CASE STUDY

Masking Unmasked

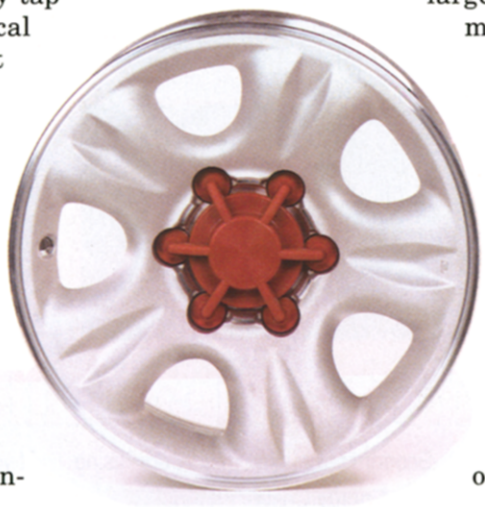
To finish or not to finish, to coat or not to coat? For silicone, vinyl, thermo-plastic elastomers, EPDM, or neoprene masks, that is indeed the question.

By Steve Bjerklie

Sometimes it's not about the doughnut but the hole. In high-end, high-tech, as well as industrial finishing, sometimes the most important part of the process is not the surface that's finished with a coating or with chrome but what's left unfinished.

That's where masks come in. Made of silicone rubber, vinyl, EPDM (ethylene propylene diene monomer), high-temperature thermo-plastic elastomers, or neoprene, in shapes as various as the metal parts themselves—sheets, plugs, cones, rods, blocks, knuckles, rectangles, squares, circles, checks, oblongs, etc.—masks prevent coatings from reaching the surfaces they cover. Anyone who has prepped a room before painting by taping over window frames, electrical outlets, door knobs, and cabinet handles knows what masking is all about.

In metal finishing and coating, however, masking is often rather more complex than simply taping over a surface—though Shercon, a manufacturer of maskings based in Santa Fe Springs, Calif., makes die-cut masking tapes, too. The true art of masking, say Shercon senior design engineer Richard Ramos and manufacturing cost engineer Ruben Dominguez, is in difficult—yet crucial—molded maskings for coated parts. These include automotive brake calipers, aerospace applications, electronic boards, computer chips, titanium plates and screws for hip, shoulder, and spine implants. If a masking fails in any of these applications, true disaster can result. Steve Gagel, engineer, and Fred Zeyfang, senior vice president, with Caplugs in Buffalo, N.Y., agree: "Even a 0.1 percent failure rate can result in hundreds of thousands of dollars of cost," Gagel said. "Not only that, but you don't catch the failures until it's too late."



Silicone Star: This silicone plug on an automotive wheel masks bolt holes and threads from chroming—chromed threads would cause the bolts holding the wheel on to the hub to loosen. Masking threaded bolt holes is a common use for such plugs. (Photo courtesy of Shercon, Inc.)

Ideally, the Shercon engineers work with the actual part to be masked. Ricardo Sanchez, the company's marketing manager, brings out a collection of parts and their maskings: an aluminum crank for a bicycle, a casing for an analog gauge, a chromed part for a Harley-Davidson engine, the piping for an automobile's gas tank. The U.S. Department of Defense's ordnance casings and missile bodies that Shercon also makes maskings for don't fit in the box. The tiny maskings for titanium screws for knee replacements would get lost among all the larger, heavier parts. Shercon makes masks for all of these applications, as well as for parts in heavy equipment and other kinds of industrial manufacture. It makes a mask for coated light bulbs and for automotive gear-shift knobs. The box alone, however, makes the point: For just about every part of anything that's coated, there's a complementary mask.

NEGATIVES AND POSITIVES

It's a process of thinking in terms of negatives and positives. The surface area to be masked is the negative; the mask for that surface is the positive. There's an analogy in the art of silkscreening: in silkscreen patterns, the masking—the positive, in other words—blocks out ink; the negative spaces where there is no masking are where the ink flows. On occasion, Ramos and Dominguez have designed a single mask to cover several surfaces and points on matching parts. The engineers bring out a matching pair of motorcycle engine parts, right and left, and then

Injection Protection: These injection-molded plugs and masks are made from high-temperature thermo-plastic elastomers, a lower-cost alternative to silicone. (Photo courtesy of Caplugs.)

proudly show off the single mask they designed to cover the inside of each part. The parts snap easily on to the mask, like Legos. "See, here's one, two, three...six masking points in all covered by this single mask," beams Ramos, admitting that there's a special satisfaction for an engineer when he can find a single elegant solution to a multi-point masking task.

Often the engineers don't have the part in hand when they're asked for a mask. "We work from blueprints, 3-D models, rubbings, even scrawlings on napkins," Ramos said. "The most difficult part of our job sometimes is to quantify subjectivity. When a customer tells us he wants something 'loose' or 'snug' or 'tight,' we have to interpret what he means, and it can be difficult." Usually, however, the specifications are detailed, often complex. Sanchez notes that among automotive customers, the Asian manufacturers present especially tight specifications.

Silicone rubber, marketed under the trade name Ultrabake, is the material of choice at Shercon. "It's head and shoulders above the other choices in terms of temperature variation," Ramos points out. "For example, it remains stable at more than 600°F, and cold temperatures don't affect it much, either. That's why silicone is used in applications such as for parts finished in high-temperature ovens that are subject to harsh chemicals, and that are used in the space shuttle and in satellites, where the temperature range fluctuates hundreds of degrees in just a few seconds during lift-off."