



# Nozzle Calibration

## Peristaltic Pump Calibration.

With tablet coating it is important to know your actual spray delivery rate, so an informed adjustment can be made to optimize the process.

### Basics

The delivery rate will be affected by three things:

- Tube Bore Size (and age)
- Pump Speed
- Solution Viscosity

#### Tube Bore Size

Peristaltic pumps are effectively a displacement pump, and for a given pump speed they will displace a volume of liquid.

A pump will be designed for a specific tube wall thickness, normally 2.4mm (CSI standard)

The tube used can then be selected from a list of standards, 4.8mm being the most common for tablet coating.

The pump will move a certain amount of solution depending on pump speed and viscosity against any restrictions (liquid tip size and tube length).

As the pump tube ages, its ability to relax back to a normal round shape will diminish and so its capacity to pump. Calibration can help to identify tube efficiency.

#### Pump Speed

At low speeds, peristaltic pumps will pulse as the rollers rotate, this pulsation will be seen easily with water but less obviously with a viscous solution.

Keeping the pump speed up will reduce pulsation but increase tube wear, ultimately reducing tube life. The compromise is to select a tube size that will deliver the volume of solution required with minimal pulsation.

For tablet coating pump speed can normally be set from 10 rpm up to 120rpm. On some systems it is set as % of speed from 0% to 100%; on others it is simply a reference number.



## Solution Viscosity

Solution viscosity will give a resistance to the pump and will be affected by the tube size, tube length and liquid tip size. Standard tablet coating liquid tips are 1.2mm; other sizes available are 0.8mm and 1.8mm.

## Calibration preparation

In order to calibrate you will need to be able to run the spray system without atomisation air or spray width air. This can be done on some systems by use of a dedicated calibration or test screen, on other systems Pump Prime mode can be used.

With the nozzle facing down and a suitable container under the tip to collect the solution, remove the air cap, the system should be primed to fill the solution lines.

## Calibration

Once ready, two tests should be conducted. If this has not been done before, an initial estimate of a pump speed will be required, 20rpm or 20% would be a good starting point.

Run the pump for 1 minute and collect solution (if possible run for 2 or 3 minutes for improved accuracy).

Obtain the measured amount in Millilitres (ml) or grams (g) and record the result.

Repeat the test at 40rpm or 40%.

Obtain the measured amount in ml or g and record result.

Remember to divide by the number of minutes to give a reading in ml or g / minute.

## Calibration Calculation

Using the two readings, it is possible to plot the values on a graph and see the slope.

Peristaltic pumps are very linear within normal operating speed range.

Using the values obtained, we will subtract the first reading from the second to give us the difference in amount (g or ml) per change in speed (rpm or %). We then divide the amount by the change in speed to get a value (g or ml) per (rpm or %).

Then once we have this number we can change the pump speed and predict the spray rate per nozzle.

A calibration video is available on the coating systems international YouTube channel at

<https://www.youtube.com/watch?v=Clov5izLuPA>