

# “Is This a Convenient Time to Clean?”

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Asking if it's a convenient time to clean is equivalent to asking: “Is this a convenient time to extract your impacted molars”? The simple answer is “No.” There's never a convenient time to clean (or remove impacted molars). Cleaning does not have any associated technical glamour or appeal — it tends to be considered a necessary evil and is therefore always inconvenient. No one comes to work in the morning excited about the prospect of cleaning. To make matters worse, often cleanroom surfaces don't look any different after cleaning. Cleaning is also viewed as a disruption to the orderly flow of manufacturing; ostensibly, if you are cleaning, you cannot be making product.

On the one hand, cleaning is a recognized requirement for minimizing contamination in cleanrooms. But in practice, these activities are often postponed, compromised, or ignored. When this occurs, air-borne or contact-transferred contaminants will accumulate on critical surfaces and unless they are removed by regular cleaning activities — for example by wiping — these contaminants can affect processes, products and yield. It may seem incongruous that a low-technology activity such as the wiping of surfaces can be effective in controlling contamination in modern, totally-automated, multi-billion dollar semiconductor manufacturing facilities, but there is no substitute for the surface energy that wiping provides to remove contaminants and the subsequent containment of those contaminants within the wiper fabric.

There are three interconnected solutions to address this problem:

- Protocol development and training
- Convenience
- Audits

Cleanroom operators must be supplied with written protocols on contamination control. For wiping activities, the protocol should explain what objects to wipe, what type of wipers and cleaning agents to use, how often to do the wiping and how to wipe for best results. Operators need to be trained, tested for proficiency and re-trained on a regular basis. Illustrated posters are excellent ways to reinforce proper protocol. As a good rule of thumb, each operator should be trained to wipe his or her immediate work area

at the beginning of the shift, before beginning any routine production tasks. That way, the operator knows that the area is clean for that work period.

Convenience is key. If wipers, or preferably pre-wetted wipers are conveniently available, then there is some reasonable expectation that the necessary wiping activity will be done. If operators have to walk some distance to retrieve a bag of wipers from some central storage location, then return the unused wipers to that location, one can foresee that the necessary wiping will be skipped. Further, the availability of wipers near the work area will visually reinforce the need to maintain the area clean before and during the shift, and will provide the opportunity to do as-needed glove wipe downs as items are handled. This will prevent undesirable contact transfer of contamination. Pre-wetted wipers tend to be preferred over dry wipers because they eliminate the need to find filled squirt bottles of the appropriate cleaning agent (e.g., 6% IPA). Pre-wetted products provide wipers with the proper amount of wetting solution on them in one convenient delivery system.

Finally, auditing the cleanroom on a regular basis (e.g., monthly or quarterly) will provide feedback on cleaning frequency and effectiveness. Typically, one would audit for visual appearance of surfaces, appearance under high illumination at oblique angles, surface sampling for particle levels, wiper usage per zone and the appearance (or absence) of used wipers in the trash. These are but a few of the items that might be done in an audit review.

A convenient time to clean occurs when operators are trained and when cleaning products (i.e., wipers) are conveniently available. Convenience, surprisingly, translates to protocol adherence, and consequently, cleaner cleanrooms. Regrettably, there's still no convenient time to extract impacted molars.



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