

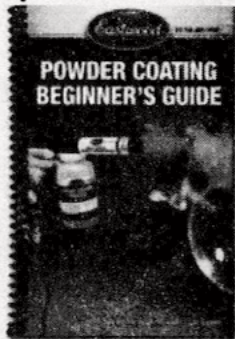
LET'S TALK ABOUT PAINT

Part II - Powder Coating Equipment

by Lee Carroll
and the
Skinned Knuckles staff

Last month we looked at the basics of powder coating. This month we will look at the equipment and the principles of powder coating. In future issues we will get into the actual application of powder-paint onto metal.

I would like to recommend a book to you as a start. Joe Richardson (many of you will remember Joe's Place column in *SK* several years ago) of the Eastwood Company has written an easy-to-read, easy-to-understand book on powder coating. Entitled Powder Coating Beginner's Guide (Eastwood #14104*), Joe begins with the most elementary questions about powder coating, and he continues through the more sophisticated techniques for the experienced powder coater.



What we will look at in this series are the most basic rules and techniques for powder coating. As you progress, you will want to learn more about special techniques, multiple colors, special-need applications and more. But let's crawl before we run.

You are going to need special equipment to powder coat. There is no getting around this fact. It's not like wet paint where any old brush will slap a coat of paint over the old color. The equipment to get started isn't necessarily cheap, but over a very short period of time it will pay for itself. Actually, for under \$300 you can be operational. Just add your own air source. Each time that you bring an item into a powder coater's shop, you will be leaving a minimum of about \$100 – often much more.

Much of the needed equipment and supplies can be purchased on-line or at local shops, but we recommend that you begin with the Eastwood Company. We recommend them for a number of reasons: we know their quality – it's good! We know that their prices are competitive; they carry everything that you will need (not so in many of the specialty paint shops); and finally, they have the support that you might need to understand the techniques of use, and they can help you troubleshoot problems.

Powder coating equipment begins with safety. Always wear a dust mask and goggles. Always! Never smoke or have a flame or lighted cigarette in the area. Chances of fire or explosion are remote, but possible. Never use a gas oven to cure parts (many professional shops do use gas ovens but they require much more sophisticated equipment than you will need). Finally, never use the cooking oven to cure powder-coated parts. The powder gases off as it cures, and harmful fumes may remain in the oven to contaminate food. There are another couple of warnings, but we'll get to them as they apply.



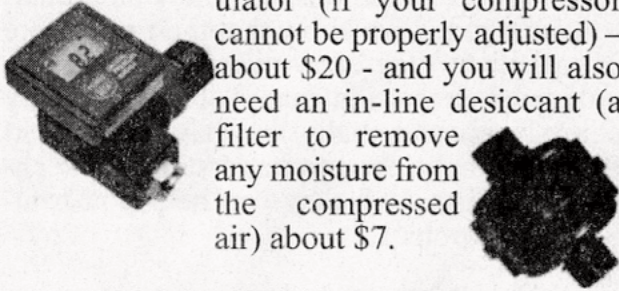
If your club has a tool-lending program, powder-coating equipment could be a very good addition. Costs will be amortized among the members.

Equipment

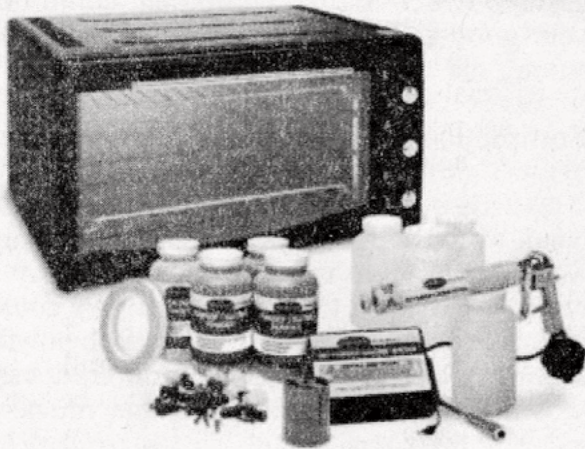
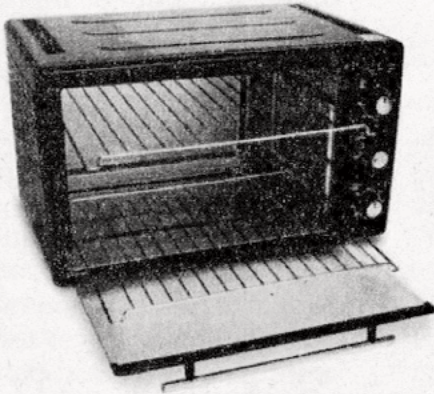
To begin, you will need a well-ventilated, brightly lighted area to work. A garage works well; there is very little over-spray so waste is confined to a small area. (Of course take the cars out of the garage before powder coating!) A closed-in basement room doesn't provide the fresh air ventilation that you need.

You will need a special powder-coating gun (a basic gun will cost under \$100). You

will need a compressed air source. Your regular air compressor or even an adequate air storage tank will suffice if the pressure can be controlled. You will need an air-pressure regulator (if your compressor cannot be properly adjusted) – about \$20 - and you will also need an in-line desiccant (a filter to remove any moisture from the compressed air) about \$7.



Then the big thing: the curing oven. Although you can often find an old electric kitchen oven that you can use, they generally require a 220-volt source. A dedicated powder-curing oven starts at under \$100* (at Eastwood), and a complete starter kit – including the oven, basic gun, powder, and accessories costs under \$300 at Eastwood (#15783). My recommendation, though, would be to spring for a few dollars more and get the dual voltage gun*. The Eastwood oven is small enough (21"x15"x13") to store on a shelf or on a rolling cart for ease of storage, yet large enough internally for most smaller parts.



The other accessories that you will need (and they come with the starter kit)

are powder (black and an assortment of colors), silicone plugs, high temperature masking tape, and stainless steel wire.

One final thing: Powder coating requires a completely clean, oil-free, grease-free (and that includes fingers) surface. Eastwood's PRE or Acetone are satisfactory cleaners (wear Nitrile gloves) to remove all traces of surface contamination.



Understanding the Principles of Powder Coating

Okay. Here you are with cartons of equipment and no idea what it does or why. Let's look at the equipment and why it is special.

In a previous issue we used the analogy of rubbing a balloon in your hair or against a wool sweater to build up a static charge. The balloon will then stick to the wall or ceiling, and will remain there until the static charge dissipates – but at least for a few minutes.

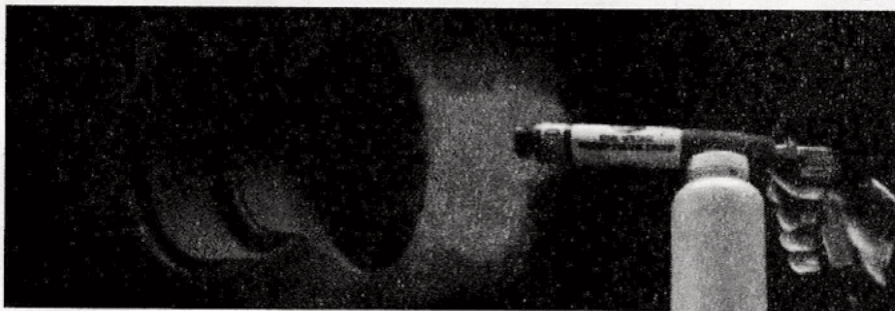
That's the principle of applying powder. The special high-voltage gun puts a static charge onto the metal part that you wish to powder coat. The static charge attracts the powder particles in the air, and they stick to the surface. When the gun is removed, the static charge remains – at least long enough to put the part into the oven to cure.

The powder coating gun plugs into a grounded 120-volt outlet. It has a screw-on cap for the powder jar, an inlet for a compressed air source and a dedicated ground wire for the part to be coated. That ground wire is of the utmost importance. If the part



does not have an adequate ground, the static charge will not allow the powder to adhere. The electrical charge that the gun emits charges the air. (The gun does not touch the part to be coated. Touching the gun to the grounded part could be dangerous and provide a serious electrical shock.) As the powder leaves the gun, it picks up a charge from the emitter rod. The charged powder is then attracted to the grounded part and 'sticks' like that balloon. When the part is completely coated with the dry powder, the power is shut off and the part – with the powder sticking to it – placed in the curing oven.

An interesting feature of the static charge is that since the air is filled with the charged powder, and the entire target part is receptive to the powder, the powder adheres around curves, in the back and into every opening. Unlike wet-spraying paint, where the paint is directed in line-of-sight, the powder will curve around to unseen parts. Threaded holes or other parts that must not be powder-coated must be plugged with special silicone plugs or masked with special tape.



The charged powder actually surrounds the part and is attracted by the ground.

The air compressor must be regulated so that it puts out a minimum amount of pressurized air – only between 5 to 10 pounds per inch. Never more than that. The compressed air does not 'blow' the powder onto the part; it only has to provide enough 'push' to get the powder out of the gun. The static electricity does the rest. At 5-10 psi, the powder 'puffs' out of the gun. Too much pressure and the powder will be blown off the target part. Because of the low air requirement, even an air storage tank can be used. It has to provide 5-

10 psi at 1-2 cubic feet per minute of air. That's pretty low.

It is important that #1: the air pressure is a controlled 5-10 psi (that's the reason for the regulator), and #2: that the air is completely moisture free (that's the reason for the in-line desiccant filter).

Because the air is 'puffed' out of the gun, and the charged powder is electrically attracted to the grounded part, there is virtually no over-spray. Excess powder falls to the floor where it can be swept up.

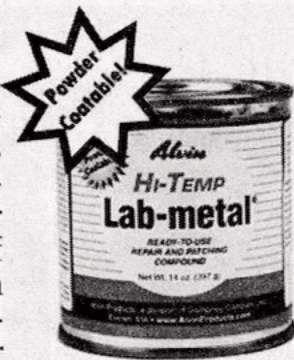
Preparing the Part for Powder Coating

Like wet painting, the finished job is highly dependant on the surface that you begin with. Powder coating will NOT hide defects, irregularities, pitting, cracks or other surface imperfections.

The part to be coated must be completely electrically conductive. (Okay, there are exceptions, but now we're getting into more advanced techniques. Read the book.) Nothing can interfere with the electrical conductivity. Nothing! Old paint is an insulator; primer is an insulator, plastic body fillers are an insulator, oil, grease, dirt, and rust are all insulators. They will all prevent a good electrical charge, and the result will be a poor powder coated finish. There are even metals that gas-off when heated, and they, too, require special preparation prior to powder coating (again, read the book).

All of the hard work comes before powder coating. Old paint or primer must be stripped off, right down to bare metal. Preparation is at least as critical as it is for wet painting. Scratches, dents - even small ones - or pitting in the metal's surface must be filled. Do not use a plastic body filler. It will not powder coat (it is not electrically conductive). Surface imperfections must be sanded out or

filled with a special electrically-conductive filler. (Alvin Products Lab Metal or High-Temp Lab Metal fillers are electrically conductive and can be powder coated.) All traces of surface contamination must be removed (sanding and acetone) prior to coating. Don't expect powder coating to mask anything. It won't happen. Even if the part looks good with the dry powder on it, once it cures, every imperfection will show up – especially with gloss finishes. Remember the old computer expression GIGO - garbage in, garbage out? That goes for powder coating, too.



Don't touch the part with your bare hands once it has been cleaned. Wear clean Nitrile gloves.



Another word of warning. Powder curing is

done at 400° F. Sometimes even a little higher. Low melting point metals (like common solder) cannot tolerate 400°F without turning molten. Special powders and special techniques can sometimes be used to cure at lower temperatures. If any joints in the part to be coated are soldered, they will probably come apart in the oven. Since the powder is attracted to ALL charged metal parts, hinges are subject to being clogged and rendered inoperable by the powder. They must be masked or treated separately.

You now understand the basics. Next month we are going to fire up the compressor, plug in the gun, pre-heat the oven and do some powder coating!

The Eastwood Company's experts are available to help you select the right tools and equipment to begin your adventure into powder coating. See their on-line catalog at www.eastwood.com, or telephone them at 800-345-1178 for sound advice. And PLEASE, mention *Skinned Knuckles* magazine.

Special thanks to the Eastwood Company and to Joe Richardson for 'teaching' us how to properly use powder coating equipment. *Eastwood has put several items on sale for *Skinned Knuckles* readers. See ad page 35.

Lee Carroll

WHY USE A DESICCANT?

Under equipment, we mentioned the need to use a desiccant to remove the water from the compressed air. As we wander around, we don't generally 'feel' the water in the air. That's not exactly true. I lived up in an area with extremely high humidity, as many of you do. When the humidity is that high you seem to feel the water in the air.

Relative Humidity expresses how much moisture is in the air as a percentage of the total moisture the air could contain at the current temperature. In other words, if the air has all the water vapor that it can contain at a given temperature, the relative humidity is 100%.

However, the warmer the air, the more water vapor it can contain, and the cooler the air, the less vapor it can contain.

Air is comprised primarily of gas – about 78% nitrogen, 21% oxygen and trace amounts of other elements. Although the water is only a very minor part of the composition of air, enough air passes into the air compressor to amount to a measurable quantity. As the air is squeezed under pressure, the gases compress, and the water is – for the most part – squeezed out. Enough water remains in the compressed air though so that the powder (coming out of the powder coating gun) absorbs the water and can cake.

The desiccant is designed to remove the remaining water from the compressed air. The water that was squeezed out remains in the tank, often a measurable amount, so the compressor tank must be drained regularly, and the desiccant changed to keep the air going to the powder coating gun as dry as possible.

S.K.