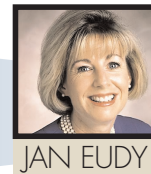


ASK JAN:

Nonionic vs. Anionic Surfactant

Jan Eudy is Corporate Quality Assurance Manager for Cintas Cleanroom Resources and the IEST 2004 President.



I'm getting soiled bunnysuits returned by my commercial launderer. He says he can't get them any cleaner with the solution he uses. My question is, are nonionic surfactants as effective in cleaning my polyester cleanroom bunnysuits as anionic surfactants would be?

If anionic surfactants clean better, then how important is it to use nonionic surfactants to clean the bunnysuits? Doesn't the act of rinsing the bunnysuit remove the surfactants anyway?

I completely understand your request for garment aesthetic, particulate and elemental cleanliness. However, in order to answer your questions accurately, I need to know the nature of the soiling of the cleanroom garments. Specifically, is the soil:

- ▶ A chemical or component used in your process?
- ▶ Make-up, tar or nicotine, skin lotion or after shave from non-compliant operators?
- ▶ Due to an action during production such as rubbing the front or sleeves of the garment against a metal surface?

First, I would like to clarify that surfactants are either "nonionic" meaning no elemental cations or anions present in the formulation, or "ionic" meaning some elemental cations or anions are present in the formulation. Nonionic surfactants are not as effective in cleaning polyester fabric as ionic surfactants.

The 100% polyester cleanroom fabric typically used in the cleanroom contamination control industry is very durable but difficult to clean because it is hydrophobic (hates water) and oligophilic (loves oil i.e. skin oils and hair oils). This fabric has a small pore size to entrain skin flakes and viable and non-viable particles. It also attracts soils of process materials, make-up, hair gels, skin lotions and after shave cologne and is easily abraded by rough surfaces. The polyester molecule is sensitive to extreme levels of acid or alkali and temperatures over 160°F will set in wrinkles.

Specific chemicals or components in your process may require a chelating agent to remove. Many companies will not supply the cleanroom garment launderer with the information required to select the correct chelating agent. Additionally, it is well known by disinfectant manufacturers that some of their disinfectants will permanently stain the polyester garment. Oils require alkaline or aromatic hydrocarbon environments to be removed from polyester. However, the polyester molecule will undergo "alkaline hydrolysis" if the alkali is not neutralized and aromatic hydrocarbons may outgas in the cleanroom if not completely removed. Additionally, skin rashes at the point of contact with the garment may occur if the final pH of the garment is above 7. Actions such as rubbing against a piece of equipment embed the soil into the fabric and it requires a similar rubbing

action to remove the soil.

Yes, the rinsing of cleanroom garments with multi-megohm DI water will remove ionic detergents as well as nonionic detergents, if performed properly and tested for efficacy of the rinsing.

What were your specifications for garment cleanliness? Do you specify a level of particulate, elemental and aesthetic cleanliness? The validated wash formula should address your specifications. For example, if the soil was due to a component of your process, the validated wash formula should have a chelating agent to remove the substance, proper agitation of the wash chemical(s), filtered processed water and garments, temperatures below 150°F and enough multi-megohm DI water rinses to remove the substance and residual wash chemicals. Testing performed during the validation process such as pH, total dissolved solids, extraction testing for specific elements and the results of the testing provide documented evidence that your specifications will be achieved.

Aggressive wash formulas to remove some specific process chemicals and most stains are more expensive to validate and execute. Additionally, over time, the more aggressive wash formulas with additional agitation will increase the pore size of the fabric and decrease the ability of the fabric to entrain particles. The more aggressive wash chemicals and scrubbing stress the polyester molecule and decrease the useful life of the fabric. Many customers do not want to pay these higher costs associated with the sophisticated wash formulas.

You may audit your process and determine that the nature of the soil is due to non-compliant operators or actions by operators that can be controlled by re-training. There are comprehensive training programs available based on the Institute of Environmental Sciences and Technology recommended practices for Contamination Control.

If you have any questions for Jan, please send them to chief editor Paul Nesdore at pnesdore@a2c2.com.

