Vehicle refinishing, finding new ways to shine

Refinishing techniques used by vehicle makers have evolved over the years. From the days of hand painting the first Ford Model A, to spraying acrylic lacquer, to using basecoat/clearcoat finishes, vehicle maker refinishing has come full circle. With more vehicles being built everyday, vehicle makers are looking at ways to improve not only the final appearance of vehicles, but also ways to lessen the environmental impact of vehicle refinishing.

IN this article, let's first look at some of the clearcoats that are being used by some vehicle makers to achieve the goals of improved final appearance and lessening environmental impact.

Nano-Particle Clearcoat

Nano-particle clearcoat uses nano technology. What is this? Nanotechnology is a scientific research field that uses very small microscopic particles (nano-particles) to build larger, complex structures. In the case of automotive clearcoats, the nano-particles are made of ceramic. When the nano-particle clearcoat is applied, the ceramic nano-particles create a very hard, tightly cross-linked structure when the clearcoat cures, making it very durable. Mercedes-Benz introduced nano-particle clearcoats on their vehicles in 2004, and uses it currently for production (see Figure 1). Benefits include higher resistance to micro-scratching, such as from car wash brushes. Also, better stain resistance caused from debris such as tar, rail dust, and even bird droppings is another advantage of using nano-particle clearcoat. Both of these characteristics contribute to longer gloss retention of the factory clearcoat application.

Some vehicle makers are using nano-particle clearcoat on wheel rims to better repel brake dust, while others are experimenting with nano-particle clearcoats that contain solar cells for powering some vehicle electrical systems.

Powder Clearcoat

Powder clearcoat is being used by BMW for the 5, 6, and 7 series vehicle models (see Figure 2). Once the vehicle has the basecoat colour applied, the vehicle has a static charge applied to it. The powder-based clearcoat is then pumped into the spraybooth. The vehicle's static charge attracts the powder to all areas of the vehicle. Once the vehicle body is covered with the powder, any powder that is not attached to the vehicle is reclaimed, so it can be used on the next vehicle body. The vehicle body is then heated, which causes the powder to melt and flow out. Once cooled, the powder is now the clearcoat. The ability for a vehicle maker to reclaim and re-use unneeded powder clearcoat is a major reduction in hazardous air pollutants and VOCs.

Self-Healing Clearcoat

Self-healing clearcoats are another new technology that is showing up on some vehicle maker products. Self-healing clearcoat has the capability to not only resist scratches, but also the ability to repair minor scratches on the surface. Depending on the depth of the scratch, the elastic resin-based product can reflow when exposed

Figure 1 - Mercedes-Benz uses nano-particle clearcoat.

Figure 2 - This BMW M6 has powder clearcoat from the factory.

Figure 5 - The I-CAR website has information on related training courses.

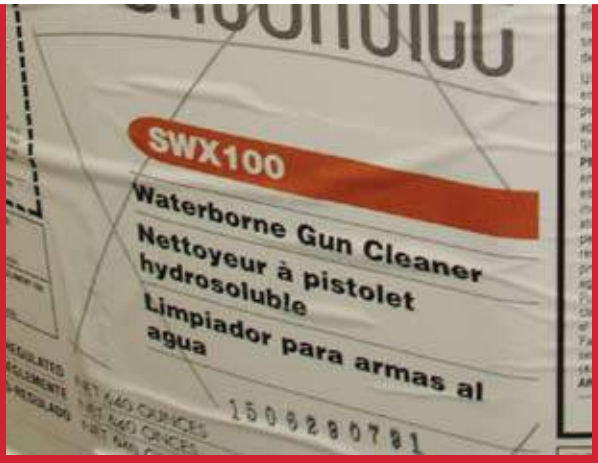

Figure 6 - There are specific cleaning materials for waterborne basecoat.

to warm enough temperatures and repair minor scratches, such as from car wash brushes or fingernails (see Figure 3). Self-healing clearcoat is being used by Infiniti on the 2008 EX.

Repairing New Clearcoats

When it comes to performing refinishing repairs on vehicles with these new types of clearcoats, there are typically no special materials or recommendations required. These clearcoats can be sanded and scuffed with conventional methods currently used in the refinish process. Some paint makers are offering clearcoats for refinishing repairs that have similar characteristics to some new clearcoats being used by the vehicle makers, to aid with returning the vehicle finish as close to original as possible (see Figure 4).

Clearcoats summary

As vehicle makers continue to produce new vehicles, the demand to create high gloss, durable finishes while limiting adverse affects on the environment will continue to drive changes in finishes and clearcoats. As technicians, the need to stay informed on these changes is critical as well.

For information on advances in refinishing technologies, such as new technologies being used at the vehicle maker level, waterborne basecoats, and UV-cure products for repair facilities, refinish technicians, and collision repair and insurance estimators should look for training courses on the I-CAR web site homepage at www.i-car.co.nz (See Figure 5).

Waterborne Basecoat

Now let's focus on the increasing use of waterborne basecoat, not only by the vehicle maker, but also in the collision repair facility.

Vehicle refinishing has evolved over the years. Today, vehicle makers are using refinishing products that not only improve finish longevity, but also have less of an environmental impact.

Waterborne Basecoat Technology

The use of waterborne basecoat has grown in an attempt to decrease the amount of volatile organic compounds (VOCs) being released into the atmosphere during the refinishing process. The EPA defines a VOC as any organic compound that evaporates readily into the atmosphere. Traditional basecoats are a solvent-based product. Solvent acts as both a reducer and a carrier so the basecoat can be applied to a vehicle body via spray gun. The VOCs in refinishing products are released into the environment when the solvents in the product evaporate during the curing process. EPA studies have shown that these VOCs contribute to depletion of the ozone layer, photochemical smog production, and adverse health effects.

Several vehicle makers have begun using waterborne basecoats during manufacturing. Instead of using petroleum-based resins and solvents in the basecoat, water-soluble solutions and resins are used. Specific water-based reducers are used to act as a carrier for the waterborne basecoats. Waterborne basecoats still contain some solvents, although the solid content is higher than a solvent-based product. This results in less VOCs emitted during the spray application process.

Figure 3 - Small scratches may "disappear" in a self-healing clearcoat.

Figure 4 - Glasurit offers this self-healing clearcoat.

Figure 7 - Waterborne basecoat waste material must be properly disposed.

Figure 8 - Air multipliers improve flash time of waterborne basecoats.

VOC Regulations and HAP Reduction

Several geographic locations across North America have been regulated for product and equipment type when refinishing vehicles since 1998. These geographic locations of VOC-regulated areas are primarily on the west and east coast and around the Great Lakes. The National Rule of 1998 is aimed at reducing VOCs by regulating the amount of solvents that are used to atomize the products, and requiring a higher amount of solids.

Currently, the state of California is moving forward with low VOC compliance. Part of the transition is using up all materials with excessive VOC content by the end of 2008. Switching over to waterborne basecoat for refinishing procedures is also part of the transition. Other regions that are looking at similar VOC regulations include Canada, Northeastern United States, and the Great Lakes region.

Along with VOCs, efforts to reduce all hazardous airborne pollutants generated by collision repair facilities are currently being implemented.

Gearing Up for Waterborne

Switching from solvent-borne basecoat to waterborne basecoat may involve both technical training and equipment upgrading. Paint makers that offer waterborne basecoats may offer specific training programs.

Equipment upgrades will typically include a dedicated spray gun. Using the same spray gun for both solvent-borne and waterborne materials is possible with extensive cleaning in between uses. If solvent-borne basecoat and waterborne basecoat intermix, the results are typically a sludge-type material, which becomes extremely hard and difficult to remove, especially from inner spray gun parts.

Spray gun cleaning equipment must also be specific for waterborne products. Waterborne cleaning material is not conventional thinner, but more of an alcohol-based product (see Figure 6). The waste material must be collected and disposed of properly, similar to solvent-borne products (see Figure 7).

Air filtration, such as incoming spraybooth air and compressed air used for spraying must be extremely clean, as waterborne basecoats are more susceptible to contamination. One paint maker recommends intake air filters capable of filtering particles down to 10 microns in size, while compressed air for spraying initially should be filtered to 5 microns, and then a second filter down to 0.01 microns, along with trapping oil and water vapor.

The other major equipment upgrade will be some way to increase air movement over the painted surfaces. Waterborne basecoat takes longer to flash when compared to solvent-borne basecoat. While it will flash from conventional spraybooth airflow, the extra time needed may decrease efficiency. Items such as hand-held air multipliers (see Figure 8), spraybooth-mounted ceiling fans, or spraybooth-mounted air multipliers are all available from different product makers to help collision repair facilities gear up for transitioning to using waterborne basecoats.

Waterborne Basecoat Summary

With waterborne basecoat being used by more and more vehicle makers, it is likely that most collision repair facilities will evolve with them, as was the case when solvent-borne basecoat/clearcoat finishes began being used. Some facilities that have switched to waterborne admit there was a learning curve, but now prefer waterborne basecoat. Not only does using waterborne basecoat duplicate what the vehicle maker used originally, it also reduces the amount of VOCs being emitted into our atmosphere, which is beneficial to everyone and everything.

This article first appeared in the I-CAR Advantage Online, which is published and distributed free of charge. I-CAR, the Inter-Industry Conference on Auto Collision Repair, is a not-for-profit international training organization that researches and develops quality technical education programs related to automotive repair. To learn more about I-CAR, and to subscribe to the free publication, visit www.i-car.co.nz, then click on 'Links', then 'I-CAR Advantage Online'.

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