# Maximizing the Gloss of PVA-Based Film Coating Systems

## PURPOSE

Polyvinyl alcohol (PVA) film coatings can be applied as high solids suspensions in order to decrease production time. These film coatings are available in white, pigmented, and clear systems. Clear systems can be applied as top-coats over pigmented or white systems to increase gloss. Ideally, the combination of the base and top coating will provide the maximum level of gloss in a minimum quantity of time. This study was conducted to determine the effect of solids content, coating weight gain, and production scale on the gloss of PVA-based film coating systems.

## METHODS

Acetaminophen caplets (500 mg) were coated to a 3% weight gain (WG) with Opadry® II high performance film coating, red, 85F16122 followed by a 1% WG gain of 85F19250 clear, using 15" and 24" O'Hara fully perforated coating pans. Optimal processing parameters to maximize gloss were utilized for both pans. The 15" trials were conducted with film coating suspensions prepared at 7.5%
and 15% solids. Based on favorable results at the 15" scale, both the red and clear coatings were coated at 7.5% solids in the 24" pan (Tables 1 & 2).

Additional 15" trials were conducted for tablets coated to a 3% WG gain with Opadry II yellow, 85F12437 applied at 20% solids followed by a clear top coat of 85F19250. The clear coat was applied at 2.5%, 5.0%, 7.5%, 15% and 20% solids to a weight gain of 3% with samples taken every 0.5% of film coating applied. All samples were measured for gloss using a model 801A gloss analysis system manufactured by Tricor Systems, Inc.

***Table 1. Coating Parameters for all 15" O'Hara Lab Coat II Film Coating Trials***

| Parameter Description | Parameter Value |
|---|---|
| Batch Size | 3 kg |
| Pan Speed | 22 rpm |
| Inlet Airflow | 190 cfm |
| Inlet Temperature | 70ºC |
| Spray Rate | 15 g/min |
| Gun Type | Spraying System VAU |
| Fluid Nozzle | VFAB 4078 |
| Air Cap | VAAB 113289-60 |
| Number of Spray Guns | 1 Gun |
| Atomization Air Pressure | 30 psi |
| Pattern Air Pressure | 30 psi |
| Coating Fluid % Solids | 2,5, 5.0, 7.5, 15 & 20% w/w |
| Tablet Bed Temperature | 50 – 55ºC |

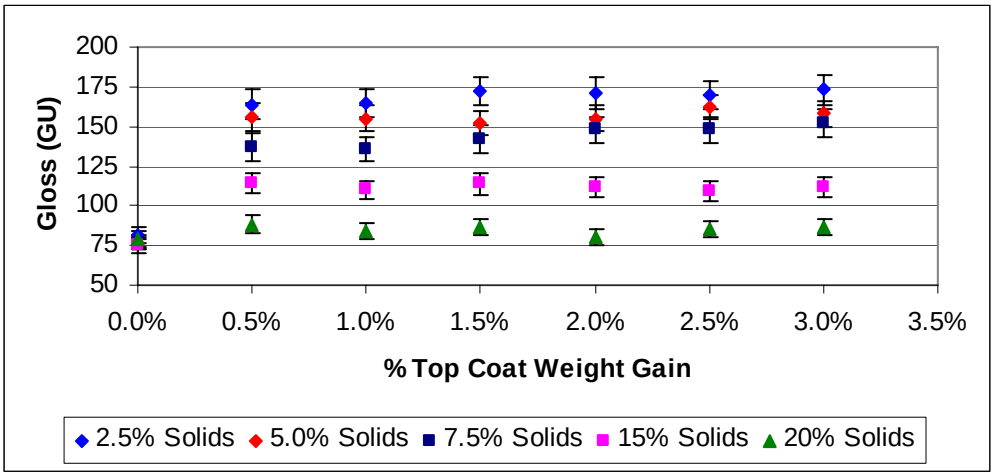
*Table 2. Coating Parameters for all 24" O'Hara Lab Coat II Film Coating Trials*

| Parameter Description | Parameter Value |
|---|---|
| Batch Size | 14 kg |
| Pan Speed | 14 rpm |
| Inlet Airflow | 350 cfm |
| Inlet Temperature | 90ºC |
| Spray Rate | 35 g/min |
| Gun Type | Spraying System VAU |
| Fluid Nozzle | VFAB 4078 |
| Air Cap | VAAB 113289-60 |
| Number of Spray Guns | 2 Guns |
| Atomization Air Pressure | 40 psi |
| Pattern Air Pressure | 40 psi |
| Coating Fluid % Solids | 7.5% w/w |
| Tablet Bed Temperature | 50 – 55ºC |

## RESULTS

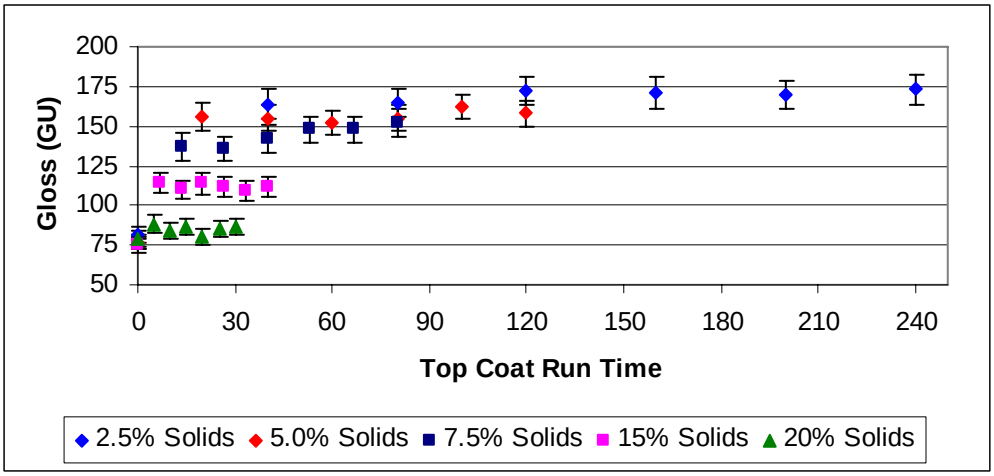
Tablets coated with 85F16122 red at 7.5% and 15% solids in a 15" coating pan had gloss values of 122 and 111 gloss units (GU), respectively. When the 85F19250 clear coating was applied at 7.5% solids to the tablets base coated at 7.5% solids, the gloss value increased to 154 GU. When tablets using the same coating systems were coated at the 24" scale, the gloss value remained 154 GU.Tablets coated with Opadry II yellow, 85F12437 followed by Opadry II clear, 85F19250 showed increasing gloss as coating suspension solids decreased. The weight gain of the clear coating had less effect on the measured gloss than coating solids (Figure 1).

***Figure 1. Gloss for Tablets with Opadry II Yellow, 85F12437 Base-Coat***
***Opadry II clear, 85F19250 [at different suspension solids and weight gains] Top-Coat***



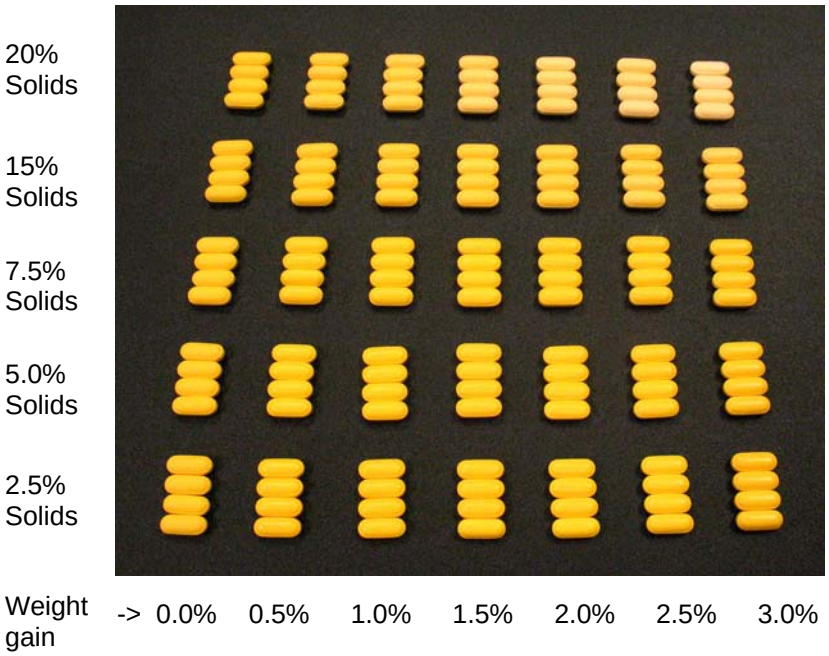

Analysis of the coating time versus gloss showed that higher gloss could be achieved in less time for coatings applied at lower solids. A coating applied at 5% solids achieved a gloss of 156 GU in 20 minutes, whereas, the maximum gloss achieved for all coatings applied at higher solids was 152 GU for a 3% WG applied at 7.5% solids in 80 minutes. A clear coating applied at 2.5% solids achieved a gloss of 164 GU in 40 minutes (Figure 2).

***Figure 2. Gloss Versus Coating Time and Suspension Solids***




For clear coatings applied at higher solids, a visual frosting effect became evident at higher weight gains. This effect can be seen as a shifting of the color from yellow toward white for tablets in the upper right corner (Figure 3). For coatings applied at lower solids, the gloss was visually enhanced at higher weight gains even when the analytical gloss measurements remained the same.

***Figure 3. Visual Appearance of Tablets at Increasing Clear Coating Weight Gains and Suspension Solids***




## CONCLUSIONS

The gloss of pigmented PVA-based film coatings can be increased by decreasing the solids content of the coating suspensions. Gloss is further increased by the application of a PVA-based clear coating. High gloss can be achieved in less time by applying a clear coating at low solids over a pigmented base coating at high solids. Upon increasing production scale from 15" to 24", a high gloss level was maintained.

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