

Topic Hub: Aerospace Subsection : P2 Opportunities

Metal Fabrication and Machining P2 Opportunities

Please refer to the Metal Fabrication and Machining topic hub's section on [Pollution Prevention Opportunities](#) for more information.

Metal Finishing P2 Opportunities

Please refer to the Metal Finishing topic hub's section on [Pollution Prevention Opportunities](#) for more information.

Fiberglass Reinforced Plastics P2 Opportunities

Please refer to the Fiberglass Fabrication topic hub's section on [Pollution Prevention Opportunities](#) for more information.

Spray Painting at the OEM

Spray painting is probably the number one contributor of VOCs at an aerospace manufacturing facility. The following are suggestions to reduce the toxicity and quantity of paint and related preparatory materials used.

Application Equipment

In order to effectively reduce paint waste and produce a quality coating, proper application techniques should be supplemented with efficient application equipment. Through the use of equipment with high transfer efficiencies, the amount of paint lost to overspray is minimized.

High Volume Low Pressure (HVLP) Spray Guns - The HVLP spray gun is basically a conventional air spray gun with modifications and special nozzles that atomize the paint at very low air pressures. The atomizing pressure of HVLP systems is often below 10 psi. The design of this gun allows better transfer efficiency and reduced overspray than that of conventional air guns. The low application pressure decreases excessive bounceback and allows better adhesion of the coating to the substrate.

Airless Spray Guns - Instead of air passing through the spray gun, an airless system applies static pressure to the liquid paint. As the paint passes through the nozzle, the sudden drop in pressure atomizes the paint and it is carried to the substrate by its own momentum. Pressure is applied to the paint by a pump located at a remote supply.

Electrostatic Spray - Electrostatic spray systems use paint droplets that are given a negative charge in the vicinity of a positively charged substrate. The droplets are attracted to the substrate and a uniform coating is formed. This system works well on cylindrical and rounded objects due to its "wrap-around" effect that nearly allows the object to be coated from one side. Very little paint is lost to overspray, and it has been noted to have a transfer efficiency of over 95%.

Heated Spray - When paint is heated, its viscosity is reduced allowing it to be applied with a higher solids content, thus requiring less solvent. When the paint is heated in a special container and supplied to the gun at 140 to 160 degrees Fahrenheit, coatings of 2 to 4 millimeters dry-film thickness can be applied in one operation, resulting in considerable savings in labor cost.

Plural Component Systems - A common problem that facilities face when working with two-part coatings is overmixing. Once the component parts of a catalyst coating are mixed, the coating must be applied. Otherwise, the excess unused coating will cure and require disposal. Additionally, the coating equipment must be cleaned immediately after use. One large advantage of plural component technology is the elimination of paint waste generated by mixing an excess amount of a two part coating.

Paint Booth Maintenance

Wet-Vacuum Filtration - Wet-vacuum filtration units consist of an industrial wet-vacuum head on a steel drum containing a filter bag. The unit is used to vacuum paint sludge from the booth. The solids are filtered by the bag and the water is returned to the booth.

Tank-Side Weir - A weir can be attached to the side of a side-draft booth tank, allowing floating material to overflow from the booth and be pumped to a filtering tank for dewatering.



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Consolidator - A consolidator is a separate tank into which booth water is pumped. The water is then conditioned by the introduction of chemicals. Detacified paint floats to the surface of the tank, where it is skimmed by a continuously moving blade. The clean water is recycled to the booth.

Centrifuge Methods - Two common types of centrifugal separators are the hydrocyclone and the centrifuge. The hydrocyclone is used to concentrate solids. The paint booth water enters a cone-shaped unit under pressure and spins around the inside surface. The spinning imparts an increased force of gravity, which causes most of the solid particles to be pulled outward to the walls of the cone. Treated water exits the top of the unit and the solids exit from the bottom.

Alternative Coatings

Powder coatings - Powder coatings are 100 percent paint solids in a powder form. Transfer efficiencies can reach 95 percent to 99 percent while achieving a durable, corrosion-resistant finish. Product overspray collected in the paint booth exhaust system can be recovered and reused. Powder coating is extremely sensitive to part cleanliness, making multi-stage washers a prerequisite. In addition, powder coating requires specialized application equipment and a heated curing booth.

High solids paints - High solids paints are solvent-based products with 50 percent or more solids content. Because of the higher solids content, the desired film thickness can be accomplished with fewer spray applications. Quality characteristics include improved abrasion and mar resistance. High solids paints are sensitive to temperature and humidity and may require heating to obtain an acceptable cure time.

Water-borne paints - Water-borne paints contain water as a solvent, but also may contain 2 percent to 30 percent petroleum-based solvents.

UV / EB Coatings - Coatings systems that are curable by ultra violet light or electron beams (UV/EB). The resins used in these coatings are basically the same as those used in conventional high performance coatings which have been modified to make them polymerizable by UV or EB energy.

Spray Technique - A good manual coating application technique is very important in reducing waste. If not properly executed, spraying techniques have a high potential for creating waste. Here are several techniques for reducing overspray:

1. Triggering - triggering the paint gun at the end of each pass instead of carrying the gun past the edge of the surface before reversing directions
2. Avoid Excessive Air Pressure
3. Perpendicular Spray Pattern - keep the gun perpendicular to the surface being coated
4. Overlap - An overlap of 50 percent can reduce the amount of waste by increasing the production rate and overall application efficiency. Overlap of 50 percent means that for every pass that the operator makes with the spray gun, 50 percent of the area covered by the previous pass is also sprayed. If less than a 50 percent overlap is used, the coated surface may appear streaked. If more than a 50 percent overlap is used, the coating is wasted and more passes are required to coat the surface.
5. Paint Proportioning Mixing batches of paint on an as-needed basis, whether through the use of a paint proportioning machine or otherwise, can reduce the amount of paint wasted. Record keeping requirements to track the amount of paint and thinner used can also help conserve materials and prevent waste.

Best Management Practices

Production planning and sequencing - is used to ensure that only necessary operations are performed and that no operation is needlessly reversed or obviated by a following operation.

Process or equipment modification - is used to reduce the amount of waste generated. For example, manufacturers can change to a paint application technique that is more efficient than spray painting, reduce overspray by reducing the atomizing air pressure, reduce drag-out by reducing the withdrawal speed of parts from plating tanks, or improve a plating line by incorporating drag-out recovery tanks or reactive rinsing.



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Raw material substitution or elimination - is the replacement of existing raw materials with other materials that produce less waste, or a non-toxic waste.

Loss prevention and housekeeping - is the performance of preventive maintenance and equipment and materials management so as to minimize opportunities for leaks, spills, evaporative losses, and other releases of potentially toxic chemicals.

Waste segregation and separation - involves avoiding the mixture of different types of wastes and avoiding the mixture of hazardous wastes with non-hazardous wastes. This makes the recovery of hazardous wastes easier by minimizing the number of different hazardous constituents in a given waste stream. It also prevents the contamination of non-hazardous wastes.

Closed-loop recycling - is the on-site use or reuse of a waste as an ingredient or feedstock in the production process.

Training and supervision - provides employees with the information and the incentive to minimize waste generation in their daily duties.

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