The ***Met-L-Chek***® *Penetrant Professor*

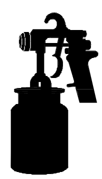
May 11
Mother's Day

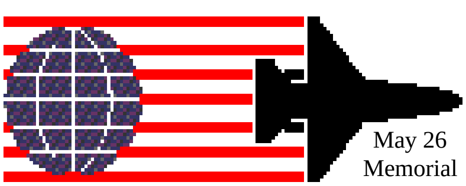
AEROSOL SPRAYING

Almost every inspector understands that in order to get good penetrant indications, it is necessary to apply a thin coating of developer. This is particularly true when the inspector uses form "d" non aqueous aerosol developer. We often get questions about other methods of applying form "d" developer, for example, using pump spray bottles, paint sprayers, etc.

While all of these alternative forms of application will put developer on the surface of the part under inspection, none of them work as well as using an aerosol can. There are important technical reasons why this is so.

Let us first take a look at pump sprayers, these ubiquitous containers are used to apply everything from laundry detergents to furniture polish to insecticides. They put out a nice spray, so why not use them to apply developer? The answer is that the mechanism used to form the small droplets that make up the spray is mechanical. It works somewhat like putting your thumb over the end of a hose to get a spray effect. While it is true that droplets form, they are simply too large and not uniform enough to apply the fine coat that is needed. This is also true of a paint sprayer, although to a lesser degree. Pump spray bottles are made by the thousands or millions, and reflect what one would expect from a device that is sold for pennies. They do the job for which they were designed, but no more. In the case of a paint sprayer, one has the advantage of air pressure and a considerably more refined mechanical breakup system. So, with care, a satisfactory coating can be achieved.





May 26
Memorial
Day

Now consider the aerosol can. Here the mechanism to form droplets is entirely different, and is based on the phase change of the propellant from a liquid to a gas. It works like this. Inside the aerosol can there is a solution of propellant and carrier liquid, frequently a hydrocarbon propellant such as butane or propane, and a carrier liquid such as alcohol. The propellant is in liquid form because it is under pressure. This liquid has the developer powder suspended in it. When the can is shaken, it suspends the powder in the liquid mixture. Now when the actuator is depressed, the pressure in the can forces the liquid-powder mixture out of the nozzle and into the pressure of the atmosphere. At atmospheric pressure, the propellant liquid boils to become a gas. This action is almost instantaneous, and each liquid droplet that comes out of the nozzle explodes into thousands or millions of smaller droplets. These tiny droplets then impinge on the part surface, where they form the desirable thin coating.

A recent article in the magazine **SPRAY TECHNOLOGY** makes some comparisons between the size of the droplets formed by a pump sprayer and those formed by an aerosol can. For the pump sprayer, the average diameter of a droplet is about 125 microns, in comparison to the average diameter of the aerosol can, at about 22.5 microns. This

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difference of a factor of 5.5 does not sound like much, but when it is translated into the number of particles in one milliliter (ml), one can easily see the difference. One ml from the pump sprayer contains 977,000 particles, and one ml from the aerosol can contains 167,800,000 particles. There are 172 times as many particles in the aerosol spray as there are in the pump spray. And, more important, the aerosol spray particles are much smaller, allowing the desired thin coat to be applied. The surface area of the pump spray droplets is about 47,980 square millimeters, and the equivalent area from the aerosol can is about 266,800 square millimeters, or also 5.5 times as much. In practical terms, applying developer with a pump sprayer will cover less than 1/5 of the area that can be covered with an aerosol can, and this area will likely be 5 times as thick as the aerosol can coating. This is exactly why an aerosol can is the best method to apply form "d" developer.

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To receive it-- call, fax or email
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Percentages, parts per million, etc.

We have covered this in past issues of the "Penetrant Professor" but we keep getting questions on this subject. Units that are used to report the amount of contaminating elements in penetrant products can be confusing. This can occur because the specification that governs the analytical procedure may produce values in percentage units, and the specification that is being used by the customer may require parts per million units. In these cases, one must know how to make the conversion. It is easy, and the following table explains the relationship when a 100 gram sample is analyzed; it is just a numbers game, but is simple if you just keep the decimal points in the right place.

May 2008

Contaminant	***Percent***	***Parts per Million***
1.0 gram	1.0%	10,000 ppm
0.1 gram	0.1%	1000 ppm
0.01 gram	0.01%	100 ppm
0.001 gram	0.001%	10ppm

The Penetrant Professor