. Now, the entire table ('segmented', as it is divided into a number of parts) is exchanged, and the individual dies are no longer used. The pressing holes are fabricated directly in the table.

The technological advance:

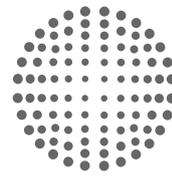
- each segment of the circle can be removed individually
- no dies, higher dimensional stability in the machine and for the tablets
- no die screws or threaded holes
- more tablets with the same pitch circle diameter and the same speed of rotation



The new segment table.



The segment ring.



The benefit

It's the benefits that interest the reader, so here is a brief shortlist:



Up to 40% more yield.

Product losses reduced by up to 50%.

Up to 40% more yield

- Greater number of stations for the same turret diameter

Product losses reduced by up to 50%

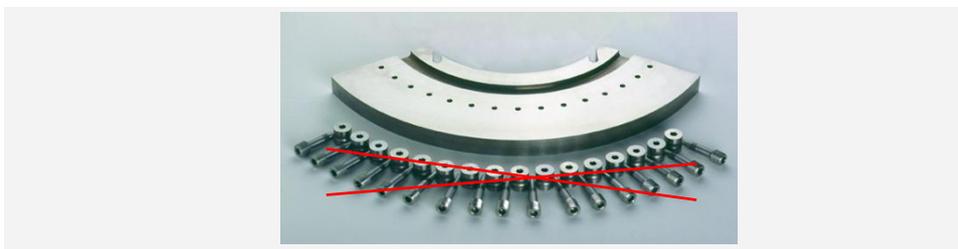
- No protruding or sunken dies
- No crevices at the die holes



Product changeover and cleaning up to 88% faster.

Product changeover and cleaning up to 88% faster

- Flat, smooth surfaces
- E.g. only 9 individual parts instead of 72



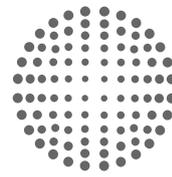
Simplification of logistics and logistics costs.

Simplification of logistics and logistics costs

- Reduction in the number of individual parts from, for example, 72 to 9
- Simpler storage and cleaning logistics

Another advantage:

This technology can be retrofitted to tablet presses built since around 1990.



THE TABLET PUNCH A CONTRIBUTION TO IMPROVED EFFICIENCY

Old technology: the EU19 tablet punch

Tablets are pressed between two punches, an upper and a lower punch. This is still the state of the art.

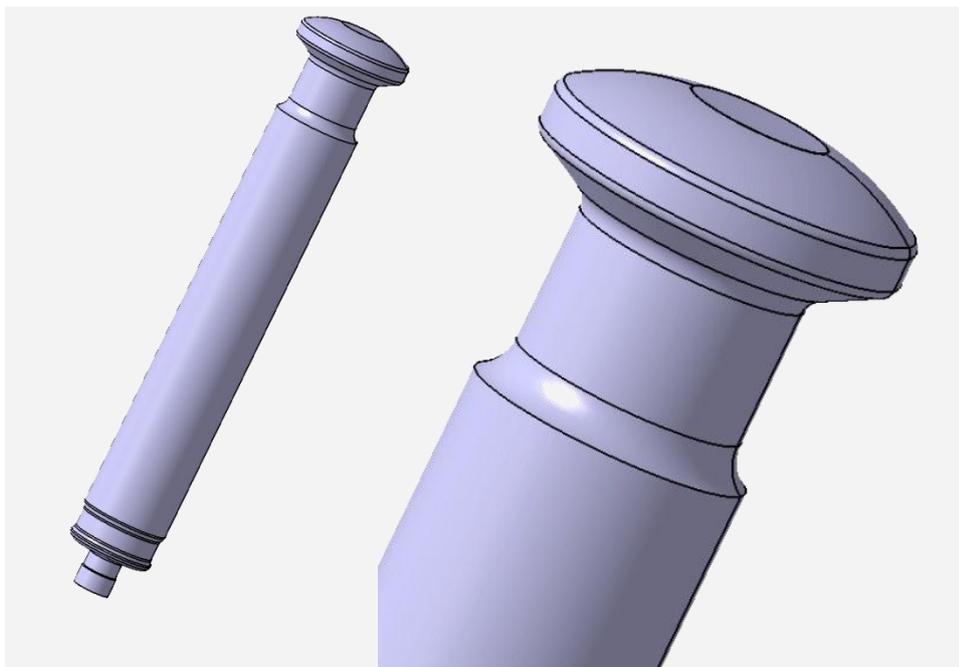
Standard dimensions and shapes have become established through tradition, based on the technologies available last century.

One of the standard dimensions is the 19 mm punch (19 mm shaft diameter, 25.27mm head diameter), which is known as EU19.

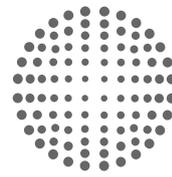
The diameter of the head (in this case 25.27 mm) determines the maximum possible number of punches on a table of given diameter in the turret of the tablet press.

With a maximum possible circumferential speed of the turret, the tablet yield per unit of time is therefore also determined.

Old:



19 mm punch with 25.27 mm head.



New technology:

The FS12 tablet punch

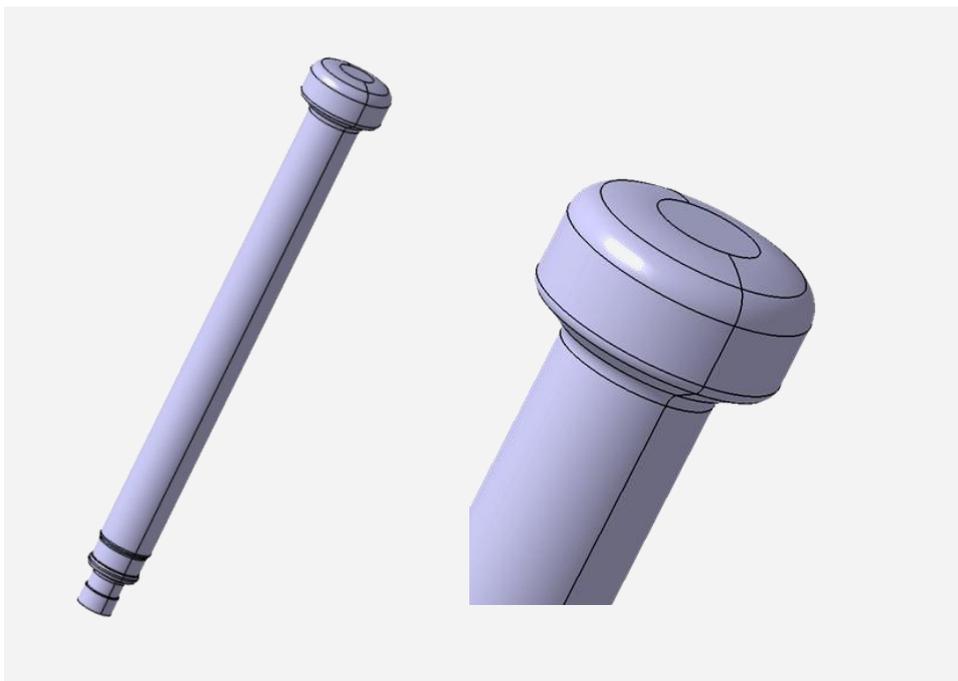
As mentioned above, the tablet yield per unit time is one of the parameters (if not *the* parameter) when considering the efficiency of a tablet machine. The demand for continuous improvement applies, of course, here too. A higher tablet yield with a constant tablet quality brings a linear increase in operating profit.

Using modern materials with high-quality, hard surfaces, and with the expertise of the tablet machine manufacturers enabling an optimized head shape, punches with a reduced diameter (both shaft and head) have been developed. The diameter of the head, which is the crucial dimension for the maximum number of punches on the turret of the tablet press, has been reduced to 19 mm. This is a reduction of around 25% when compared with the 25.27 mm head diameter of the EU19 tablet punch. Together with the possibilities of reduced clearances and with the segment technology, an increase in yield of up to 50% can be achieved.

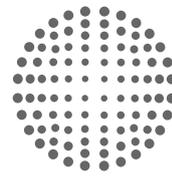
The increased yields from the FS punch (there are FS12 and FS19 versions) have proven themselves over many years in production at leading tablet manufacturers, where they generate this additional value every day.

All the familiar machine criteria such as the compression forces, hold times, centrifugal forces and so on remain identical, and the quality of the tablets remains at the same high level.

New:



12 mm punch with 19 mm head



The benefit

A real example:

A comparison between two tablet presses, the number of tablets per rotation on the XY press with 47 stations as against 66 stations. This corresponds to an increase of 40% at the same speed of rotation and with the same circumferential speed of the turrets.

The annual increased tablet yield, or the annual saving with the same number of tablets, calculated on the basis of a real example:

	Old technology	New technology
Number of stations	47	66
Punch	EU19 (19 mm)	FS12 (12 mm)
Turret rotation speed [1/min]	70	70
Running time [h/shift]	12	12
Shifts/day	1	1
Shifts/week	5	5
Working days/year	260	260
Total production time [h/year]	3.120	3.120
Output/year [millions]	615	864
Additional volume with the same running time [%]	0	+ 40 %

Comparison of old and new punch technologies

Additional volume with the same running time:
+40%

Working days/year		185
Total production time [h/year]		2.222
Output/year [millions]		615
Saving with constant output [h/year]. The true savings are significantly higher, since the cleaning cycles are also reduced.		-898

Comparison of old and new punch technologies

Saving/year with constant output:
-898 h/year



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