Choosing a cleaning compound by examining the total manufacturing process.

Once only considered an after thought in the aqueous cleaning selection process, cleaning compound choice is finally beginning to be seen as one of the critical variables of part washing. This selection of compound will ultimately either enhance or detract from the machine that is manufactured to perform the washing.

Since the move from solvent degreasers began over a decade ago, the challenge has been to attain the cleanliness level with water and soap that had been achieved before the new regulations mandated the elimination of ozone depleting products. Since that time, material handling, nozzle configuration, pump flow and pressure, stage length, part orientation, and solution heat normally are the variables that command the most attention when developing an aqueous cleaning process. By concentrating on these variables, process designers have deliberately ignored the opportunity to choose a soap that is compatible with the process. In the past, this variable has been deliberately left out because sheet metal fabricators, engineering houses, and machine builders who manufacture the washers were out of their area of expertise when it came to a product such as a cleaning compound. Recently, however, this practice of ignoring the opportunity to choose a compound has reversed itself. Part cleaning system designers and manufacturers have begun to work more closely with, rather than against, chemical blenders.

Prior to this new attitude of joint venture, a great deal of finger pointing could be counted on whenever a problem arose in the field with a washer. From component deterioration to cleanliness level specification failure, if a customer brought up a problem to the manufacturer with the equipment, the first thing the manufacturer would question would be the type of chemistry used. While the chemical blender would, inevitably, question the design of the system itself.

These new partnerships are necessary in order to optimize the cleaning effectiveness, and consequently the customer satisfaction, for those who need to wash parts. This situation is especially true in high volume, continuous feed applications. Washer manufacturers and those responsible for washing parts in high volume manufacturing environments need to be knowledgeable about what each chemical cleaning compound offers each application. With this knowledge, they can recommend a blend that provides for all the needs of the application.

There is much this new attitude empowers vendors to do. Capital equipment builders are still unlocking the potential of chemical blenders to: contribute to the extension of bath life, limit foaming, enhance the ability to coat or paint the part in subsequent operations, reject oil, or inhibit the part to protect from corrosion.

The key to discovering the correct compound for each application, lies in answering a few critical questions.

The first characteristic of the manufacturing process to consider when choosing an appropriate cleaning compound is the part itself which is being cleaned. The material that the part is made of influences the decision. It makes a difference whether the item being washed is a tray of plastic dunnage, a stainless steel fixture, a cast iron hub or an aluminum component. It is a rare, relatively ineffective chemical blend, that would be appropriate to be used in each of these applications. Remember, if it can work on everything, it will not work very well on anything.

Ferrous metals need to be washed with a blend that contains some kind of corrosion inhibitor such a triethanolamine, triazoles or borate. Without these in the blend, the part may experience flash rusting before it even exits the machine. The percentage of rust preventative contained in the compound however, is determined by the subsequent operation. A manufacturer would be foolish to use a cleaning product or rust inhibitor that promised four weeks of rust protection if the next step in the manufacturing line was through a paint line. The blend that promises long term corrosion protection is able to do so because it leaves a film on the surface of the part that keeps the moisture away from the material. This film may also prevent the paint from attaching itself to the part adequately. Consequently, it will encourage the part to peel soon after the paint is applied and dried.

Plastic dunnage, stainless steel and aluminum obviously do not need corrosion inhibitors in the mix. They often require some kind of wetting agent that will enable the part to shed water more easily. This similar washing need however, does not mean it is safe to assume that the same compound can be used for each of these and provide satisfactory cleaning in all instances. Plastic needs something that will be effective in low temperature applications. Aluminum parts need to be clean on the surface without the aluminum being oxidized to create “white rust”. Thus, there are numerous reasons why you would want a different cleaner for each application.

The second manufacturing characteristic that needs to be known is the type of contaminant that is being washed off the product. Coolant, chips, drawing and stamping compounds, grease, or light, medium or heavy oils all can be freed from the substrate with varying degrees of success. What blend is appropriate for which application depends on what combination of contaminants need to be cleaned off. Hydroxides, silicates, phosphates, amines and carbonates all provide a source of alkalinity that is effective in cleaning. Some processes need a higher pH content to be effective, while others do not need the pH and therefore their users can forego the hassles of treating and disposing of water that, in effect, is considered hazardous waste even before the first part has been washed in it.

Knowing what contaminant needs to be washed off, is necessary not only to know how to free the contaminant from the substrate, but also so that wash water can be effectively treated. This is vital to an organization that must perform high volume, in-line cleaning.

For example, due to the strength of the economy, it is not unusual for an automotive plant or supplier to run 24 hours a day 7 days a week. Working at that breakneck pace is only possible if the machines in the manufacturing process are able to be maintained on a regular basis, while production continues. To accomplish this, auto lube systems, automatic water makeup systems, timers, differential pressure switches, intricate filter arrangements and programmable controllers are installed into units so that when something needs to be taken care of, the operators are warned in advance of a system failure and instructed on how to remedy the situation.

In addition to the mechanical instrumentation, which often can relieve washwater of chips and dirt, the proper cleaning compound can also allow parts to be washed clean of varying weights of oil for an extended period of time. Soluble oil separates from water over time by rising to the top of the water and floating. This makes removal easy. Oils only rise naturally from their mixed state, however, when the turbulation caused by the pump action ceases. Chemistry can encourage this necessary separation while the turbulation continues.

What is accomplished with the right chemistry blend, is the rejecting of those oil particles that are mixed in the wash tank. This causes them to pop to the top in a timely manner. Oil rejection is preferable to emulsification, which in essence greatly reduces the length of the bath life. When that rejection takes place, simple oil coalescing and removal systems will eliminate the oil from the tank before it saturates the tank and forces the washing process to continue with dirty water.

There is no a simple formula that works every time to make sure the correct chemical blend is chosen to reject oil. Only laboratory testing by an independent lab, a chemical blending lab, or an advanced technology center like those found in some washer manufacturing companies, will prove which chemical blend will adequately reject which combination of oils best. It should be noted that not all oils can be separated from the water solution. Sometimes the cleaner itself binds to the oil thus breaking it away from the part to be cleaned. These systems are those in which cleaner concentration must be closely monitored, because as soon as all the cleaning agent is chemically “used up “ to clean parts, the parts washer fails to accomplish its purpose.

Production rate also plays a desired role in determining the correct compound for washing. This characteristic of the process helps determine the compound’s necessary durability and effectiveness. A high production rate greatly affects the amount of time that the cleaner has to perform its cleaning activity. For example, at twenty-seven feet a minute a monorail system would need a cleaner that is very effective in a short period of time. This usually means the cleaner will be aggressive. On the flip side, a belt washer moving at one and a half feet a minute would need a cleaner that is less aggressive; such a slow production rate creates an action that is almost like soaking. The production rate also affects bath life. A high production rate means a large amount of contaminant is being dumped in the bath. This weakens the cleaners effectiveness sooner then the cleaner in a slow production rate system. As with anything you pay for what you get. The more durable the cleaner the more expensive the price per gallon. As note of common sense, always choose a product based on "product out the door cost", rather than on cost per gallon. A cleaner that is twice as expensive as another, yet last three times as long is the best bargain. Successful cleaning is only another source of frustration if it is not coupled with successful bath maintenance that has as its goal extended life.

Cleanliness specifications can affect the compound that is chosen. A very stringent spec will lead one to chose a cleaner that will clean down into the surface of the part. A general spec might allow one to use a cleaner that passes a "clean to the touch" test.

Knowledge of the previous and subsequent manufacturing processes are essential in choosing the right compound for the operation. A part that comes out of an oven at seven hundred degrees acts far different chemically, than a part that is at ambient temperature. Also note, that if a part is going to sit in a ship's hold for a six month trip after the washing process, a rust inhibitor in a rinse stage would be a very likely choice. Similarly, the cleaners used must be compatible enough to get the part as clean as necessary and as rust inhibited as necessary, yet still enable the next step in the manufacturing process to be successful. Whether that is painting, welding, assembly, or packaging for shipment in a humid environment, washing is pointless if it does not help the next process.

Water temperature and water condition also need to be considered. Low temperature washing needs a compound with anti-foam ingredients. Sometimes a high temperature is needed to assist in the chemical breakdown of the contaminant. These can affect choice of compound and add to cost per gallon of the compound. If foam is present a manufacturer will severely limit the unit's ability to wash parts. Like low temperature, soft water can also cause a foam. Foam hinders cleaning by overflowing the tanks onto the floor, encouraging the pumps to cavitate, dissipating heat quicker and by making it virtually impossible for oil coalescing systems to successfully remove oil from the bath. Hard water can greatly reduce the effectiveness of a cleaning agent by making it chemically inactive.

A cleaner that does not harm the substrate's surface while thoroughly cleaning it, must also encourage soil to separate from the rest of the solution in a turbulent tank. It must treat easily after tank cleanouts have been performed in order to limit the number of wastewater barrels that must be disposed of. the right cleaner must also limit foam. Above all else though, the proper cleaner for the cleaning process must allow the part to successfully complete the next step in the manufacturing process.

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