KYZEN

Technical Article

FASTEN DOWN YOUR COST OF OPERATIONS

Go Lean & Green With New Technology

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A lot of OEM fastener manufacturers encounter issues with new lubricants or machine coolants that do not react with existing cleaning process. As an example, new synthetic lubes will not clean in same process or system as organic based lubes. High temperature lubes often require more mechanical action, and sometimes, even a different cleaning chemistry. Various grade metals react with the forming, machining process or dies, and most metals often require corrosion protection. These modifications in parts cleaning are generally affected by the ever-tightening environmental regulations including restrictions on air emissions, waste discharge/disposal, and personal safety. Bottom line is, manufacturing performance is directly related to these items.

GLOBALLY ACCEPTED CLEANING TECHNOLOGY

New globally accepted cleaning technology is now being applied to small parts/high volume production methods in order to yield:

- ✓ Superior cleaning
- ✓ Environmentally preferred features
- ✓ Various processing options
- ✓ Lower "Total Cost of Ownership"

Vacuum degreasing technology is leading the way to replace older generation solvent cleaning systems as well as some alternate aqueous cleaning processes.

Today's new vacuum degreasing equipment is designed to offer a wide variety of cleaning applications in one central piece of equipment using one chemical cleaning agent for all soils and processes.

OVERVIEW OF PROCESS BENEFITS

Small parts in high-volume applications generally require immersion cleaning to ensure all surfaces of the parts are exposed to the cleaning agent. These soils can be a cutting oil or lube (nonpolar in nature) "or" can be water soluble coolants (typically polar in nature).

Most bulk parts in a common work baskets require mechanical action to enhance the soil removal such as:

- ✓ Rotation or basket rocking action
- ✓ Ultrasonics
- ✓ Bath turbulation (spray under immersion)
- ✓ Multiple stages of washing (hydraulic flooding effect)

These mechanical actions combined with the cleaning agent's chemical compatibility and operational temperature create the process required to remove the soils in desired time frame and provide the cleanliness level to meet your production requirements. The process is able to reach the center of the work basket where parts are shielded from external impingement actions.

Most new vacuum degreasers offer the above stated process options inclusive in one machine, which helps shortening the overall process time. The end-user simply selects the cycle program and functions that match the parts being processed—from desired wash stages to dwell times to the type of mechanical action required, all controlled by the HMI.

VACUUM DEGREASING MACHINE

Today's equipment often have available selection for fragile or tough, rotation or not, ultrasonics or not, and short or long cycle times. Acceptable cleaning of all parts must ensure that required cleaning levels are met before next process step whether that is plating, coating, heat treat, additional machining or packing for release to buyer.

PRODUCTION FLEXIBILITY

For decades, solvent degreasing was the preferred cleaning method for most high-volume/small-parts manufacturers. Compared with aqueous cleaning, most factories found degreasing to be a simple, one-step process, requiring less floor space,

maintenance and cost, while providing greater compatibility for numerous soils and substrates.

Government regulatory changes created a partial exit from solvent cleaning and resulted in an increase in aqueous processes. We are now seeing a change back to vacuum solvent processes based on the facts outlined here. Several facets have contributed to recent increase in solvent usage. A majority of them will be illustrated throughout this article.

Degreasing is especially effective for parts with complex geometries due to solvents' ability to penetrate the smallest tolerances. These parts are sometimes difficulty to rinse and dry in a required time frame. Solvent usage in a vacuum degreaser improves that portion of the cleaning process. If any solvent remains on the part, it will be evaporated inside a sealed chamber leaving minimal or no residue without affecting the substrate, and most importantly not being discharged into the atmosphere.

When used with the correct chemistry, these units will work equally well in removing both polar and nonpolar soils. This means one common cleaning system will work on all production parts without having to operate and maintain separate systems.

For parts requiring an anti-corrosion protection, the process can be easily adapted to include rust preventative inside the system, eliminating an external step of a separate application device and material handling.

These systems reduce energy consumption over typical degreasers or aqueous process lines due to vacuum technology that allows the solvent to operate at lower temperature. Due to the enclosed design, solvent consumption is considerably lower on an annual purchasing basis by up to 50% or more.

Floor space requirement is generally less than most tank lines. Most of these units have an internal separation system that removes the soils that were displaced off the parts from the solvent. This allows the same solvent to be re-used for conservation of operational cost as well as reducing waste disposal volume.

PREFERRED FEATURES FOR ENVIRONMENTAL SAFETY

During the vacuum degreasing cleaning process, all cleaning work is conducted inside a sealed unit. This isolates any operator from potential chemistry contamination as well as drastically reduces any fugitive emissions such as VOCs that could contribute to global warming.

Ambient area personnel are not exposed to open process tank, nor subject to fugitive emissions migration created by wind drafts or improper operation of system and lack of proper ventilation.

Dirty metal parts enter the system and clean parts exit only after all the proper cycles have been completed. The process chamber door is sealed before start of cleaning cycle and only opened after the process chamber has been evacuated of residual cleaning

solvent. Clean and dry parts can be removed and generally ready for next stage immediately due to lower part temperature allows rapid handling.

There is no remaining chemistry to drain during processing. Waste are separated for periodic disposal, but at a lower volume versus discharging entire tank bath as in past.

And there is no rinse water to recycle or dispose of. This feature in itself is one strong point in facilitating compliance to the Clean Water Act.

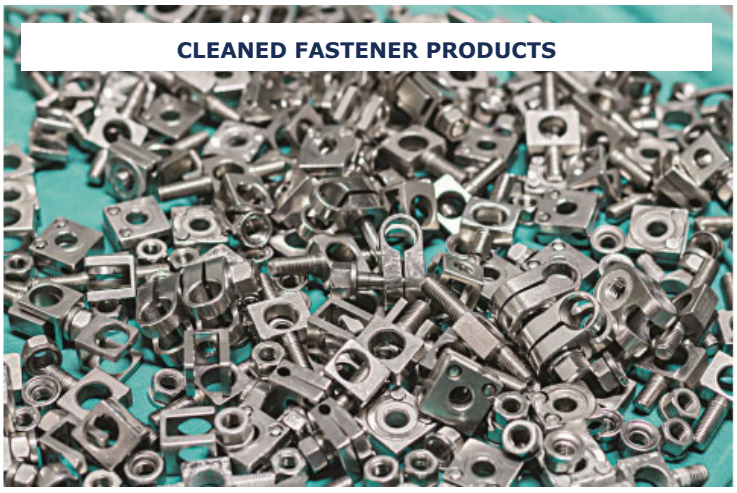
CHEMICAL COMPATIBILITY

Modified alcohol is the typical cleaning agent used in most of these new degreasers. Chemistry such as KYZEN Metalnox® M6386 cleaning blend is designed to clean a wide range of oils and coolants, and it is safe on steel, brass, aluminum and other metals. Europe has led the way for this type of process to replace both solvent and aqueous systems in recent years.

Another common solvent used in vacuum degreasing is a "*hydrocarbon compound"* such as KYZEN Metalnox® M6381. This solvent is mostly for nonpolar soils and it is typically not recommended for polar soils. The process using hydrocarbons also requires higher operational temperature than modified alcohols.

This chemistry and process is quickly growing worldwide, especially in the USA where small parts in large volumes create the need to clean and dry quickly as well as thoroughly inside a work basket filled with small parts.

The benefits of this new solvent to match this new equipment process is now accepted by a large number of users. These include users that cannot or will not use a water cleaning process, users that require solvent cleaning for blind holes, cavities and passage ways where the substrate requires cleaning/rinsing/drying. Sometimes water processes simply will not work.



CLEANED FASTENER PRODUCTS

The modified alcohols solvents features:

- ✓ Compatibility with a wide variety of metals.
- ✓ Effectively removes both polar and nonpolar soils.
- ✓ Has excellent solvency for a range of soils.
- ✓ Has extremely low surface tension to penetrate and remove soils from blind holes and crevices.

- ✓ Very low odor on parts upon exiting the system.
- ✓ Parts are dry and free to chemical residue.
- ✓ Can be recycled / re-used.
- ✓ Not listed as HAP by EPA.
- ✓ Meets regulatory and safety requirements.

WHY SWITCH?

Small metal parts, especially in high-volume bulk, are sometimes difficult to clean and dry in desired time frame. They can present material handling issues to prevent part damage during transfer from containers to cleaning process or during the cleaning process itself. Various substrate materials or soils may require dedicated process equipment and/or application specific chemistry. In addition:

- ✓ EHS concerns are front and center in any plant.
- ✓ OSHA/EPA/ACGIH and other groups are developing new guidelines that may affect current process methods.
- ✓ Cost of quality increase as a result of rejects/rework.
- ✓ Overall operational cost for chemicals, utilities, labor, waste disposal, operational compliance/monitoring/process adjustment and other additional items.

Environmental impact is driving equipment design toward enclosed systems when possible. Whether an atmospheric shielded tank or hermetically sealed chamber, vacuum degreasing is easily becoming the preferred process of many companies. The advantages of these systems are readily apparent. These include lower solvent usage costs and emissive losses, combined with a controlled process that yields repeatable results with minimum operator interface. All the above leads to lower cost of operations.

GAZING INTO THE FUTURE OF VACUUM DEGREASER PROCESS

In my opinion, the vacuum degreasers are quickly becoming the future of solvent cleaning technologies for small parts/ high volume cleaning in my opinion! And they generally function equally well with most aqueous soils. In this particular market, the industry as a whole is seeing new machines being ordered at an increasing rate for many different reasons:

- Small, precision cleaning operations needing totally enclosed systems featuring automation to minimize operator interface while conserving maximum solvent.

- Solvents cleans better, faster, and in tighter areas than water can reach. And now there are many safe solvents.

- Today's cleanliness spec for precision/critical cleaning cannot have any contaminant or rinse water residue on the end product, drives some users toward solvent.

- Cost to clean will always be a part of this equation, as will the cost for environmental compliance and end user confidence. There isn't a "one size fits all". Some applications can go either solvent or aqueous, and there will remain alternate choices for all.

Solvent and equipment manufacturers believe this new process will remain viable into the future. We know the equipment will evolve along with the solvent that goes into them. The basic process will remain similar. Improvements will come in new solvent blends and processes, material handling concepts, solvent recovery systems and even tighter environmental compliance.

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