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COMMUNICATIONS

Measurement of acceleration in a rotary tablet machine

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The manufacture of any new variety of compressed tablet is always preceded by a formulation study. At this stage, the working material may only be available in small amounts: it is, therefore, often valuable to have a procedure for compressing single tablets.

Although the single-punch press can be used for this purpose, its compression characteristics are different from those of the rotary press used in commercial tablet production. Nowadays, the practical choice for precise experimental work is likely to lie between the simulator and the instrumented rotary press, both of these having merits. We chose to develop an instrumented version of the Manesty Betapress which has now been in service for some five years and can be used to prepare a single tablet—if the die is filled by hand—and to provide detailed information relating to its compression. However, if the resultant tablet is to be representative of those made under production conditions, the rate of its compression must itself be realistic.

The factor controlling compression rate for a single tablet will be the acceleration of the turret from rest, after the application of power to the drive motor. Information on this characteristic was not available from the machine manufacturers, and it was therefore necessary to measure it directly. This was done by optical means, using a photodiode to detect pulses of reflected light from a patterned tape on the machine.

Method

The outer surface of the turret was cleaned with acetone to remove traces of grease, and Letraset 13087 tape was applied round it as a complete horizontal band. This tape has a matt black surface with clear transparent bars at about 4 mm pitch, and provides a good optical contrast.

A reflective opto-switch (RS Components type no. 307–913) was mounted on a small circuit board at a short distance from the turret, at the level of the patterned tape: its ouput was taken to a chart recorder (UV oscillograph, SE Labs type 6008/12).

One station of tooling was fitted: the remaining fifteen stations were left empty.

Test runs were made at four nominal machine speeds: in each case, power was applied to the motor and the photodiode output was then recorded at a known chart speed. The arrival time of each pulse, and the total time to reach constant speed, could then be calculated from the chart trace. The results of these measurements are summarized in Table 1.

Table 1. Nominal and measured speed and time to reach constant speed.

Nominal speed (rev min^{-1})	Measured speed (rev min^{-1})	Time to reach constant speed (s)	Angle of rotation
42	40·85	0·13	15°
56	56·33	0·17	27°
75	78·25	0·28	66°
98	96·24	0·35	97°

Conclusions

The Betapress accelerates to constant speed over a comparatively small fraction of a complete rotation; even at the highest control setting, steady conditions are reached after little more than a quarter-turn. The angular separation between the filling and compression areas is much greater than this, being almost 180°.

If the Betapress is used for the experimental compaction of single tablets, it can safely be assumed that those tablets will be compressed at the speed indicated by the control setting of the machine.