UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Office of Research and Development
Washington, D.C. 20460

ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM VERIFICATION STATEMENT

TECHNOLOGY TYPE:	**HIGH VOLUME, LOW PRESSURE (HVLP) LIQUID COATING SPRAY APPLICATION EQUIPMENT**
APPLICATION:	**LIQUID ORGANIC COATINGS APPLICATION IN AUTOMOTIVE REFINISHING**
TECHNOLOGY NAME:	**Sharpe Platinum 2013**

COMPANY:	**Sharpe Manufacturing Company**		
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The United States Environmental Protection Agency (EPA) has created the Environmental Technology Verification Program (ETV) to facilitate the deployment of innovative or improved environmental technologies through performance verification and dissemination of information. The goal of the ETV Program is to further environmental protection by substantially accelerating the acceptance and use of improved, cost-effective technologies. ETV seeks to achieve this goal by providing high-quality, peer-reviewed data on technology performance to those involved in the design, distribution, financing, permitting, purchase, and use of environmental technologies.

ETV works in partnership with recognized standards and testing organizations, stakeholder groups, which consist of buyers, vendor organizations, and states, and with the full participation of individual technology developers. The program evaluates the performance of innovative technologies by developing test plans that are responsive to the needs of stakeholders, conducting field or laboratory tests (as appropriate), collecting and analyzing data, and preparing peer-reviewed reports. All evaluations are conducted in accordance with rigorous quality assurance protocols to ensure that data of known and adequate quality are generated and that the results are defensible.

The ETV Coatings and Coating Equipment Program (CCEP), 1 of 12 technology areas under ETV, is operated by Concurrent Technologies Corporation (*CTC*), in cooperation with EPA's National Risk Management Research Laboratory. The ETV CCEP has recently evaluated the performance of high-volume, low-pressure (HVLP) spray guns for painting metal and plastic parts. This verification statement provides a summary of the test results for the Sharpe Platinum 2013 HVLP spray gun, manufactured by Sharpe Manufacturing Company.

VERIFICATION TEST DESCRIPTION

The ETV CCEP evaluated the pollution prevention capabilities of HVLP liquid spray equipment. The test was conducted under representative factory conditions at *CTC*. It was designed to verify the environmental benefit of the HVLP spray gun with specific quality requirements for the resulting finish. The operational pressure of the HVLP gun at the air cap was verified to be $\leq$10 psig per the definition of HVLP application equipment. The finish quality applied under HVLP conditions was verified to match that of the CAS baseline prepared by the ETV CCEP. If an HVLP spray gun cannot provide an acceptable finish while operating under HVLP conditions, the end users may have a tendency to raise the input air pressure to meet their finishing requirements. However, these adjustments eliminate the environmental benefits of HVLP. These environmental benefits include a significant drop in paint usage and subsequent reduction of VOC/HAP emissions and solid waste disposal.

In this test, the Sharpe Platinum 2013 HVLP spray gun was tested under conditions recommended by Sharpe Manufacturing Company, the gun's manufacturer. Flat cold-rolled steel panels measuring 10.2 cm x 30.5 cm (4 in. x 12 in.) received an automotive refinishing coating selected by Sharpe Manufacturing Company. The spray gun was mounted on a robotic translator to increase accuracy and repeatability of the test. The translator is capable of moving the spray gun horizontally and vertically. The panels were sprayed in a single row of eight per rack, with three racks coated per run, and a total of five runs per test. Coated test panels were used for paint transfer efficiency (TE) and finish quality analyses. The TE improvement of the HVLP spray gun versus that of a conventional air spray (CAS) gun baseline was verified using American Society for Testing and Materials (ASTM) method D 5286. The CAS guns used in the baseline were gravity-feed, non-HVLP spray guns. The finish quality was compared to the CAS baseline prepared by the ETV CCEP. The CAS baseline panels' finish quality validated the comparison of the HVLP and CAS baseline TE data.

The details of the test, including a summary of the data and a discussion of results, may be found in Chapters 4 and 5 of the "Environmental Technology Verification Report – HVLP Coating Equipment: Sharpe Manufacturing Company - Platinum 2013 HVLP Spray Gun," which was published by *CTC*. Contact Robert J. Fisher of *CTC* at (814) 269-2702 to obtain copies of this statement, the Verification Report, or the Data Notebook.

TECHNOLOGY DESCRIPTION

The Sharpe Platinum 2013 HVLP liquid spray gun was tested, as received from Sharpe Manufacturing Company, to assess its capabilities. The gun was equipped with a #2000 air cap and a 1.3 mm (0.051 in.) fluid tip, and was set to obtain a fan pattern of 20.3 cm (8 in.). Because this HVLP spray gun is marketed to automotive refinishers, Sharpe Manufacturing Company selected an exterior coating used on automotive equipment. The coating was DuPont ChromaPremier#B9008N single-stage urethane mixed 3:1 with DuPont Activator #12305S.

The Sharpe Platinum 2013 HVLP liquid spray gun is one of Sharpe's Platinum Series HVLP spray guns. The spray gun is a gravity-feed gun that can use either an aluminum or nylon paint cup. More information on the spray gun, including recommended air caps and fluid tips for various paint formulations, is available in the Sharpe Platinum Series HVLP Gravity Feed Product Data Sheet. At the time of this verification test, the list price of the Sharpe Platinum 2013 HVLP spray gun was $449.

VERIFICATION OF PERFORMANCE

The performance characteristics of the Sharpe Platinum 2013 HVLP liquid spray gun include the following:

Environmental Factors

- Relative Transfer Efficiency (TE): The Sharpe Platinum 2013 HVLP spray gun provided a 23.2% relative improvement in absolute TE when compared to the CAS baseline. Absolute TE for this test is defined as the actual, unadjusted TE obtained. The Sharpe Platinum 2013 HVLP spray gun provided a 16.2% relative improvement in applied TE over the CAS baseline. Applied TE for this test is the absolute TE adjusted to discount the dead space between the panels and outside the racks. The applied TE represents what would be expected if the eight panels on a rack were one contiguous, 81.3 cm x 30.5 cm (32 in. x 12 in.) panel. The standard deviation of the Sharpe Platinum 2013 test was 0.6% for the absolute TE data.

- Emissions Reduction: The absolute TE improvement equates to a reduction of volatile emissions of 0.8 kg per kg of solids applied when compared to CAS guns. The applied TE improvement equates to a reduction of volatile emissions of 0.3 kg per kg of solids applied when compared to CAS guns. The specific quantitative reduction in paint usage, volatile organic compound (VOC) or hazardous air pollutant (HAP) emissions, solid waste, and cost due to increased TE depends on numerous factors such as paint formulation, process line and paint booth design, and the products being coated.

- Cost Savings: The increased TE of the HVLP spray gun provides an economic advantage in terms of reduced paint usage and solid waste generation. In this verification test, the absolute TE improvement equates to a reduction of 1.6 L of paint used and 0.8 kg of solid waste generated per kg of solids applied when compared to CAS guns. Also, the applied TE improvement equates to a reduction of 0.6 L of paint used and 0.3 kg of solid waste generated per kg of solids applied when compared to CAS guns.

- Output Air Pressure: The output air pressure is a function of the spray gun design and depends on the coating being sprayed. In this verification test, the output air pressure was measured with a #2000 test air cap and an Ashcroft 0–15 psig gauge. The dynamic air pressure at the cap was set at 10 psig by adjusting the input air pressure.

Marketability Factors

- Dry Film Thickness (DFT): Based on their preliminary testing and discussion with DuPont, Sharpe Manufacturing Company recommended the target DFT to be 2.2–2.5 mils. The DFTs for all tests were determined from nine points measured on 25 random panels selected from each test (i.e., 5 panels from each run). The DFT of the HVLP test averaged 2.6 mils with a standard deviation of 0.1 mil. The average DFT for the CAS baseline was 2.5 mils with a standard deviation of 0.2 mil.

- Distinctness-of-Image (DOI): The DOI was measured per ASTM D 5767 Test Method B (exception: an eight-bladed rotating disc was used rather than a sliding combed shutter) at three points on five panels per run. The target value, based on the results of the CAS baseline, was determined by ACT Laboratories to be an average of 74 DOI units with a standard deviation of 7 DOI units, for all three CAS guns. The average DOI for the HVLP test was 67 DOI units with a standard deviation of 5 DOI units. This test method has a range of 0–100 DOI units; therefore, the difference between the HVLP panels and the CAS baseline panel is 7% of full scale.

- Gloss: The gloss was measured per ASTM D 523 Test Method at three points on five panels per run. The test method has a range of 0–100 gloss units. The target value was based on the results of the CAS baseline panels prepared by the ETV CCEP and was found to be an average of 75.1 gloss units measured at a 20° angle with a standard deviation of 3.9 gloss units for all three CAS guns. The HVLP test had an average of 72.5 gloss units with a standard deviation of 3.1 gloss units.

- Visual Appearance: *CTC* personnel assessed the visual appearance of all 120 panels sprayed. The intent of this analysis was to identify any obvious coating abnormalities that could be attributed to the application equipment. The visual appearance of the coating was found to be acceptable with a small degree of orange peel effect on both the HVLP and CAS panels. In addition, minor imperfections were noticed on all panels; however, the coating may be considered acceptable for its intended application.

SUMMARY

The test results show that the Sharpe Platinum 2013 HVLP spray gun provides significant environmental benefit by reducing VOC/HAP emissions, paint usage rates, and solid waste generated and by producing a comparable finish to conventional paint spray guns when applying an organic coating under HVLP conditions. As with any technology selection, the end user must select appropriate paint spray equipment for a process that can meet the associated environmental restrictions, productivity, and coating quality requirements.

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