Technical Report

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Industrial Washers & Cleaning Systems

Cleaning and degreasing metal, plastic and glass by dipping, soaking or spraying with liquid cleaners is a common process in the manufacturing industry. Industrial parts washers remove grease, soil, oil abrasive dust, corrosion, and other contaminants from the surface of components in production. The parts washers are usually powered by electricity, gasoline, oil, or steam and include a wash tank made of glass, plastic, steel, or stainless steel.

Types of Industrial Cleaning Systems

Immersion Cleaning:

This system is an effective and simple method of parts washing. It involves immersing a part directly into a liquid cleaning agent. Immersion cleaners are preferred for parts that must be placed in baskets and for processes requiring extended soak time because of the type of contamination to be removed or the shape of the part. Foam is much less of a problem in immersion washers. Cleaners used in this application are generally detergents that emulsify oils. This characteristic is desirable because it prevents the parts from becoming re-soiled as they are lifted out of the cleaning solution. Applications include general-purpose cleaning, surface preparation, bottle or container cleaning, degreasing, de-scaling, or stripping.

Ways to Enhance Immersion Cleaners:

1. *Heat*
2. *Agitation*
3. *Sonic waves*

Ultrasonic Cleaning:

This process is an enhancement to immersion cleaning. It improves the cleaning efficiency of most liquids including neutral, alkaline, acidic, and semi-aqueous solutions. It is a good alternative to traditional solvent-based cleaning operations such as vapor degreasing. Ultrasonic systems may be used to effectively remove particles, machining chips, grease, oils and other contaminants; usually in a multistage process consisting of an ultrasonic wash, rinse, and dry.

Ultrasonic energy is created within a liquid by means of transducers which convert electrical energy into acoustic energy. The transducers consist of vibrating elements tuned to specific frequencies. Alternating high and low pressure waves generated by these frequencies produce cavitation, which is the rapid formation and collapse of millions of tiny bubbles in liquid. During the low pressure phase, these bubbles grow from a microscopic size until, during the high pressure phase, they are compressed and implode. The agitation caused by cavitation creates a highly effective scrubbing of both exposed and hidden surfaces of parts immersed in the cleaning solution. As frequencies increase, the number of cavities produced also increase but the energy released by each cavity decreases, making higher frequencies ideal for small particle removal without substrate damage.

Advantages to Ultrasonic Cleaning:

- *Ultrasonic cleaning is powerful enough to remove tough contaminants, yet gentle enough not to damage the substrate*
- *Provides excellent penetration and cleaning in the smallest crevices and between tightly spaced parts in a cleaning tank*
- *Ability to clean sensitive parts with mild chemistries*
- *Precision, speed, and consistency*

Ultrasonic energy penetrates into crevices and cavities allowing any type of part or assembly to be cleaned. In many cases ultrasonic cleaning is the only way to meet strict cleaning specifications. In addition, ultrasonic cleaning is faster than any conventional cleaning method in the removal of soil and contamination from parts. Entire part assemblies may be cleaned without disassembly. Unlike manual cleaning, ultrasonic offers unmatched cleaning consistency, whether pieces to be cleaned are large or small, simple or complex, in batches or in an automated line.

Cleaners used in this application are generally detergents with low surface tension and high vapor pressure. These characteristics are the most significant aspects for determining cavitation intensity and cleaning effectiveness. The energy required to form a cavitation

bubble in liquid is proportional to both surface tension and vapor pressure.

Auger Washers:

These are generally combination systems where parts are drawn through immersion baths and subsequently sprayed with the same solution. The nozzle pressure in these washers is generally low, so foam is less of a problem than in other types of spray washers. These washers are often used in removing relatively heavy oils with cleaners that have reasonably good detergency. Oils are typically skimmed from the solution surface so an oil rejecting cleaner is usually desired

Vibratory Cleaning:

Typically these systems are used for de-burring, pre-plating, and de-scaling processes. The machinery delivers mechanical energy to the media, cleaning compounds, and parts to achieve the desired finish. The media abrades, burnishes, or polishes the parts as driven by the machine. The cleaning compounds keep the media in good condition, lubricate the parts to improve the finish, flush media slurry and metal fines out of the vibratory chamber, and treat the part finish for color and/or corrosion resistance. Parts may be hand or conveyer introduced. Extraction of parts usually occurs by hand, but may be aided by using separating screens.

The function of cleaners in this type of operation is to suspend and remove fines that are generated during the process. In many cases foam is desirable as a method of floating off the fines.

Spray washers:

In this process parts are cleaned with a directed, pressurized spray of hot water, detergent or cleaning solution, which is generally alkaline. The solution is sprayed onto the surface to be cleaned. The shape and arrangement of the nozzles and the spray force have a major influence on the degree of cleaning action that is provided in this system.

Foam is easily generated in spray washers. The higher the pressure, the more foam produced. Spray washing systems are recirculating systems, usually making it desirable to have cleaning compounds that reject oil so that it does not spray back on to the parts. Rejected oil can be skimmed from the sump, extending the cleaning solutions life. Soil removal is generally accomplished mechanically in spray washers. The degree of contact of the cleaning solution is more important than the degree of detergency in this process, and therefore is often at a minimum in cleaners designed for spray pressure washing.

Important Factors for Cleaner Selection

- Soil to be removed
- Surface condition or properties needed for subsequent operations or the end product
- Substrate compatibility
- Corrosion protection requirements
- Material restrictions
- Plant Health and Safety

Typical Cleaners for Industrial Washers

CIMCLEAN MA322 is designed for cleaning polished machined steel parts such as camshafts and crankshafts. **MA322** cleaner is formulated so solid residues are not left on the part surface which may interfere with electronic gauging operations. Evaporated residues are clear, mobile, and liquid.

CIMCLEAN HA484 & CIMCLEAN 492 are highly alkaline, phosphate-free, silicated cleaners. They effectively clean aluminum, steel, brass or galvanized surfaces in high-pressure spray washers and in dip or soak operations. These products are suited for washing aluminum engine blocks, heads, transmission parts and cases.

CIMCLEAN MA338 cleaner contains phosphates and effectively prevents corrosion and staining of ferrous metal surfaces. This cleaner has been shown to defoam washers contaminated with foaming metalworking fluids. Surfaces cleaned with **MA338** do not exhibit water spotting.

CIMCLEAN MA359 is a mildly alkaline, phosphate-free cleaner designed for cleaning ferrous and non-ferrous metals. When used in washers operating at ambient temperatures, it will not stain aluminum. Evaporated residues are clear, and soft.

Consult with your regional CIMCOOL® Technical Service Engineer for specific recommendations, or call CIMCOOL® Technical Service at 1-513-458-8199.