Stripping, it is all in the Method

By Sandra Anderson

Stripping is an important part of Industrial Finishing. Basic Methods are:

Chemical, which works by softening or dissolving the film and breaking the bond between the coating and the substrate;

Abrasive, which uses compressed air to impinge a media such as steel shot, sand, ground nutshells, ice, plastic pellets etc. agaist a coated surface;

Mechanical, which use some form of impact or grinding action to remove the coating;

Thermal or Burn-Off, which uses pyrolytic strippers to burn the coating off the substrate

And due to the wide array of modern paints (electrocoats, primers, solvent-borne, powder coatings, etc.) and substrates (steel, aluminum, galvanized steels, zinc and its alloys, magnesium, titanium, etc.) encountered, there is no single method or chemical product that will universally strip all coatings from all substrates according to David Chalk, PH.D. Principal Research Chemist, Galaxy Associates Laboratories.

SELECTING THE PROCESS

Chalk explains that selection of the appropriate process and product for stripping cured paints will be determined by:

1. What paint(s) must be removed?
2. From what substrate (metal) must the paint(s) be removed?
3. What equipment (tanks, availability of heat and agitation, ventilation, etc.) is available for the operation?
4. What special environmental or industrial hygiene restrictions are in place?

There are quite a few factors that need to be considered according to Daniel Yankovich, Product Manager – General Industry, Chemetall US, Inc:

- Type of paint being stripped, thickness (and variation in thickness)

Oisometric burn off oven.
Photo courtesy of Steelman

- Quantity and size of parts, racks, etc. that need to be stripped
- Substrate that's being stripped - and its sensistivity to stripping methods - i.e. heat, abrasion, dimensional stability
- Time frame within which the parts needs to be stripped
- Environmental restrictions - emissions, discharge limits, creation of ash, etc.
- Cost of the process - capital/equipment, energy, manpower, supporting equipment, supplies
- Floor space available
- Flexibility of process

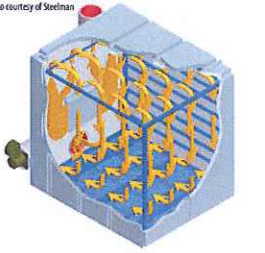
Yankovich says, "Every situation is different and requires careful consideration to make the best decision. I believe it starts by reviewing all of the key factors and setting up a matrix of the key factors and then weight-ranking them relative to each other - i.e. System Cost, Labor, Disposal, Energy, Flexibility, Speed. Usually this analysis will point to one or two methods that may be best for them. Of course, we sell chemical paint strippers and feel that this approach offers the best overall combination of these factors." Chemetall offers a broad array of chemical paint stripping products that include alkaline, acid, alkline/solvent hydbrid, acid/solvent hybrid, solvent-based and thickened products as well as custom designed chemical paint stripping equipment. They also carry a broad array of specialty chemical products and solutions that include the following broad families of products and services - cleaners, conversion coatings, rust preventives, metalworking fluids, permanent coatings, passivation treatments, paint strippers, paint spray booth treatments, water treatment products (boiler, cooling, wastewater) laboratory support services, and chemical feed, monitoring and control equipment.

BURN OFF

Steve Moore, Sales Manager: Burn-Off Oven Products, Steelman Industries, Inc., says Steelman Industries is the leading manufacturer of heat-cleaning, or burn-off, ovens. Burn-off ovens are used to remove paint or powder coating from metal parts — normally hooks and racks — by heating the parts in a low oxygen atmosphere. The paint or powder coating is converted to smoke which is pulled into a high-fire afterburner where it is destroyed by temperatures as high as 1,800° F.

He says things to consider when looking into the purchase of an oven, "Damaging the hooks and racks through over heating or allowing them to catch fire is a common concern. Steelman's patented "Top-Down" heating and venturi grill system combined with our patented rate control, work to prevent any fires before they occur."

Top assembly of an oven.
Photo courtesy of Steelman

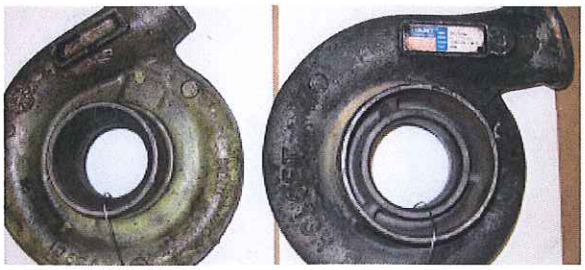


David Freeman, ProQuip Consultants Inc. adds, "This also ensures Temperature uniformity, which prevents warping and damage to larger hooks and racks. Operating costs, labour and utilities can be minimized by racking the hangers so they can be cleaned without reloading and unloading. The efficiency of the design can minimize hot air going directly up the chimney. This should be understood by the purchaser." He adds, "Operating cost due to poor design (excessive gas consumption) and excessive handling due to error in Oven sizing and cart design can result in a long ROI."

The demand in burn off ovens tends to be safety and speed. "Second to safety (all Ovens must meet the inspections standards TSSA-CSA) for gas but many other safety features are important to allow controlled operation. Process speed and automatic operation (no operator input) is one of the top questions we are being asked. Steelman's Top-Down heating and Automatic Process Control allow the oven cycle to automatically adjust to each load; only running as long as necessary to properly clean (pyrolyse) the loads thus reducing operating costs and quickly processing the load," says Freeman.

Freeman from ProQuip suggests that the finisher always do their homework before investing in an oven. "Most Manufacturers provide a guide to selecting an Oven. These should be read carefully as they are written in such a way to show that their product is unique. Beware of claims of per cent efficiency or any other claims that can't be substantiated. Do your homework and understand the process. Have confidence in your sellers knowldege and don't be fooled by references selected by the Manufacturer. Remember: there are few people who will admit their mistake or they're not aware of better products."

Chalk says all Galaxy's customers who paint, "will also do some amount of paint stripping, if for no other reason than to strip the hooks from which they hang their work." He adds, "While a burn-off oven



Parts Before Paint Stripping. Photo supplied by Chemetall US, Inc.

Parts After Paint Stripping. Photo supplied by Chemetall US, Inc.

can accomplish this, some drawbacks include high energy costs and need for specialized acid rinses to remove the "ash" from the burned work. Also, any reactive substrates other than ferrous metals (e.g., aluminum or galvanized work) are generally not suitable for stripping in a burn-off oven."

Galaxy Associates is a specialty chemical company offering industrial chemicals to support manufacturing. Their products include lubricants and cutting fluids for fabrication of metals, cleaners, pretreatments, sealers, and rust preventatives for protection and painting of all substrates, as well as paint booth compounds, waste treatment products, truck washing products, and course paint strippers.

CHEMICALS

"Chemical strippers are therefore used routinely for stripping of all substrates," says Chalk. "In the early days, before environmental regulation of solvents, chlorinated solvents were used for both cleaning the metal before painting and for stripping of defective painted work." Chalk adds, "Because volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) are now heavily regulated, the cleaning, finishing and stripping of painted work must be accomplished without using chlorinated solvents."

Yankovich from Chemetall says, "When it comes to chemical paint stripping our customers are looking for products that will strip their particular set of paints as quickly and effectively as possible at the lowest cost. They want as simple a process as possible while minimizing up front capital and ongoing energy costs - and doing this within the constraints of their production schedules." He adds, "Speed is still very important."

STRIPPING METHODS AND THE ENVIRONMENT

As for environmental issues, Yankovich from Chemetall says, "We are seeing more environmental pressures on paint stripping - and as you may know, the US has some pending emissions regulations that would be devastating to the burn-off oven manufacturers and users." He says, "Green technologies will continue to be emphasized." Chemetall offers several HAPS-Free and SARA 313-Free chemical paint strippers.

Yankovich explains, "Almost every paint stripping method has some sort of environmental impact:

Burn-Off Ovens - Particulate and VOC emissions

All Processes - Disposal of stripped coating (possible potential for recycle)

Chemical - Potential for hazardous pollutant content, disposal of spent solution, vapors

There are several abrasive methods (media blasting, carbon dioxide/dry ice, ice crystal, high pressure water) that may have less environmental impact, but require more elaborate equipment or have slower stripping times and are labor intensive - and have difficulty removing paint in narrow openings.

Freeman from ProQuip says, "All Burn Offs are subject to M O E regulations and must be approved for emissions. Ovens cannot be operated unless they are permitted. The ash remaining after Pyrolysis is non toxic (unless the coating contains heavy metals) and can be disposed of in land fill but should be submitted to the M O E for testing and approval. This ash can cause significant housekeeping issues. The Microbe Bath eventually has to be replaced and I believe it has to be disposed of as hazardous waste. Similarly the sand from the fluidized bed breaks down over time and also must be disposed of as hazardous waste. Water discharge is not an issue."

SALTS TO WATER-SOLUBLE SOLVENT

In many cases, water-borne solutions that were comprised of high concentrations of caustic salts and sequestering agents were used for stripping paints, says Chalk. "Later developments included water-soluble solvents, leading to the development of "di-phase" paint strippers that both broke down and dissolved the cured paint."

ON-LINE STRIPPING

David Freeman, ProQuip Consultants Inc. explains that there are two methods of online stripping.

1. Hot Caustic: Very expensive to operate and there are safety concerns due to very high temperatures. When the caustic needs to be replaced it is hazardous waste. If it fails or needs maintenance the line must be shut down. Environmental approval is difficult and can require costly stack emission testing.

2. Induction Heat: A new process is just being introduced using induction heat to soften the paint, and brushes are used (like the conveyor cleaning system) to remove it without heat or emissions. This system is only suitable where there is one style of rack or very similar.

There are a few systems in operation and it is very expensive. This is a simpler system than the caustic and does not require M O E or Gas approval, just electric. Operating cost is fairly high, but should save money in the long run.

SPECIAL CONSIDERATIONS

Chalk explains, "Special considerations for stripping of aluminum and other white metals led to stripping products based on non-chlorinated/low volatility solvents and unique caustic compounds that do a very good job of stripping paint coatings while inhibiting impact on the reactive base metals." He adds, "These highly specialized materials must be kept "dry", i.e., no water must be permitted to contaminate the stripping tank. However, they facilitate removal of cured paint from substrates that otherwise could not be stripped in a conventional burn-off oven."

NEW STRIPPING PRODUCTS

Chemetall's newest paint stripping products are "hybrid" technologies that combine alkaline and solvent-based components in a mixed two-phase solution.

"The combination of the two components provides superior paint stripping results for a wide variety of coatings," says Yankovich. called Eurostrip 7028/7031 and Eurostrip 7048/7049.

Steelman is proud to be the first to offer a customizable touch-screen PLC control system as an option on their burn-off ovens. This system allows for monitoring of the oven over a network and monitors critical functions. It also allows for expert diagnosis from the factory by e-mailing the read outs from the Operating Oven to the Service Department. (Serviceman on the spot). In addition there are fluidized sand Units that strip very quickly but these units are costly and are high energy users as they have to be kept at "idle" all the time whereas the burn-Offs only run when stripping. They are also labour intensive as they can only process a small number of racks each time. It is also very "messy" as sand is carried out with the racks.

Recently a new stripping method has been introduced: Microbes! these organisms remove the paint without heating the racks/hangers but the systems are very slow if not heated, labour intensive and require a high degree of filtration.

COST CONCERNS

"Cost is a concern no matter which paint stripping process is used," says Yankovich. He says the finisher must determine the overall best cost/benefit that works for them because each situation is different.

Freeman from ProQuip says, "Many Companies are using outside "job" shops to do their stripping. This is expensive and entails packing shipping and unpacking. Due to the high cost some Companies do not strip as frequently as they should. This can result in high paint/powder cost as virtually all conveyorized systems utilize electrostatic guns and excess coating on racks means high consumption rejects and in extreme cases (powder systems) a spark and fire or explosion of the paint dust. This also means that unless they have redundant racks they are at the mercy of the stripper and the weather. In order to make a proper comparison between outside and in house the Customer has to make an honest appraisal of the true frequency for efficient operation times the cost of each strip including transport and rack damage. Excessive build up of coating on the rack (1/4" dia rack = 1" dia excess coating means that this excess paint is adding to the heat load for the dry-off and paint bake."

Chalk sums it up, "Customers are strongly encouraged to contact their chemical supplier for an on-site survey to determine the best approach for stripping of painted work. Usually some laboratory work will be needed to verify the chemical product selection and stripping parameters to achieve the expectations." ■

Editor's Note: The companies that contributed to this article can be reached:
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www.galaxy-associates.com
www.ChemetallAmericas.com
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