

Automation of Vape Laboratory processes: greater efficiency, better data integrity

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Introduction

The smoke and vapour laboratories face common challenges in aerosol generation, sample preparation and in the processing of the filter pads where aerosol is captured. Process flows and adherence to SOP's are always a challenge where laboratory staff may not recognise the importance of compliance to the integrity of the data produced.

Appropriate automation significantly reduces the variability inherent in some processes and can increase laboratory efficiency, as well as presenting the potential for increasing efficiencies by reducing the number of staff present at any point in an analytical cycle so helping with social distancing in this current climate.

One area where the smoke/vapour laboratory can be helped is by adopting operator-independent techniques such as the extraction process of Cambridge filter pads. One example was presented at TSRC by Sirius Automation Inc Group*.

The Analytical Challenges:

One of the challenges faced in the design of any automated system for the smoke/vapour laboratory lies in the need to be able to select different solvents, vary volumes, use different glassware, variable agitation time SOP defined wash cycles and other options. All of these need to be factored into the fundamental equipment design.

To meet these exact requirements Sirius needed to be able to:

1. Comply with published methods
2. Have enough capacity for 15 flasks on a shaker table with robotic systems for stoppering and liquid dispensing reaching all the flasks
3. Have a critical homing system to remove an expensive robotic vision system; cost is always important in a laboratory!
4. Fast fill and dispense systems to drive uniform sample history
5. Have "wash cycles" for the dispensing canula with optional filtering of particulates (disintegration of pads)
6. Vapour tight flask sealing system with glass or polymer stoppers
7. GC vial capping after dispense
8. GLP & 21CFRpart11 compliance with simple friendly user interface

The Designed Solution: XTrac®

As these systems have been put into use, it has been noted that there are numerous other features that can be added to the system to ensure data integrity such as a bar code scanners. The design architecture allows a level of customisation that can incorporate these features and others that may develop as the analytical laboratory deals with new products such as VLN cigarettes, new vaping products, heat not burn and even oral nicotine products.



Figure 1: Sirius Automation Xtrac® machine configured for extraction of Cambridge filter pads and dispensing into vials for GC analysis

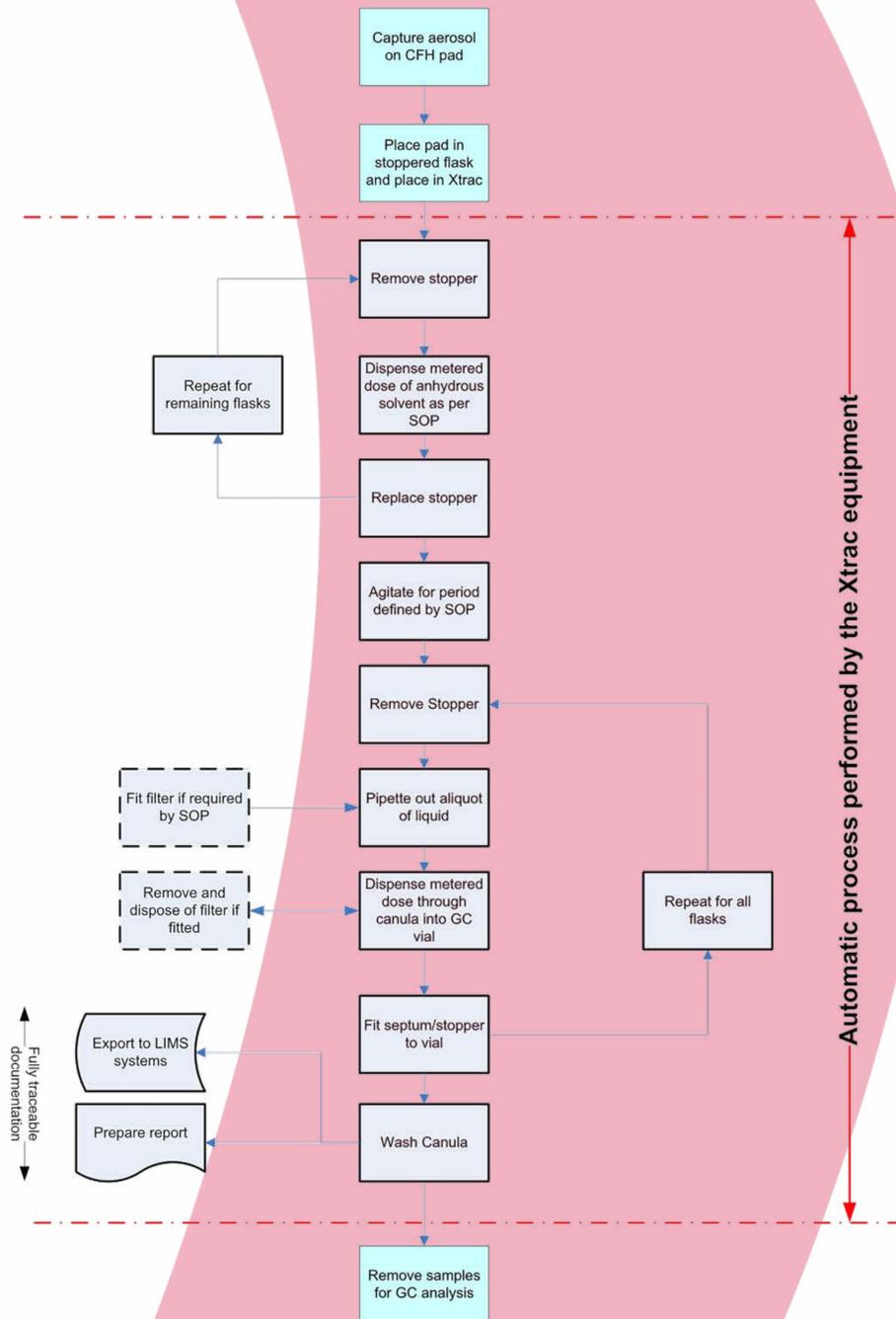


Figure 2: process flow for the Sirius Automation Xtrac machine removing significant operator error/interaction and producing GLP compliant documentation

The Result:

The Sirius Xtrac® system showed excellent equivalency to manual systems with the added benefits inherent in automation including a verifiable audit trail.

A simple trial of 8 data sets from smoking representative test pieces showed good equivalence between the manual and automated methods – it was noted that a PTFE coated canula gave improved results: (figure 3)

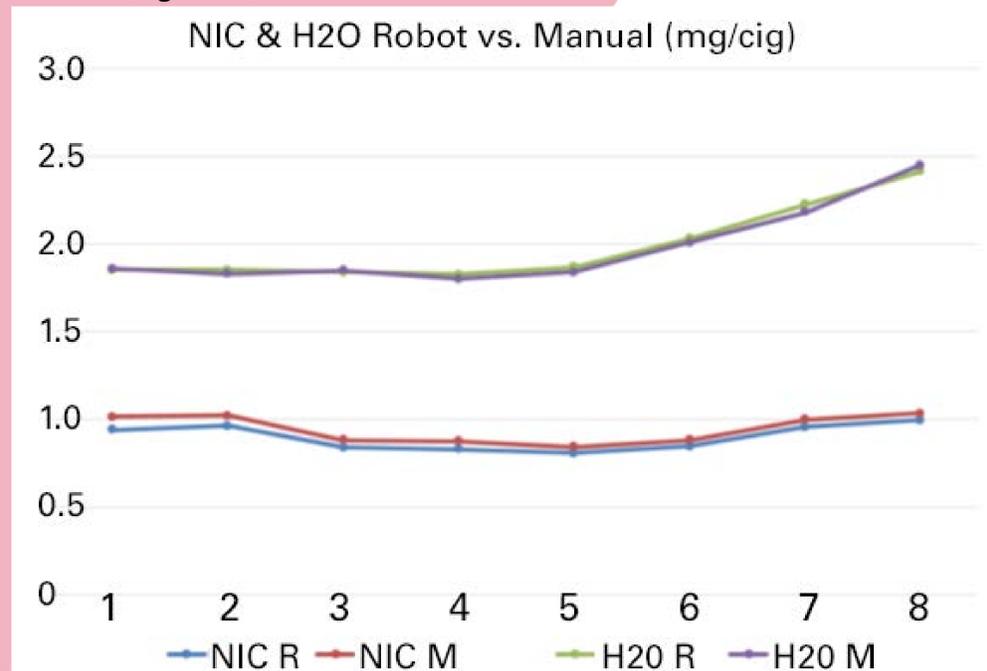


Figure 3: Comparison of nicotine & water assays from manual process and Sirius Automation Xtrac® machine

* Development and evaluation of a benchtop walkaway platform for the automated solvent extractions of Cambridge filter pads. Julian "Tony" Cox et al, 70th Tobacco Science Research Conference 2016 Palm Beach Florida

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