Layers of Soil

Internal quality systems and external customer demands require metal forming companies to wash every component they stamp, cut, hydro-form, turn, shear, or otherwise produce in their facility. This washing process is essential for each company to turn out a quality product for their customers.

An independent automotive study in the early 1990s demonstrated that one main reason for transmission failure was the amount of soil in a faulty transmission. However, driving did not produce this soil. Rather, nearly 80% of all soil found in the failed transmissions was introduced during the original manufacturing process.

Time, temperature, mechanical action, chemical blend, part orientation, and other variables all work in conjunction with each other during the cleaning process. Problems arise when all the parts of this process accomplish their goal. When working, they turn out a clean part. However, by producing a clean part, they leave behind the entire load of soil that was removed from the part, and it is left in the washer bath. If this soil is not removed or treated, then the washer will be stuck performing its job with dirty water and producing unacceptable parts.

There are two ways to alleviate this concern - wash water can be completely dumped and replaced, or in-process systems can be introduced to treat and remove the layers of soil left behind during the washing.

Dumping the entire bath and replacing it with new fluid is the simplest route, but it is also the most expensive for a company. In order to replace the entire bath, the maintenance crew must perform a series of steps that take almost 8 hours to complete, and production must be halted during this time frame. The company must pay for the crew, the chemistry for the bath, the new fluid, and lose a large chunk of production time. These costs can be over $1000, plus lost production and wages paid in performing non-value added tasks each time the job is performed.

The other, more proactive option is to treat the soil during the washing process. The treatment begins at the start of the washing process and continues throughout. There are different methods available, and a manufacturer must pick what is best for them in regards to in-process treatment.

During metal forming, there are a myriad of by-products that must be cleaned. They can be classified based on how they float, sink, or remain suspended in the wash solution. Different in-process systems handle certain soils more efficiently than others.

Heavy particles and chips drop to the bottom of the bath once removed and settle on the tank floor. Heavy drawing lubricants made of a chlorinated paraffin substance also drop to the bottom. The most common way of removing these substances is through filtration. The challenge is selecting the correct micron size of filtration media to safely remove the particulate for the next process.

The size of filtration necessary is determined by the next step in the manufacturing process. The larger the micron size used, the more chance smaller micron particles are allowed to stay in the tank to cause problems later on.

Particle filtration can use a step down, in-series configuration, a by-passable parallel arrangement, or a combination of these options. In the step down system, water passes through several filters, each smaller than the last, to alleviate stress on the individual filters while still removing nearly all particles. This increases the duration of

the filters between change out. In the by-passable system, the operator can switch between different sets of similar filters when one becomes plugged. This allows maintenance to be performed on one set of filters while the other remains in operation, avoiding downtime. The combined system allows filters to run longer by removing only specific sizes, and by switching the water stream routes during change out to facilitate continuous operation.

Another layer of soil that needs to be removed is mechanically emulsified oil. This oil floats to the top of the bath, but only if turbulation ceases. The challenge is forcing the oil to float to the top during turbulation and processing it out of the bath in a timely fashion.

Oil will cause a variety of problems if not treated. It will smell if not removed. If allowed to build, it will eventually sink due to accumulation of mass and cover the bottom of the tank with a thick buildup. It can even carry over into the non-fluid stages of the machines, coating air knives in a dried cake.

Thankfully, there have been many advances made in removing this layer. Depending on company budget, they can use an inexpensive belt skimmer and squeeze blade to remove the top layer of oil, or they can use an advanced chemical technology that forces the oil to the separate from the water and even allow for sale of used and recaptured oil.

The third, and most challenging layer is the oil that remains in suspension in the bath. This oil can saturate the solution, and even cause foaming when mixed with the soap. No technology is available to remove these water soluble, synthetic lubricants. Baths forced to deal with this soil must revert back to dumps and recharges of fresh solution.

Each layer of soil contributes to the deterioration of the washer and the reduced effectiveness of the washing process. It is necessary that each individual manufacturer determine the methods of in-process water treatment that are most suited and profitable for their company.