Preferential Spraying

What is Preferential Spraying?

With most production tablet coating systems, multiple spray nozzles are used from a manifold.

Distribution of the air supplies is usually taken care of within the manifold design to give the same pressure and flow to each nozzle.

With the solution delivery, having a pump for each nozzle can be expensive and some manufacturers reduce cost by using one larger pump and distributing the solution to the individual nozzles via a manifold.

One Pump

With one larger pump, in theory the nozzles should deliver solution evenly. To help balance the nozzles, the solution lines can all be the same size and length.

Unfortunately the spray nozzles themselves also have an effect; each nozzle will have manufacturing tolerances and with all nozzles having interchangeable parts balancing out any differences can be difficult.

As the nozzle operates at the tip where the atomization air atomizes the solution, there is a restriction on the exiting air creating a Venturi effect. This gives rise to a low pressure on the solution chamber proportional to the air volume.

This low pressure effectively sucks the solution from the manifold

When a number of nozzles share a common solution feed system, small differences in the nozzles will give rise to a nozzle having a preferential spray rate.

Multi Pumps

With a pump on each nozzle, the nozzle will spray whatever the associated pump delivers.

Testing

Testing a system dynamically to assess for individual solution flow can be difficult.

A simple test can be to set the nozzle to operate without a pump and measure the vacuum created on the solution line (kPa). Or by placing a bucket of water on the floor with the solution line in the bucket.

On average for every one bar of atomization air pressure, the solution line should see a lift of water by about 30cm (system dependent).

Nozzle performance can be compared by the lift differences, the nozzle with the stronger vacuum (greater lift) indicating this nozzle would have a preferential spray if in competition with others on a common feed manifold.

For further testing, run the nozzle at normal operation pressure and place the bucket at an appropriate height to allow the nozzle to draw the water and spray; then measure how much water is sprayed within a given time for each nozzle.