During the tableting of orodispersible tablets (ODT), capping was observed by the client on the M2i industrial machine. Despite various trials to adjust the compression settings, the client could not solve the capping issue. Therefore a study has been performed in order to understand the capping issue. In particular whether, it could be related to potential batch to batch particle size variability, or to non-optimal tableting settings.

Three different batches of the client’s formulation were tested; batch 1, 2 and 3. Batch 3 contained a higher proportion of fine particles than the other two. Particle size distribution was determined by the sieving method.

A compression study was performed on a Stylcam 200R compression simulator using punches provided by the client. The DC blending process was similar to the client’s process, and tablet target mass was 325 mg.

The difference in particle size distribution is significant for batch 3, having a higher proportion of fine particles. Batches 1 and 2 show no significant particle size differences.
Compression study:

A compression study was performed on Stytcam 200R compression simulator.

The influence of compression force on tablet hardness, without a pre-compression step was first tested on batches 1, 2 and 3. The compression profile obtained, with hardness as function of main compression is given in Figure 2.

The best compression profile in terms of hardness as function of compression force was obtained with batch 3, which contained a higher proportion of fine particles. However at a compression force of 20kN, this batch displayed capping during the hardness testing carried out. Batch 2 displayed capping at compression forces upwards of 15kN.

Finally, capping was not seen with batch 1, but a loss of hardness was observed above 12 kN compression force. This could be explained by the lower density of the mixture blend, see Figure 3.

The influence of pre-compression was then evaluated on the same batches; 1, 2 and 3. Trials were conducted at 19 kN ± 1 kN main compression force, and at 2 different pre-compression forces. The precompression/compression force ratios used were 15% and approximately 30%. Results are given in Figure 4.

Figure 4 shows that both 15% and 30% pre-compression/compression ratio improved the hardness of the three batches, tested at 20 kN main compression force.

An equal hardness is reached with batch 2 (low amount of fine particles) and batch 3 (high amount of fine particles). This suggests that the difference in particle size distribution has no impact once pre-compression is applied.

Also, capping was not observed in any of these tablets, suggesting that a pre-compression setting is a useful aid in the avoidance of capping.

Conclusion

This study showed that without optimised settings, the tableting behavior of the client’s ODT formulation could be influenced by two main physical properties:

- The particle size of the formulation (in particular the fines fraction). Higher levels of fines allowed application of a higher compression force before occurrence of capping.
- The density of the formulation. A less dense blend could lead to a loss of hardness above 12 kN.

Once pre-compression has been applied, a higher hardness is achieved for all 3 batches (over 100N with 20kN compression force) regardless of the pre-compression/compression ratio. As shown by Figure 4, batch 2 (low amount of fines) and batch 3 (high amount of fines) produce the same high hardness without the occurrence of capping. This indicates that the introduction of pre-compression will solve the tableting issue faced by the client.