

Automated Cleaning Swab Validation Testing Using the Prelude[®] Assay Workstation

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Introduction

Analysis of cleaning swabs provides its own set of challenges to the pharmaceutical laboratory. The large numbers of samples that must be tested make it an ideal candidate for automation. Automated serial processing of swab samples can improve both the analytical quality and laboratory responsiveness.

Materials and Methods

Instrumentation

The Prelude Workstation performs sample preparation using a sonication probe. Sample assay uses an on-line Agilent 1100 controlled by Waters[®] Empower[®] chromatography data system.

Method

The Prelude Assay Workstation serially processes samples. Technicloth[®] nonwoven wipes TX612 are cut into 5cm squares which are inserted into 16X100 mm tubes after sampling. The analyst, as part of the set up, inserts sample swabs into 16X100 test tubes. The Prelude fully automates the sample preparation using the following steps. A specified volume of methanol is dispensed into the sample tube. The tube is then automatically delivered to the sonicating station for extraction. The extracted analyte is withdrawn at the liquid chromatography injection station and subsequently injected into HPLC by the Prelude's on board Rheodyne[®] injector. All method settings are controlled by Prelude's operating system and the associated Empower interface. All solvent dispenses are gravimetrically confirmed and retained in the secure database. Standards are prepared by applying standard solution to the swabs so that they may be extracted in the same manner as the samples. For the data referenced in this application note a generic HPLC method is used which has a cycle time of 10.5 mins.

Results

Analytical Results

For extractions using methanol approximately 0.2% by weight is lost from each tube by evaporation during sonication. Solvent losses have no significant effect on total error, e.g. a total error of approximately 0.4% RSD is observed for tested standards.

We routinely observe linearity for extractions over the range 10 to 4000 µg per swab with a correlation of R = 0.999 and an intercept passing with 95% confidence interval about the origin.

Productivity

When the Prelude, solvents, etc. are prepared in advance, approximately three minutes of analyst time is required when samples arrive in the laboratory to setup and start run. Analysis takes place while the next swab is being prepared. When the Prelude method has begun, the first sample (blank) is analysed after about seven minutes.

For ten swabs the unattended Prelude takes 70 minutes, which includes 63 minutes of HPLC analysis time. With manual swab preparation of ten swabs the analyst takes about one hour in total plus 63 minutes of HPLC run time.

Results are available from 10 Prelude processed samples in about half the overall time compared to the manual batched approach. The automated approach saves about one hour of analyst's time.

Discussion

Typically between 10 and 80 swabs are submitted for analysis by a single method, but swab numbers depend on equipment used in the plant process and the nature of the active ingredient. More than one analysis with different compounds per day can be required.

Traditionally, swab samples are prepared for analysis in a batch mode. After solvent addition and subsequent analyte extraction, samples are loaded into an auto injector for HPLC analysis. Batch processing creates a false impression that it provides a higher level of efficiency.

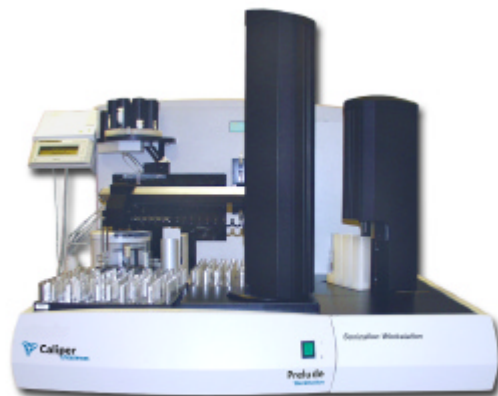
Batch processed samples are initially extracted and then set up for injection. In this approach each sample is left for different periods of time prior to analysis. Sample preparation conditions are therefore not the same for all samples, which can add analytical variability.

The overall time it takes to obtain results can be critical when equipment is in regular use. Batch processing of the sample preparation and subsequent batch processing of the HPLC analysis typically takes longer than when the samples are serially processed using Prelude. In a batch process the overall time to results is the sample processing time plus the HPLC run time for the samples. In serial processing single samples are prepared and then injected. The subsequent sample is prepared while the previous sample is running on HPLC.

Treating each sample exactly the same though serial processing can provide improved precision for routine analysis as well as remove variability during method development.

Advantages of using Prelude technology include:

- ❖ Traditional chemistry and HPLC detection methodology maintains or improves specificity and precision.
- ❖ Analysis immediately after each preparation minimizes analyte stability issues.
- ❖ Automated extraction method validation incorporating preparation and accurate spiking of standards onto swabs for recovery and precision tests.
- ❖ Limited manual operations are required to transfer approximate amount(s) of standard reference material to tube(s) and ensure correct solvents are in place.
- ❖ Highly efficient and fast sonication is achieved by direct immersion of sonic probe into disposable tube containing swab and extraction solvent. The sonic probe voltage intensity, continuous or pulsed mode, specified probe depth, and probe height cycling can be programmed into the extraction method. Vortexing can also be used.
- ❖ A sequence of extraction methods using different solvents or regimes can be linked in a single run if required.



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