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Recovery Studies for Rinse Sampling

A key feature of any cleaning validation protocol is having sampling methods and analytical methods that can accurately assess the levels of residues on the sampled surface. One regulatory expectation is that the sampling method be challenged in conjunction with the analytical method to determine the percentage recovery of the sampling method. Doing a sampling recovery for a swab method is relatively straightforward, in that it involves performing the swabbing procedure (SOP) in the laboratory with a model surface spiked with a known amount of the residue to be analyzed. This is "straightforward" in that the swabbing procedure is exactly the same as the procedure performed on equipment during a cleaning validation protocol.

When rinse sampling is used as the sampling method, it is more difficult to reproduce the rinsing conditions in the lab to determine a percent recovery. Therefore, it is necessary to "simulate" the rinsing conditions in such a lab study. What is involved in simulating the rinsing conditions in this lab recovery study? Well, some things are done exactly like in a swab recovery. A model surface is chosen, that model surface is spiked with a fixed amount of the target residue, and (generally) that spiked residue is allowed to dry on the model surface.

The next steps are where the "simulation" comes in. How is water (or another solvent) used to simulate the rinsing that occurs in the equipment during rinse sampling? Some things are obvious. The water (and I will use water in this illustration, although other sampling solvents could also be used) for the recovery study should be of the same quality and temperature as the water used in the cleaning validation protocol for rinse sampling. The impingement of the water on the surface and the agitation or flow of the water should be the same or less severe than those characteristics used in the protocol. The ratio of the volume of water used to the surface area rinsed should be the same or lower than the ratio used in the protocol. Be careful here if you are doing a grab sample of the final process rinse; the correct ratio is NOT the total volume of the final process rinse to the rinsed surface area. The time of contact of the water in the recovery study should be the same or less than the time of contact in the protocol. Here again, be careful NOT to use the total time of contact of the process rinse.

There are several ways to simulate contact of the rinsing water with the spiked surface. One way is to spike a coupon much like you would do in a swab recovery, and place the coupon at a slant over a clean vessel (such as a glass beaker). Pipette an appropriate volume of rinse water onto the top of the coupon (above the spiked area) and allow the rinse water to cascade down the coupon, covering the spiked area. The rinse water then drops into the collection vessel, and is mixed and sampled for analysis.

A second way is to use a beaker of the model surface you are evaluating (stainless steel, glass, Teflon, etc.). Spike the bottom of the beaker with the target residue, and allow the spiked solution to dry. Then carefully pipette the appropriate amount of rinsing water down the side of the beaker to cover the bottom. Place the beaker on a shaker or other vibratory device for a fixed time. Decant the rinse water and measure the target residue in the rinse water.

A third option combines aspects of the first two. A coupon is spiked (as in the first example), but the coupon is placed in the bottom of a glass or stainless steel beaker. As in the second example, a fixed volume of rinse solution is pipetted down the side of the beaker, and the beaker placed on a shaker. At the end of the rinsing time, the rinse water is decanted and analyzed. Note that this third technique may be fine if you are using a

specific HPLC method. However, if your analytical technique is TOC, realize that you are also sampling the sides and bottom of the coupon, and this will contribute to the measured TOC. Unless very extreme care is used to prevent extraneous contamination of the bottom and sides of the coupon, this simulation is not recommended if TOC is the analytical method.

With any of these sampling recovery examples, appropriate blanks and controls should be utilized to assure that the recovery percentages calculated are reflective of the recoveries achieved in actual rinse sampling of equipment.

This Cleaning Memo is not designed to promote one kind of sampling over another, or to advocate one kind of rinse sampling simulation over another. In addition, there may be other kinds of rinse simulations that can be appropriately used to measure rinse recovery percentages.