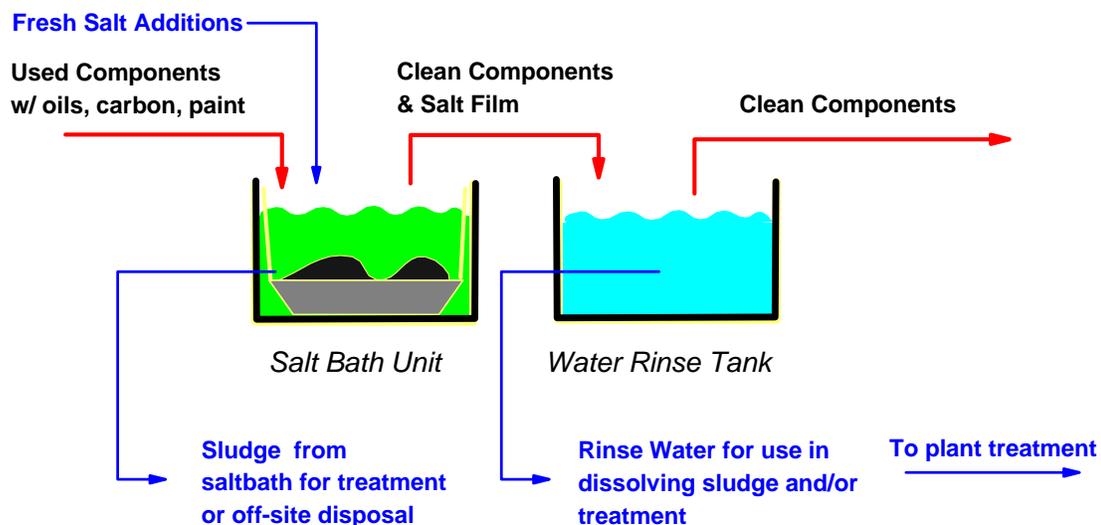


Process and Environmental Overview Molten Salt Cleaning Processes

In order for the process to continue to clean components in a consistent and predictable manner, reaction products (sludge) must be routinely removed from the bath. Formed in proportion to the organic loading, sludge consists of inorganic compounds resulting from the thermochemical oxidation of the paints, oils, greases, and carbons present on the work. Also included in the sludge are any inorganic compounds that were originally present: dirt, sand, metal oxides, scales, metal fines, gasket residues, etc.

Process Flow



All of these byproducts settle out of the working bath by gravity, and are accumulated in a sludge pan located in the bottom of the salt bath. When these insolubles are removed, the working level of the bath drops slightly. To make up for this level loss, additions of fresh process chemical are made to the bath. This not only restores the working bath's physical level, but also helps to maintain the proper bath chemistry. It is through this routine removal and addition procedure that the bath continues to perform *ad infinitum*; the bath does not have to be routinely "dumped" and recharged, as is common with most chemical cleaning processes.

The sludge is a 100% inorganic material and, as such, is largely water soluble; any and all insoluble organics that were introduced into the working bath have been destroyed. While there are no heavy metals in the process chemicals *as supplied*, the sludge will probably contain heavy or restricted metals as the result of the processed work. The most common heavy metal is lead (from bearing wear and fuel additives), but other

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heavy metals such as barium, cadmium, zinc, etc may also be present. Sources of these metals include paint pigments, platings, lubricant additives, etc. For these reasons, the sludge – as removed from the salt bath - is considered a hazardous material under current federal regulations.

The sludge may be either processed in-house, or sent off-site for proper treatment and disposal. Since the vast majority of the sludge is water soluble, treatment is relatively easy and uncomplicated. Before any treatment may begin, it is necessary to make a water solution of the sludge. Quench water, fresh water or combinations of the two may be used for this purpose. A typical solution will contain about one pound of dissolved sludge per gallon of water. The main characteristics that need to be addressed include:

- high pH due to carbonates and occluded salt
- potential heavy metals content
- suspended solids

A typical treatment regime will include adjustment of the pH through the addition of a mineral acid such as sulfuric, or bubbling gaseous carbon dioxide through the solution. If sulfuric acid is used, sodium / potassium sulfate will be formed. Analogously, sodium / potassium bicarbonate are formed when carbon dioxide is added. The solution will then need to be treated to remove any heavy metals, typically through the addition of a chemical reducing agent. This results in the chemical reduction of the dissolved metal species, and in conjunction with appropriate pH conditions, renders the metals insoluble. The final treatment step is to filter out these insolubles and then properly dispose of them.

Depending on the quantity and type of restricted metal(s) present, the ultimate disposal classification is typically determined by performing a Toxic Characteristic Leaching Procedure (TCLP) on the filter cake. In many instances, the cake will pass the leaching test even when restricted metals are present.