COMPARISON OF FILM COATING PROCESS USING FULLY PERFORATED AND PARTIALLY PERFORATED COATING PANS

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Purpose

Fully perforated and partially perforated coating pans are commonly used for film coating processes. The aim of this study was to compare the coating processes using different types of perforation.

Methods

A commercial PVA (PolyVinyl Alcohol) based film coating formulation (Colorcon, Opadry Yellow 85F12383) was used for this study. Placebo tablets consisting of microcrystalline cellulose, lactose DT and magnesium stearate were compressed using a rotary press (Vector 247-33) with an average weight of 500 mg. A coating system capable of accommodating both a 36-inch fully perforated pan and 36-inch partially perforated pan was used (Vector Hi-Coater VPC-5811) (Figure 1 and 2).

A sample of 200 cores were numbered and individually weighed. The cores were pre-heated to 42° C and individually weighed again. These cores were then mixed with 35 kg of additional cores and coated in a fully perforated pan. The quantity of suspension applied was calculated to yield a theoretical 3% weight gain. After coating, the marked tablets were identified and weighed. The same process was repeated with the partially perforated pan. The process parameters are listed in Table 1.

Table 1 Process Parameters

Inlet Temperature:	78° C for fully perforated pan
	71° C for partially perforated pan
Inlet Air Velocity:	600 CFM (1019 m^3/hr)
Exhaust Temperature:	42° C*
Pan Speed:	8 rpm*
Spray Rate:	91 g/min per gun (total = 182 g/min)*

* Note: Used for both pans

The coating efficiency (CE) was calculated based on the actual weight gain divided by the theoretical weight gain. The surface roughness was analyzed by 3-D white light non-contact profilometry (Micro Photonics, Inc.). The arithmetic mean of the deviation from the mean (Sa) and the quadratic mean of the deviation from the mean (Sq) were calculated.(Figure 3)

Figure 1 Design of Coating System with Fully Perforated Pan

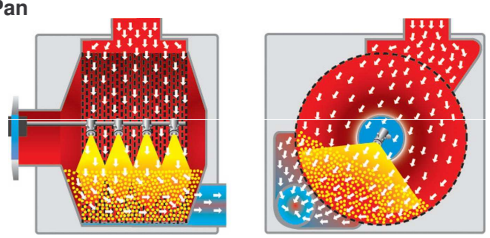


Figure 2 Design of Coating System with Partially Perforated Pan

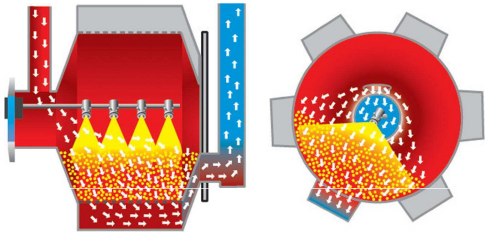
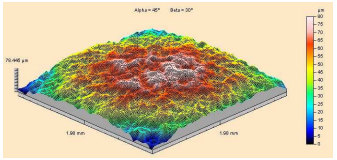
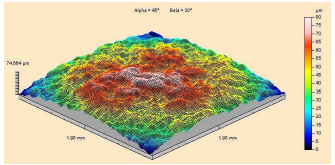


Figure 3 3D Scan Diagram for Fully and Partially Perforated Pan

Fully Perforated Pan



Partially Perforated Pan



Results

Experiments	Energy KW-Hour/min	Moisture Content % (LOD)	Coating Efficiency	Adjusted Coating Efficiency*	Surface Roughness
Fully Perforated	5.10	1.61	101.1	94.2	**Sa= 4.00 µm** (RSD=4.3%) **Sq= 5.05 µm** (RSD=4.8%)
Partially Perforated	4.01	1.40	92.0	92.0	**Sa= 3.94 µm** (RSD=8.1%) **Sq= 4.94 µm** (RSD=8.1%)

***Note:** **Adjusted Coating Efficiency calculated with equal tablet moisture content basis (accounts for lower moisture content of tablets from partially perforated pan).**

Conclusions

In this study, the partially perforated pan required a lower inlet temperature (at the same air volume and spray rate) to maintain the same exhaust temperature when compared to fully perforated pan.

The energy required by the partially perforated system is lower than the fully perforated system. This is possibly due to 1) less heat loss and/or 2) more efficient heat transfer in the partially perforated pan.

For practical purposes, the coating efficiency, after adjustment based on the difference in moisture content, were not significantly different for the different type of perforated pans used.

There was no significant difference in surface roughness between tablets coated with two different types of perforation. The RSD of the roughness of the fully perforated pan is lower than the partially perforated pan, however, this did not create a difference in the visual appearance.

Acknowledgement

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