Application Note 84: On Line NIR Analysis of Tablet Coating Thickness

Introduction:

On-the-go measurement of tablets in a spray dryer is an important application for the pharmaceutical industry. Applying a coating to a tablet is carried out in a rotating drum with a spray manifold located in the centre. As the tablets are tumbled, the coating is sprayed onto the tablets. The thickness of the coating and the uniformity of the coating are important quality control parameters in this manufacturing process.

The coating thickness can be determined off line using a Dissolution Tester and HPLC or UV Visible Spectrophotometer. However this required at least 1 hour laboratory analysis time. Meanwhile the tablet coating equipment is standing idle.

NIR spectroscopy provides a very rapid means of measuring the coating thickness of tablets. NIR energy can penetrate up to 30mm through a collection of tablets by bouncing off the surface of the tablets. Each collision with the tablet absorbs a small amount of energy across the NIR spectrum. Since the coatings are generally sugar solutions, then the NIR spectrum can then be used to quantify the coating thickness.

The task is to design a sampling system that can collect a number of tablets and present them to the NIR spectrometer so that measurements can be made every minute or so.

Description:

Figure 1. shows a schematic of a rotary tablet coating system. Figure 2. shows a schematic of a Remote Sampling Head designed to collect tablets from the coating drum and to perform the NIR spectral collection.

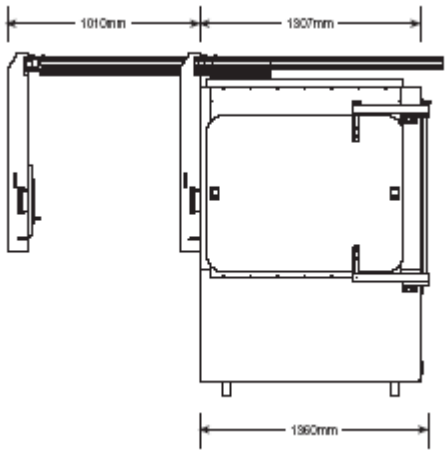

Figure 1. Schematic of a Tablet Coater

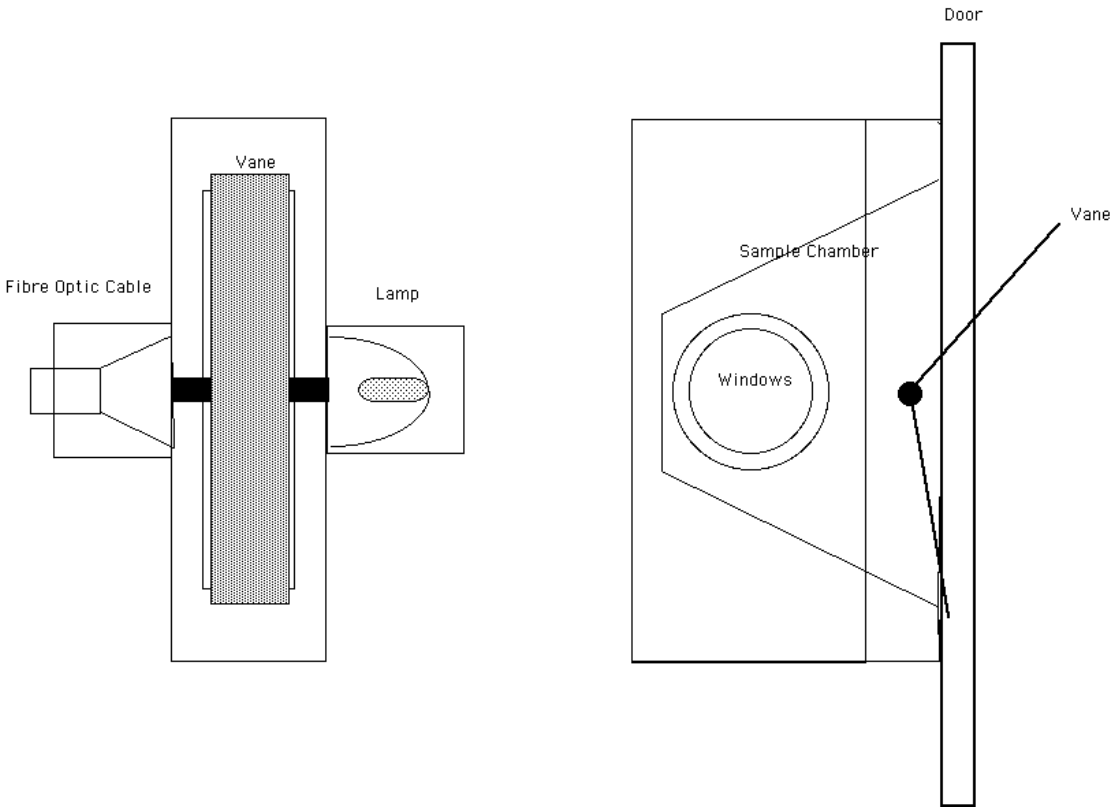

Figure 2. Schematic of the Remote Sampling Head for collecting tablets from the coating system.

The Remote Sampling Head was designed for use in a Combine Harvester to collect samples of grain and thereby make NIR analysis of whole grains for moisture and protein. With a simple modification, the Remote Sampling Head can be attached to a flat stationary surface within the drum, eg, the door, so that tablets can be sampled as they are rotated by the drum.

There is a vane in the Remote Sampling Head that opens to allow tablets to drop into the sample chamber. NIR light is shone through the sample chamber holding the tablets. The transmitted light is collected by a fibre optic bundle and passed back to the NIR spectrometer located on a stand. The NIR spectrometer computes the coating thickness and sends the information to a display screen or a PC for the operator to monitor the coating thickness.

When the analysis is completed, ie, 10 – 20 seconds, then the vane is closed and the tablets drop out bottom and return to the drum. The cycle can be repeated every 20 seconds.

Figure 3. shows the NIR spectra of several tablets, Aspirin and Panadiene, collected using the Remote Sampling Head and the NIR Technology Systems FOP-38 On Line Spectrometer and Fibre Optic Cable. The spectra were scanned from 720-1100nm.

Figure 4. Shows the second derivative of the NIR spectra for these tablets.

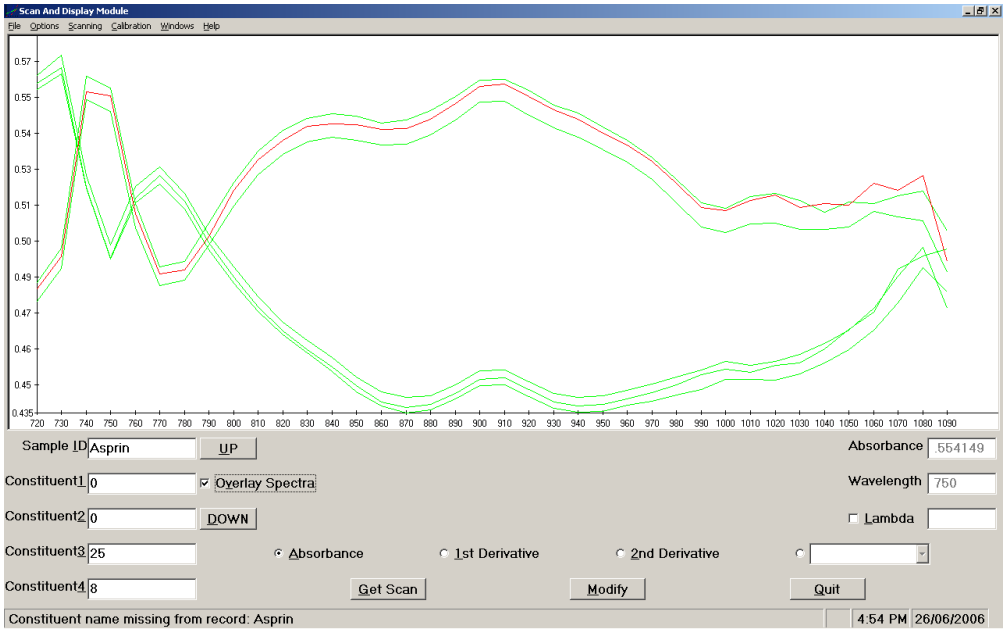

Figure 3. NIR Spectra of whole tablets, Aspirin and Panadiene

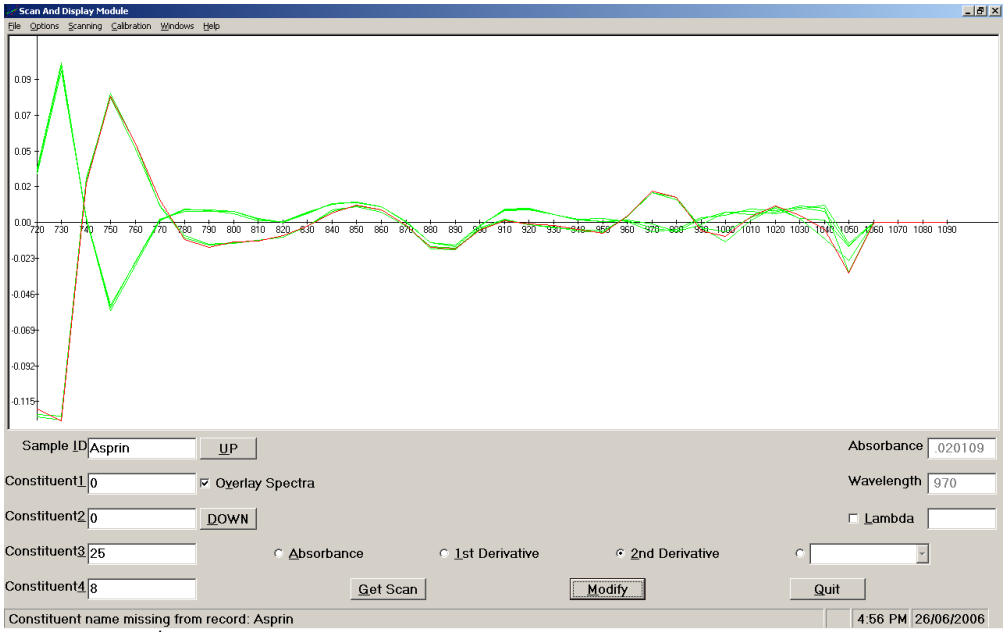

Figure 4. 2nd Derivative NIR Spectra of Aspirin and Panadiene tablets.

Discussion:

This application note is a preliminary study on the use of the FOP-38 On Line Analyser with a Remote Sampling Head to collect NIR spectra of whole tablets. As we did not have any tablets that were coated, we were unable to quantitatively estimate the accuracy of this technique. Other studies have demonstrated that ability of NIR to measure coating thickness and as such, we will defer to them as proof that the technique works. Our objective was to demonstrate the ability of the remote Sampling Head to collect tablets and then for their NIR spectra to be obtained using the FOP-38 On Line Analyser.

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