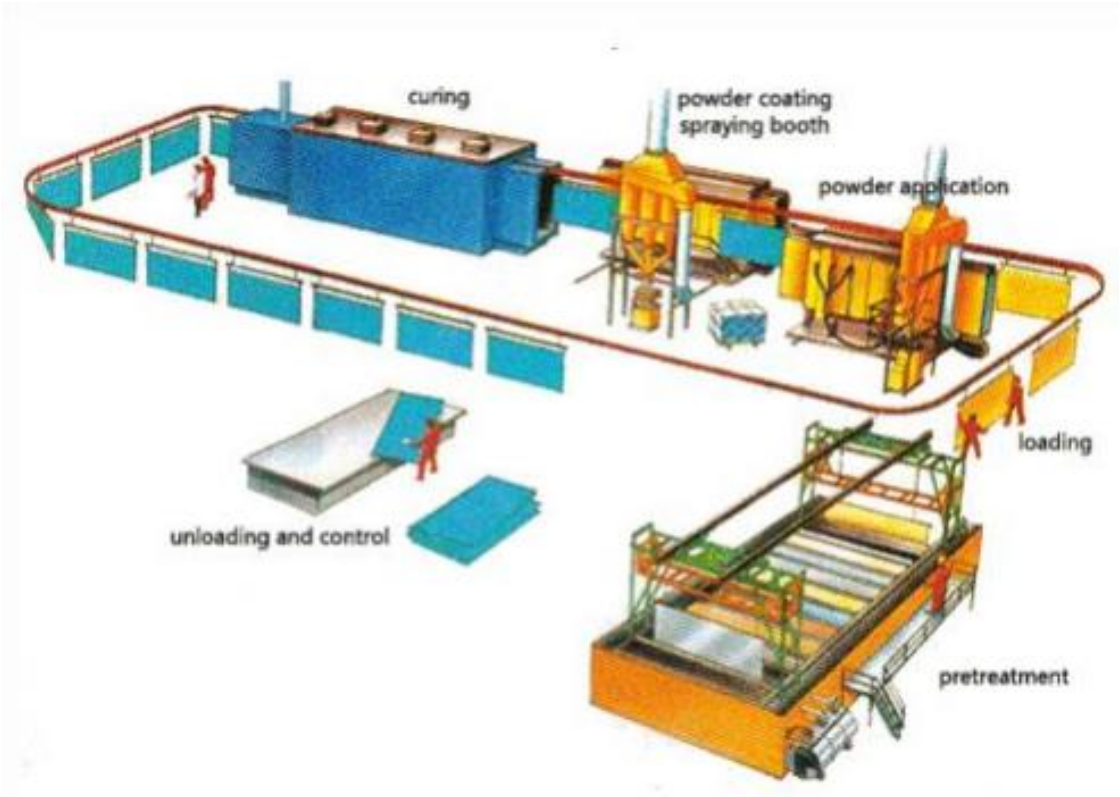
# Spray Cleaning for Excellent Pre-Cleaning

Powder-coated, electro-coated, and painted surfaces that meet and exceed wear resistance and corrosion protection owe their success to adequate surface preparation. Sufficient cleaning before applying a top coating, such as phosphates (iron, manganese, zinc), zirconium, and chromates, is critical.

Today, in-line cleaning cycles often involve mechanical devices, such as spray machines, or the typical three- and five-stage automatic lines. Here are some important facts related to optimal spray cleaning.

**A complete powder coat automated line. Note the size of the pretreatment segment of the process, which signifies the importance of this critical step.**



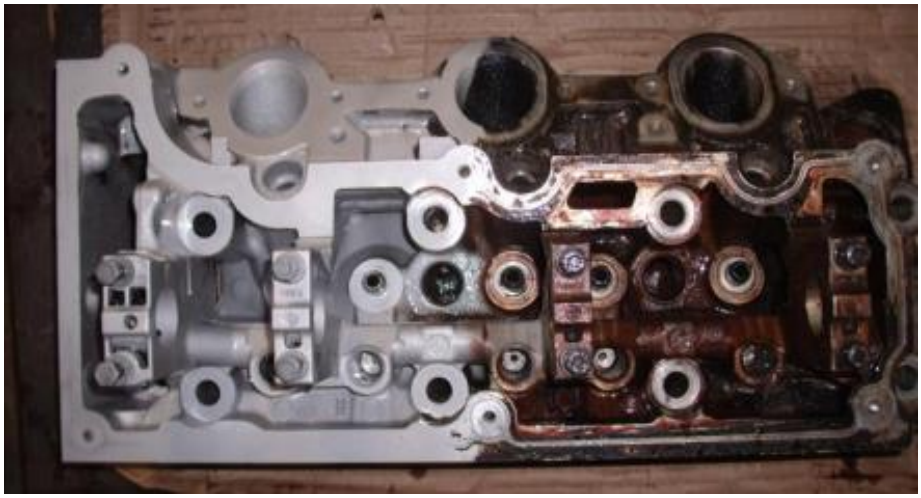
## Inside a Spray Cleaning & Rinse Line

### 1. Versatility of Metal

- Brutality is a way of life for steel parts, whether they're cold-rolled or hot-rolled.
  • Mechanical forming drives oil and metallic shavings into the surface.
  • Heat-treating bakes and burns oils and grease into surface pores.
  • Oxide scales form, with a severity based on the treatment atmosphere.
  • If the parts have been mass-finished, media residue or chemical compounds may be left on the surface or driven into it.
  • Parts may have been treated with a rust preventative.
  • Storage based on humidity and time may result in or accelerate rusting.

## Examples of Heat-treated Parts

**Engine Block Segment Before & After Spray Cleaning**



## 2. Effective one multiple metal substrates

- It is all too common to have a mix of products or a variety of parts. Aluminum, brass, copper alloys, and zinc parts may be run in the same line, at different production loads, or interchangeably. Often, parts may be fabricated using mixed metals or alloys. Variables like these and others affect the chemistry of the cleaner, along with cleaning demands and requirements.
- The simplest scenario is where all the parts are of the same base metal coated with the same process oils. Choices for spray cleaning may address any of the parts in a single process line using a single cleaner or require offline pre-cleaning of some parts in advance.

## 3. How spray cleaning works

Spray cleaners combine chemical and mechanical action to remove soils from the substrate. The cleaning action must be rapid, as contact times in most spray machines typically range from 30 to 60 seconds at temperatures below traditional soak cleaners.

### Some of the benefits

- Low foaming action
- Displacement of soils, rather than emulsification
- Lower temperature ranges, reducing energy use contributing to cost savings

## Series of Spray Nozzles for Cleaning Parts

Spray cleaner installations typically include a side overflow tank where oils and grease separate, floating to the surface for removal using an automatic skimming device (such as a belt or disk skimmer). The side tank promotes cleaner solution cooling, which speeds up the separation of the accumulated soils.

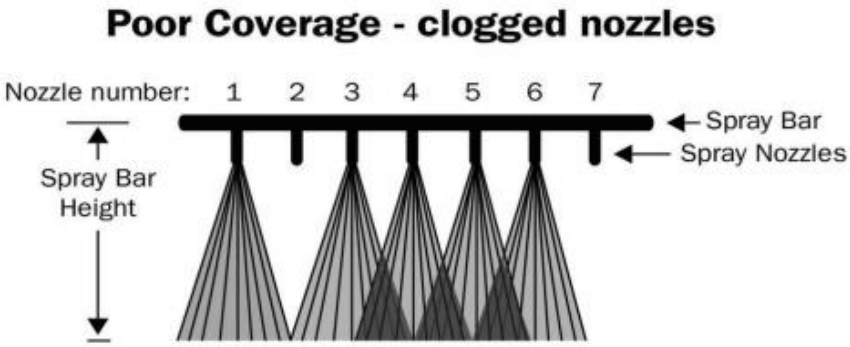
## Picture of a Side Overflow Tank

Spray cleaners may range in pH from near neutral to above 13. A variety of formulations permits the finisher to use a cleaner more adapted to a range of different metal surfaces. These would typically range from non-ferrous, light metals to steel and stainless steel. Displacement cleaning is preferred to remove oils and grease.

The sprayed cleaner is re-circulated through a side tank or sump. Oils and grease float to the surface and are removed by application of a suitable belt or wheel or by use of a membrane. White Paper Title: Spray Cleaning for Excellent Pre-Cleaning Revision Date: July 10, 2019, Better Chemistry. Better business. Hubbard-Hal Inc. l 563 South Leonard Street, Waterbury, CT 07608 • HubbardHall.com • 800-648-3412 filtration. Removal of the soils prevents their re-deposition on the parts and minimizes their loading in the cleaner. Then the solution is pumped into the spray station, to once again repeat the cleaning cycle.

The cleaner formulation consists of low-foaming biodegradable surfactants and wetting agents, SARA Title III exempt solvents, alkali builders and hard-water conditioners. Water softening is critical to prevent plugging spray nozzles with otherwise harmful soap sludge and water hardness scales.

**Here is an example of how plugged nozzles compromise cleaning:**




**Liquid and powder spray cleaners operate similarly as the following table shows:**

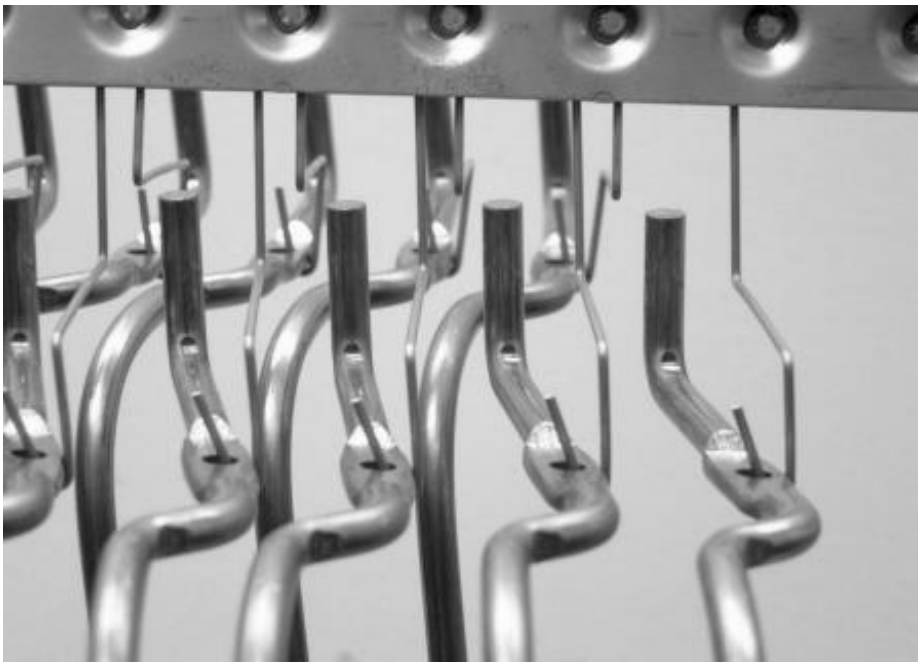
| *Cleaner Type* | *Conc. Range* | *Deg F* | *Deg C* | *Time* | *Pressure* |
|---|---|---|---|---|---|
| Powder | 2-5% v/v | 100-160 | 38-71 | 0.5-3 min. | 15-35 psi |
| Liquid | 3-6 oz/gal | 100-160 | 38-71 | 0.5-3 min. | 15-35 psi |

### 4. The rules of racking

- Parts are exposed to the mechanical spray of the cleaner.
- Racking of parts should be firm.
- Positioning of parts should expose maximum surface area, allowing for enhanced draining of cleaning solution and rinses.

It is important to note that spray cleaners are not typically blended with the concentrated formulation, as with a traditional immersion soak cleaner. A good deal of the cleaning action is generated by the mechanical spray, which enhances the activity of the cleaner components.

**Properly Racked Parts to be Spray Cleaned**



### 5. Troubleshooting

The most common barriers between you and satisfactory spray cleaning come down to “tweaking” the operating parameters - time, temperature, and concentration.

- If the cleaner is under-concentrated, adjust as required.
- If the cleaner temperature is out of range, adjust accordingly.
- Check for and modify the contact time. Confirm whether different oils are now being used in manufacturing, stamping, cutting, forming, etc.
- Test for use of appropriate cleaner chemistry. Change as required.

- Spray nozzles may be plugged, damaged, or not provide an optimum spray pattern. Check for proper positioning of spray nozzles.
- If soil is re-deposited on parts, maintain oil removal equipment. The cleaner may have exceeded its service life and needs to be replaced with fresh make-up.



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