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ARE YOU OPTIMIZING YOUR COATING PAN???

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The optimum coating process is to apply all of the principles for improving uniformity and then coat as rapidly as possible while maintaining the uniformity and elegance of the product. The solids content of the coating suspension has significant impact on the coating time. The following table shows how increasing solids in the coating suspension reduces water for the same amount of coating solids sprayed.

EFFECT OF INCREASING SOLIDS

% Solids	Coating Suspension	Solids	Water Evaporated
10	30kg	3 kg	27kg
12	25 kg	3 kg	22 kg
15	20 kg	3 kg	17 kg
20	15 kg	3 kg	12 kg

This quantity of coating is required to put a film deposit on a typical batch of tablets in a 48" side-vented pan. With a charge of 110 kg of tablets and 92% efficiency, the tablets would gain about 2.5% of their weight in film deposit. If the coating parameters permit an evaporation of 300g of water per minute, coating with a 10% solution would take 90 minutes and coating with a 20% solution would take only 40 minutes, theoretically. The downside to this increase in solids is a dramatic reduction in coating uniformity and film quality. Generally, the higher the solids; the rougher the coating. Coating parameters would have to be changed to cope with these problems.

Gun Positioning and Configuration
The arrangement of the spray guns has a large affect on the coating process. Increasing the number of guns aids uniformity. Four guns in a 48" pan, 5 guns in a 60" pan and 6 guns in a 60DXL pan are optimal. The guns should be mounted to spray at a 90 degree angle to the tablet bed at the point of the cascade. The guns should be 10 inches from the tablets. If the guns are too far from the bed, the droplets may over dry and be blown off track, lowering efficiency and producing flat, rough-looking coatings. If the guns are too close, the spray zone is too concentrated and the tablets may be over wet, causing blistering, picking and splitting. To operate the guns close to the bed, increase the RPM of the pan, reducing the time each tablet is in the spray zone. If tablets are friable, slow down the pan, move the guns farther away and spray faster to build up a protective film coat rapidly. Then the pan RPM can be increased.

Rotate the ears of the air cap of each gun 30 degrees from perpendicular in the same direction. Instead of the spray patterns from each gun overlapping, they will run parallel with each other giving a much larger spray zone and improving the distribution throughout the spray zone. For a 3-gun setup, this increases the spray zone about 25%.

Nozzle Selection and Spraying

If the spray is high volume and causing scatter or drift in the spray zone, use larger liquid caps. The typical gun is equipped with a 0.28" diameter fluid nozzle. Use a .035" or .040" diameter fluid nozzle to reduce scatter and handle larger spray volumes. A spray rate of 120g/min/gun may be the level to consider using larger nozzles. Be sure the proper air caps are used with each set of nozzles.

Atomizing air should be 30-60 psi depending on the viscosity, solids and quantity of the coating suspension being sprayed. If you are using 60 psi to spray 150g/min/gun using .028" diameter fluid nozzles, consider .040" diameter fluid nozzles and use 40 psi to atomize 150g/min/gun. If your pan looks dusty and has a large build-up of coating on the accessory equipment, lower the atomizing air pressure. If the spray is causing rough coating and wet spots on tablets (test spray with a card), increase atomizing air pressure.

Process Air

The aqueous film coating requires a large amount of energy to evaporate the water present in the coating suspension. The energy is provided by introducing hot air into the coating chamber. The energy to evaporate the water from the coating solution is supplied by a quantity of air (CFM) that drops in temperature as it moves through the tablet bed. To increase the amount of water which can be evaporated, either increase the volume (CFM) or inlet temperature of the process air. The amount of energy available for evaporation is proportional to the airflow volume and to the difference between the inlet and exhaust temperature. For an extensive review of energy balances during the process, see the Thomas Engineering Thermodynamic Analysis of Aqueous Film Coating (TAAC). As its name implies, the TAAC model utilizes thermodynamic, heat and mass transfer equations to accurately characterize the environmental conditions inside a coating pan during a steady state film coating process.

The purpose of TAAC is twofold. First, it allows a user to investigate the interrelationships between process variables. Second, TAAC provides the user with a measure of film drying rate which, once calculated for a given set of conditions, can be used to reproduce a desired coating quality under an entirely different set of conditions. It is this feature which is generally of greater interest to the user since it makes parameter variation and optimization possible.

Pump Selection

Choose the correct pump for your coating application. For enteric emulsions, use a peristaltic pump; organic solvents work well with a gear pump. Solutions with suspended particles (talc, ferric oxide, titanium dioxide) work best with rotary lobe or peristaltic pumps. For viscous solutions which develop downstream solution pressures above 10-15 psi, use gear or rotary lobe pumps.

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