**THE ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM**




# ETV JOINT VERIFICATION STATEMENT

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| TECHNOLOGY TYPE: | **HIGH TRANSFER EFFICIENCY (TE) LIQUID COATING SPRAY APPLICATION EQUIPMENT** |
| APPLICATION: | **LIQUID ORGANIC COATINGS APPLICATION IN WOOD FINISHING** |
| TECHNOLOGY NAME: | **Kremlin Airmix®** |


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The United States Environmental Protection Agency (EPA) has created the Environmental Technology Verification (ETV) Program 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 consisting 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), one of six verification centers under the ETV Program, is operated by Concurrent Technologies Corporation (*CTC*) under the National Defense Center for Environmental Excellence (NDCEE), in cooperation with EPA's National Risk Management Research Laboratory. The ETV CCEP has recently evaluated the performance of innovative liquid coating spray application equipment intended for wood finishing applications. This verification statement provides a summary of the test results for the Kremlin Airmix® high transfer efficiency (TE) spray gun, manufactured by EXEL Industrial, Inc.

## VERIFICATION TEST DESCRIPTION

The ETV CCEP evaluated the pollution prevention capabilities of high TE liquid spray equipment. The test was conducted under representative factory conditions at *CTC*. It was designed to verify the environmental benefit of the high-TE spray gun with specific quality requirements for the resulting finish. The finish quality applied by the Airmix® was verified to be comparable to the finish quality obtained by three baseline high-volume, low-pressure (HVLP) spray guns. The environmental benefit of HVLP spray guns compared to conventional air spray equipment has previously been verified und the ETV Program. The results of the HVLP verification tests can be found on the EPA's ETV website (www.epa.gov/etv). If a high-TE spray gun cannot provide an acceptable finish while operating at efficiencies representative of HVLP spray guns, the end users may have a tendency to raise the input air pressure to meet their finishing requirements. However, these adjustments may reduce the environmental benefits of the high-TE spray gun. In earlier verification tests, HVLP guns were shown to improve TE by 18.9% to 63.9% when compared to conventional paint spray guns, depending on the coating sprayed. This improved TE resulted in a reduction of 16% to 40% of coating material use, emissions of volatile organic compounds (VOC) and hazardous air pollutants (HAP), and of solid waste generated. This verification test compared the TE of a high TE liquid spray gun against a baseline of HVLP guns, which could be subsequently used to qualify the environmental benefits provided by the Airmix® when compared to conventional air spray equipment.

In this test, the Airmix® high-TE spray gun was tested under conditions recommended by EXEL Industrial, Inc., the gun's manufacturer. Two targets were used. The first target consisted of 24 in. x 24 in. wood panel backboards that were covered with heavy duty aluminum foil and suspended in the spray booth by hooks. The second target consisted of 12 in. x 24 in. wood panels that were sealed and sanded and suspended in the spray booth by hooks. Three foil-covered backboards were coated in each of five runs for each gun to be used for TE analysis. One wood panel was coated in each of five runs for each gun to be used for finish quality analysis. The application pattern was consistent among each target type. The spray guns were triggered so that 6 in. (3 in. lead and 3 in. lag) of overspray were obtained for each pass. The application pattern for all guns also allowed 50% of the first and last pass to be either above or below the panel, respectively. The spray guns were mounted on a robotic translator to increase accuracy and repeatability of the test. The translator moved the spray gun horizontally and/or vertically. The TE improvement of the Airmix® spray gun over a HVLP gun baseline was verified using American Society for Testing and Materials (ASTM) method D 5286. The Airmix® and HVLP baseline guns were all pressure-feed guns. The finish quality of the Airmix® was determined to be comparable to the finish quality of the HVLP baseline and was able to meet the finish quality requirements of the test coating; thus, the TE values obtained for the Airmix® test are representative of the actual operation of the equipment and the TE comparison was deemed to be valid.

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 "Environmental Technology Verification Report – EXEL Industrial, Inc. Kremlin Airmix® Spray Gun," which was published by *CTC*. Copies of this Verification Statement and the associated Verification Report are available at http://www.epa.gov/etv/verifications/vcenter6-16.html. Contact Robert J. Fisher of *CTC* at (814) 269-2702 to obtain copies of the Data Notebook

## TECHNOLOGY DESCRIPTION

The Airmix® spray gun was tested as received from EXEL Industrial, Inc. The gun was equipped with a VX14 air cap and a 14-174+ fluid tip. The Airmix® is an improved version of an air assisted-airless spray gun design. The paint is delivered to the gun under moderate pressure, a specially designed fluid tip atomizes the pressurized paint, and a small amount of compressed air is used to shape the fan pattern. The vendor claims that the fan pattern achieved by this design exhibits a uniform density along the long axis of the pattern, allowing for a more consistent and controllable film build. Because the Airmix® spray gun is marketed to wood finishing applications, EXEL Industrial, Inc. selected a wood furniture finishing clear topcoat manufactured by Valspar called 35 Sheen Ecoplast E1.

More information on the spray gun, including recommended air caps and fluid tips for various paint formulations, is available from EXEL Industrial, Inc. At the time of this verification test, the list price of the Airmix® spray gun and pressure pump was approximately $2,000.

## VERIFICATION OF PERFORMANCE

The performance characteristics of the Airmix® spray gun include the following:

Environmental Factors

- Transfer Efficiency (TE): The TE was determined per ASTM D 5286. The following TEs and associated standard deviations were obtained for the conditions tested:

| Spray Gun | Airmix® | HVLP #1 | HVLP #2 | HVLP #3 |
|---|---|---|---|---|
| Average TE (%) | 54.4 | 51.6 | 53.1 | 52.2 |
| Std. Dev. | 0.5 | 0.6 | 0.3 | 0.5 |

  The Airmix® provided a higher TE than the three HVLP guns for all comparisons at 95% confidence interval.

Marketability Factors

- Air Flow: The air consumption data was obtained using a calibrated air flow meter. The following air flows and associated standard deviations were obtained during this test:

| Spray Gun | Airmix® | HVLP #1 | HVLP #2 | HVLP #3 |
|---|---|---|---|---|
| Average Air Flow (SCFM) | Gun - 3<br>Pump - 2 | 14[a] | 9[a] | 12[a] |
| Std. Dev. | 0.0 | 0.0 | 0.0 | 0.0 |

[a] The air consumption of the pressure pump used for the three HVLP spray guns was not significant compared to the air consumption of the guns themselves.

- Dry Film Thickness (DFT): The DFT data was obtained per ASTM D 6132. Based on recommendations in Valspar's product data sheets for the 35 Sheen Ecoplast E1 topcoat, the target DFT was established at approximately 1.0 mil in one coat. DFTs for all tests were determined from multiple points measured on each finish quality panel. The following DFTs and associated standard deviations were obtained during this test:

| Spray Gun | Airmix® | HVLP #1 | HVLP #2 | HVLP #3 |
|---|---|---|---|---|
| Average DFT | 1.1 | 1.2 | 1.2 | 1.2 |
| Std. Dev. | 0.1 | 0.1 | 0.1 | 0.1 |

- Gloss: The gloss was measured per ASTM D 523 at multiple points on each finish quality panel. The test method has a range of 0–100 gloss units. Since each coating has its own gloss target, it is important to achieve similar gloss measurements using each piece of application equipment. The following gloss measurements and associated standard deviations were obtained during this test:

| Spray Gun | Airmix® | HVLP #1 | HVLP #2 | HVLP #3 |
|---|---|---|---|---|
| Average Gloss | 30 | 34 | 32 | 33 |
| Std. Dev. | 2 | 3 | 2 | 2 |

- Visual Appearance: *CTC* personnel assessed the visual appearance of all finish quality panels. 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 no obvious visual abnormalities that would render the coating unacceptable for its intended application.

**SUMMARY**

The test results show that the Airmix® spray gun provides paint transfer efficiency higher than that of HVLP spray equipment while maintaining comparable finish quality. HVLP spray equipment has been shown during earlier verification testing to have significantly higher transfer efficiency than conventional paint spray guns, thereby reducing VOC/HAP emissions, paint usage rates, and solid waste generation. Hence, the Airmix® spray gun provides a significant environmental benefit when compared to conventional spray guns. 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.

*Original signed on*
*9/26/06*

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