United States
Environmental Protection Agency
Design for the Environment, Auto Refinishing Shop Project

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HVLP SPRAY GUNS IN THE AUTO REFINISHING SHOP: A SUCCESS STORY

Every auto body shop wants to use paints efficiently, save money, and work safely. No shop wants to take a chance on the quality of a finish and have to redo a paint job. And there lies the promise and challenge of HVLP (high-volume low-pressure) spray guns. Capable of greatly increasing paint transfer efficiency, decreasing costs, and creating a healthier workplace, the HVLP spray gun seems an obvious choice. Yet many painters have been slow to switch from conventional guns, objecting to the feel of the HVLP spray gun and its spraying performance, especially when applying clear coat.

Recently, as part of its Auto Refinishing Shop Project, the U.S. Environmental Protection Agency (EPA) Design for the Environment (DfE) Program visited Wiley's Auto Body, Inc., a small shop near Philadelphia, PA. Wiley's Auto Body took on the challenge of the HVLP spray gun--and through the initiative of the shop's head painter, Jeff Aigeldinger, and active support of shop owner, Herb Wiley–came up with a technique that produced great results for them and should for you too!

Why HVLP Spray Guns? Research demonstrates that HVLP spray guns can achieve far greater transfer efficiency (over 60% with good technique) than conventional spray guns. Higher transfer efficiency means less of what you don't want: paint overspray, mists that a painter might breathe, emissions to the community--and more of what you do want: savings on paint and an improved bottom line (see section on Iowa's STAR program and cost savings).

Higher transfer efficiency eliminates pollution at its source and is especially important from a health and safety standpoint. Paints and coatings contain many potentially harmful chemicals–including isocyanates, solvents, and pigments (see sidebar on Isocyanates). Concern for air quality from releases of volatile organic chemicals (VOCs), like paint thinners, have prompted several state and local governments, Pennsylvania and the Cities of Philadelphia and Chicago among them, to require auto refinishers to use HVLP spray guns.

Because of the health and efficiency advantages of HVLP spray guns and advances in technology that have made them easier to use, awareness of the guns has spread throughout the industry. Nonetheless, many painters won't give up their trusty old guns: some want proof that a HVLP spray gun can match a conventional spray gun's top quality finish, especially on clearcoats–without extra rubbing and buffing; others are searching for a reliable way to make the HVLP spray gun work well for them; and still others simply prefer to stay with what they know and like.

The Successful Switch to HVLP Spray Guns at Wiley's Auto Body, Inc. For years, Jeff Aigeldinger swore by his SATA Jet 90. Its superior atomization

Design for the Environment Auto Refinishing Shop Project

In its Auto Refinishing Shop Project, U.S. EPA's Design for the Environment (DfE) program works with auto refinishers to identify and adopt safer, cleaner, and more efficient practices and technologies.

EPA's project team has uncovered many examples of health and safety improvements that increase efficiency and can help shops save money—some are even cost-free. Other factors—like the quality of the refinish job and environmental regulations—may also provide incentives for change.

If you're interested in participating or would like to learn more about this project, please call Mary Cushmac at 202-260-4443 or David Di Fiore at 202-260-3374, or visit the DfE Web site at *www.epa.gov/dfe*.

For a virtual auto body shop experience, filled with helpful health, safety, and efficiency information, visit *www.ccar-greenlinks.org*. The virtual auto body shop is a joint product of DfE and the Coordinating Committee on Auto Repair.

of materials gave him a consistently top-notch finish and helped him earn a reputation as a master auto refinisher. So, when HVLP spray guns came along Jeff was interested in the benefits, but skeptical that the HVLP spray guns could equal the performance of his conventional spray gun: "I just couldn't imagine that any other gun stood a chance against the Jet 90."

Nevertheless, the promise of improved transfer efficiency and a healthier workplace led him to experiment with HVLP spray guns. Jeff also wanted to get ahead of the regulatory curve, "I knew that regs banning conventional guns were on the way–so why wait?" The transition to HVLP spray guns for priming and basecoat was relatively easy, but he just couldn't achieve a satisfactory result for the clearcoat. Consequently, Jeff found himself juggling two gun types--typically shooting primer and base with HVLP spray guns, always going with a conventional spray gun for his clear finish.

A Second Look. Things went on this way until two events--the birth of his second child and a visit from EPA's Design for the Environment--altered his routine and prompted Jeff to take another look at the HVLP spray gun, for the clearcoat and all his spraying. DfE reminded him about the serious health issues at stake and the opportunity to save paint and reduce pollution. His second child reminded him how much he wants to be in good health to enjoy his children as they grow up--and his grandkids too!

As a first step, Jeff contacted his shop's paint distributor, Sikkens, to see what they knew about HVLP spray gun performance and if they had any advice for applying clearcoat. "What the Sikkens rep said to me," Jeff recalls, "is that success with the HVLP spray gun boils down to getting the right air pressure at the spray gun tip." For clear coats, the spray gun manufacturer recommends 10 psi. The Sikkens rep loaned Jeff an air cap pressure gauge, with gauges to measure pressure on each side of the nozzle.

When Jeff tried the pressure gauge with the shop's regular air hose, he had to significantly increase the air pressure going to the spray gun to get 10 psi at the gun tip. Jeff's solution: a new air hose with a larger inner diameter (~3/8 inch i.d.), which increased the volume of air to the spray gun. "With the new hose," Jeff explains, "I was able to lower the pressure at the regulator from 120 to 70 lbs. and still keep the gun tip pressure at 10 psi."

Isocyanates, the hardener in clearcoats and many primers, may be extremely hazardous to humans in very small quantities. **Isocyanates are the leading cause of occupational asthma, a potentially life-threatening disease.** Scientists estimate that 5 to 20% of the population may be allergic (or "sensitized") to isocyanates. Allergic reactions include: itching and watery eyes, skin rashes, asthma, and other breathing difficulties.

Unfortunately, you won't know if you're allergic to isocyanates until/unless you start experiencing the symptoms–which can appear at first contact or at any time. Even if you're not allergic to isocyanates, they may still irritate your skin and lungs, and many years of exposure can lead to permanent lung damage and respiratory problems. If you are allergic, even tiny amounts of isocyanate can trigger a severe lung reaction. A sensitized painter or technician cannot work in an auto refinishing shop without putting his life in jeopardy.

What does it all mean? Do everything you can to limit your exposure to hazardous paint materials. An HVLP spray gun is an important tool for reducing overspray and painting safely.

HVLP All the Time. In a test run with new hose and pressure gauge, Jeff adjusted the gun settings until he got the proper spray pattern and atomization with 10 psi at the spray gun tip--then he locked in those settings for that spray gun. Jeff also used the pressure gauge to calibrate his other HVLP spray guns. To avoid changing tips, he uses a different HVLP spray gun for each application--primer, basecoat, and clearcoat. (Note: Jeff only used the pressure gauge to calibrate his spray guns, he does not paint with the gauge on the spray gun.)

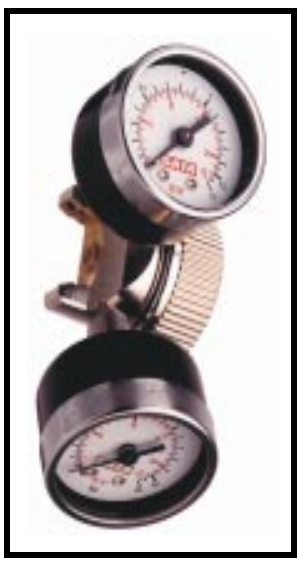

Photo provided courtesy of SATA

With all his spray guns correctly calibrated, it did not take Jeff long to get comfortable using the HVLP spray gun for all his spraying. Within a few weeks, his clearcoat finishes rivaled those from his conventional spray gun--with no additional buffing. "There is a learning curve," Jeff is quick to remind, "the conversion doesn't happen over night. It may take a typical painter two to four weeks to be at ease with the HVLP spray gun and to achieve high-quality results."

But the effort is well worth it. One big payoff: Jeff estimates that paint usage at Wiley's is down 30% on a per car basis. "The number is real," Jeff says, "but painters must remember to mix less paint for the HVLP spray gun. You're used to mixing a certain amount of paint for a conventional spray gun and you have to remind yourself to mix less or you'll just wind up with leftover paint and no savings." And beyond the savings, there's an even bigger payoff: peace of mind. "I sleep better at night," Jeff declares, "knowing that I've done something important to protect my health, reduce pollution, and improve my shop."

To ensure maximum transfer efficiency and high-quality results with his HVLP spray guns, Jeff has had to make some minor adjustments to his spray technique. Specifically, he has decreased the distance between the spray gun and the target (down to 4-6") and slightly increased the speed of his stroke–technique changes each painter will discover as he works with the HVLP spray gun. As always, Jeff ensures the best transfer efficiency by keeping his spray gun square with, and at a consistent-distance from, the target surface throughout his stroke.

Thanks to Jeff's efforts, Wiley's Auto Body, Inc. now uses HVLP spray guns 100% of the time.

Follow-up. About a year after he first calibrated the spray guns, Jeff used the gauges again to check the pressures at the spray gun tip. Jeff detected a slight shift in the pressures, an important reminder of the need for periodic checks and setting adjustments to ensure the best performance from the HVLP spray guns and a consistently high quality finish.

Information on Spraying with HVLP Spray Guns from Iowa's STAR Program. The Spray Technique Analysis and Research (STAR) program, at the Iowa Waste Reduction Center, has thoroughly researched spray painting with HVLP spray guns. Based on its research, the STAR program has learned that many variables can influence transfer efficiency–and potential paint savings. Variables that the painter can control include: paint mixture content, spray equipment type, spray equipment maintenance, and spray technique (including pressures settings, spray distance, and spray angle).

The STAR program and HVLP spray gun manufacturers typically suggest an operating pressure of about 10 psi at the gun tip. The STAR program has observed that spraying at the manufacturer's recommended pressure setting will decrease paint overspray and improve finish quality. Droplet size, in particular, has an important effect on finish quality. STAR recommends that painters look closely at the size of droplets near the spray edge. If the droplets are too large or coarse, the finish won't be smooth. Possible solutions: more air pressure, less fluid, or a smaller fluid tip.

Key Elements for Success with HVLP Spray Guns

Ensure 10 psi at the Spray Gun Tip

- Use air hose with inner diameter of 3/8 inch
- Measure air cap pressure with gauges for your specific spray gun (available through your gun distributor)

Adjust Technique

- Come in closer to car surface (remaining square with the target)
- Slightly increase the speed of your stroke

Work with the Spray Gun for a Few Weeks – and Enjoy the Benefits!

The following example from the STAR program provides an estimate of material and cost savings that a typical shop could achieve using HVLP spray guns and proper spray technique.

Success with HVLP spray guns Is Within Reach

Jeff's experience at Wiley's Auto Body shop offers a real-world example of how to make HVLP spray guns work effectively for all spray applications. With some simple equipment, a hose and pressure gauge, and a few weeks of on-the-job practice, the health, environmental and economic benefits of the HVLP spray gun can be yours. Equipment manufacturers, jobbers, and paint manufacturers have resources and training opportunities to help painters make the switch. Don't delay. Doing the right thing for human health and the environment, is the right thing for your business too.

Example of Cost Savings Using an HVLP Spray Gun

Transfer efficiencies[1]

Conventional spray guns:	40%
HVLP spray guns without training:	49%
HVLP spray guns with training[2]:	61%

Assume a facility uses 420 gallons/year of coatings (primer, basecoats, and clearcoats) to spray approximately 15 cars per week using conventional spray guns (40% transfer efficiency).

If the facility switches to HVLP spray guns without training workers on effective spray techniques (improves transfer efficiency from 40% to 49%), then 343 gallons of coatings are required to spray the same number of vehicles [420 gallons x 40%/49% = 343 gallons]—a savings of 77 gallons/year and $6,900.[3]

If the facility then decides to train workers on the proper use of HVLP spray guns (61% efficiency), then 275 gallons of coatings are required [343 gallons x 49%/61% = 275 gallons]—an additional savings of 68 gallons/year and $6,100.[3]

The total annual savings realized by switching from conventional to HVLP spray guns (with training) would be 145 gallons and $13,000.[3]

[1]Transfer efficiency estimates provided by the Spray Technique and Analysis Research (STAR) program at the Iowa Waste Reduction Center.
[2]With training assumes the painter is using proper spray equipment, maintenance practices, and spray technique.
[3]Assuming an average coating cost of $90/gallon (1998 $s) (obtained through discussions with Philadelphia area auto refinishing shops).