Aircraft Depainting:
Complying with New Environmental Air Pollution Regulations

By Jerry P. Bauer

Many chemicals used to effectively remove aircraft paint may cause dizziness, burn workers, and pollute the air with suspected carcinogens. The goal of the Clean Air Act Amendments (CAAA) of 1990 and the National Emissions Standard for Hazardous Air Pollutants for Aerospace Industry (40 CFR Part 63, Subpart GG), which was proposed in 1994, is to regulate the amount of substances used for depainting. The aerospace industry must search for compliant alternatives and still maintain high standards of safety and efficiency for its aircraft.

External structures of commercial aircraft are typically fabricated of aluminum that has been coated with an epoxy primer and polyurethane topcoat. These protect against corrosion and environmental exposure, but must be removed and reapplied every four to eight years to restore the aircraft's appearance and corrosion resistance.

Although methylene chloride-based paint strippers have been used for years to remove aircraft paint, the CAAA designated methylene chloride a hazardous air pollutant (HAP), and companies now using this or other HAP-containing strippers must do one of the following by 1998 to comply:

- **Switch** to chemical strippers that do not contain any of the 189 HAPs listed by the CAAA.
- **Use** high-pressure blasting with plastic media, wheat starch, dry ice or water to remove paint.
- **Paint** less surface area of the aircraft to reduce the amount of chemical strippers required.
- **Use** an 81% minimum efficiency (90% capture and 90% control) pollution control system.

Non-HAP Strippers

Non-HAP chemical strippers are usually formulated with benzyl alcohol and formic acid or ammonia accelerators. Although they effectively remove paint, they take longer to react with it, which increases depainting time. For some coating systems, the increased cycle time can be prohibitive.

The CAAA does not classify benzyl alcohol and formic acid as HAPs; however, these chemicals have Occupational Safety and Health Administration restrictions and are classified as volatile organic compounds (VOCs), which are regulated by the Clean Air Act. VOC emissions can be mitigated with many of the same techniques used on HAP strippers. Every HAP- and VOC-containing stripper has its regulatory, environmental and performance limitations. Substituting a non-HAP stripper for a non-VOC stripper can mean trading one environmental challenge for another.

Blasting Techniques

High-pressure nozzles project plastic media, wheat starch, or other materials at the painted surface. Blasting mechanically fractures and/or thermally shocks the coating, causing erosion, and virtually eliminates air emissions, safety problems and hazardous waste disposal issues. Wheat starch is softer than plastic media and reduces, but does not eliminate, the potential for damage to the aircraft substrate. Blasting techniques are effective, but require a capital investment ranging from $250,000 to $2 million for a manual system, and more for a robotics system. Additional annual costs include blasting media ($300,000 to $2 million), and paint chip disposal ($23,000 to $175,000).

Painting Less Surface Area

American Airlines and USAir only paint decals and stripes on aircraft. The Environmental Protection Agency rewards facilities using this technique by allowing spot-stripping with HAP-containing materials, because the quality of stripper required is significantly less than for a conventional paint and primer system.

This method works best on aircraft substrate made of high-grade aluminum, so it is not viable for most existing aircraft that typically use a lower-grade aluminum. This technique may, however, be a long-term solution for airlines that specify high-grade aluminum substrate on future aircraft.

Air Pollution Control Systems

Sometimes an air pollution control system may be an economical solution for venting strippers. An airline could paint and strip its large-body aircraft in the same hangar instead of building separate facilities for those operations. If paints with high-VOC content are used, an air pollution control system may be required. The same system can be used for both painting and depainting, so the economics of a combined operation make a pollution control device the recommended option.

Conclusion

The most economical mitigation alternative depends on such factors as ventilation requirements and composition of chemical strippers. Capital costs can be several million dollars and annual operating costs can be several hundred thousand dollars.

Affected companies must evaluate depainting options so facilities can achieve CAAA compliance by 1998. Substitution with non-HAP strippers, such as benzyl alcohol, is the alternative with the lowest capital cost; however, benzyl alcohol is a VOC and other environmental regulations may restrict its use. Blasting techniques are costly and can damage aircraft. Pollution control devices are also expensive, but can be economical if they are also required to reduce painting and priming emissions.

About the Author

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