
TECHNICAL NOTE K-09-98

POST DISPENSE SUCK-BACK VERSUS JERK-BACK

When dispensing high-tech fluids

In the mid 1960's there were no acceptable automatic dispensers for photo-resist, or other high purity, controlled viscosity high tech fluids. Post-dispense dripping and drying (change of viscosity) at the line tip, between dispense shots, were the most common problems. Sometimes a skin would form across the end of the dispense line between shots, and the following shot would break out to the side of the dried skin area, causing the target of the dispense to be completely missed.

In the late 60's Headway Research, Inc. introduced a pump with controlled suck-back after each dispense. Since that time, several dispensing systems have adopted the idea somewhat, and call it "suck-back", when it fact is should be more accurately called "jerk-back". True post-dispense suck-back works better!

SUCCESSFUL POST-DISPENSE SUCK-BACK

Successful post-dispense suck-back must commence immediately coincident with the termination of the dispense. This prevents a delayed "last drop" from independently falling and disturbing a spin coating operation.

The suck-back should proceed at a very slow, controlled rate, for a considerable length of time, such as 15 to 45 seconds. This suck-back should result in the fluid being pulled back up the dispense line a significant distance, typically ½" to 3" or more.

RATE: If the rate of suck-back is very slow, the surface tension of the retreating fluid will draw the fluid off of the internal surfaces of the typical Teflon dispense line, leaving the wall clean, without droplets to dry and cause flaws in the next dispense.

DISTANCE: The greater the distance of suck-back, the longer the diffusion path for fluid solvents to escape the fluid/air interface inside the dispense line. The less the solvents escape, the less the change of viscosity in the dispense line. Also, with a significant section of line filled only with the solvent vapors, back-diffusion of room atmosphere is reduced and undesirable chemical reaction with the atmosphere is minimized.

LESS SUCCESSFUL JERK-BACK

Post-dispense jerk-back can successfully prevent the delayed "last drop" phenomenon. It typically does not result in a significant withdrawal distance of the fluid from the end of the dispense line. More solvent will escape from the fluid/air interface within the dispense line, resulting in a change of viscosity between dispense shots. Jerking back quickly will typically leave a layer of fluid on the internal line walls, which coalesce into droplets that dry and create particles to come out in the next dispense.

AN ADDED SAFETY

A short pre-dispense purge of the dispense line can reduce the incidents of dried particles breaking loose from the external surfaces of the dispense line (exposed cross-section of the dispense tubing), and can rid the line of the "aged" air/liquid interface fluid in the line. To do this, the dispense point of the line must be movable so the pre-purge can be directed away from the target substrate. "Moving Arm" mechanisms are typically used to park the dispense line at an out-of-the-way home position, where a pre-purge can safely take place. Dynamic dispensing as the moving arm approaches the center of rotation of a substrate can, in some cases, result in superior coatings with a savings of expensive fluid.

Headway's newest dispense system, model HDP98, provides easy and consistent control of suck-back rate and time. A gravity powered suck-back version and a vacuum powered suck-back version is available, to handle a wide range of viscosity. It can be interfaced with virtually any machine control system.

Headway's new series of moving arms, the MAXX series, provides a cost effective way to move dispense lines for pre-purging and/or for dynamic dispensing (moving-while-dispensing) processes. Optional optical shaft encoder versions can provide position feedback to an interactive controller.

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