

Emission tests of non-HP toner cartridges on HP printers

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Executive Summary

This study determined the emission rates of an HP Blue Angel certified printing system when using 35 non-HP (imitation and remanufactured) cartridge brands. The emission tests were carried out according to Blue Angel protocol DE-UZ 219 (Edition January 2021).

When the printers HP Color LaserJet Enterprise M553X and HP LaserJet Pro M404dn are operated with the tested non-HP cartridges:

- 31 printing systems out of 35 failed the Blue Angel emission requirements when using the tested non-HP toner cartridges.
- In 31 out of 35 tests the emissions of total volatile organic compounds (TVOC) were higher than the Blue Angel limit.

In summary the printing system is not guaranteed to meet the Blue Angel criteria with the tested non-HP cartridges.

1 Introduction

Indoor air quality (IAQ) is important to human health. To reduce emissions and improve IAQ, the German government has set emission criteria for office equipment with printing function, DE-UZ 219. Devices which fulfill the emissions criteria qualify for certification with the Blue Angel label. Leading printer manufacturers have their products tested before market introduction. Blue Angel emissions tests are based on a manufacturer's printing system, which includes both the OEM (original equipment manufacturer) printer and OEM cartridge. However, there are cartridges available on the market, which are intended to be compatible replacements, but are not produced by an OEM. If an HP printer using non-HP cartridges has not been tested for emissions, the printer's ability to fulfill the Blue Angel emission requirements is unknown.

This report summarizes the results of a study, commissioned by HP Inc., where the emission rates of substances from the laser printers HP Color LaserJet Enterprise M553X (color) and HP LaserJet Pro M404dn (monochrome) equipped with non-HP toner cartridges were determined at Fraunhofer Wilhelm-Klauditz-Institute (WKI). Based on the standard DIN EN ISO/IEC 17025 the department Material Analysis and Indoor Chemistry (MAIC) is an accredited test lab for emission measurements of printers. WKI, located in Braunschweig, Germany, was founded in 1946 by Dr. Wilhelm Klauditz, and joined in 1972 the Fraunhofer Association which is Europe's largest application-oriented research organization. The products and materials WKI examine range from classic

wood-based materials through plastics and building products to products from the automotive, electronics, aviation, food and printer industries.

2 Methods

In this study, 17 non-HP cartridge brand (6 remanufactured and 11 imitation) toner were tested with the HP Color LaserJet Enterprise M553X (color) and 18 non-HP cartridges (16 imitation and 2 remanufactured) with the HP LaserJet Pro M404dn (monochrome). All tested non-HP cartridges were compatible with the respective HP printer. The printing paper used in the tests was the HP paper A4 80g (CHP110). The printers printed 261-360 pages in simplex mode. The HP Color LaserJet Enterprise M553X printed at a speed of ~ 36 pages per minute in color mode. The HP LaserJet Pro M404dn printed at a speed of ~ 38 pages per minute in monochrome mode. Emissions of volatile organic compounds (VOCs), benzene, ozone, dust and fine + ultrafine particles were measured, and their emission rates were calculated according to the Blue Angel test protocol DE-UZ 219.

3 Results

Of the 35 non-HP toner cartridges tested, 31 failed the Blue Angel emissions standard. Specifically, the TVOC emission limit was exceeded by non-HP cartridges by up to 407% over the limit value. Only 4 tested cartridges passed the criteria and the emission rates were below the TVOC limit.

The limit of the TVOC emission rate for monochrome printing is 10 mg/h and for color printing 18 mg/h.

Figure 1 shows the exceedance of the TVOC limit in percent for each tested printing system.

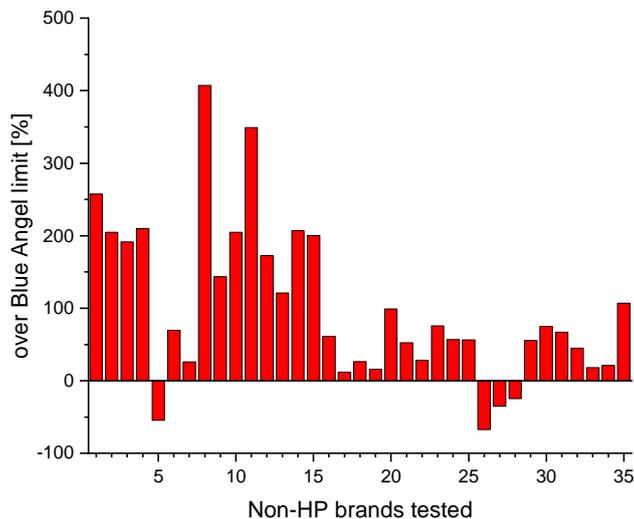


Figure 1: Exceedance of the TVOC emission of the tested non-HP cartridges (N=35) compared with Blue Angel emission limit (18 mg/h in color mode, 10 mg/h in monochrome mode).

4 Summary

The test results provide the following implications for manufacturers and users:

The Blue Angel emission test for printer certification is carried out on printers operated with OEM toner cartridges. When printers are operated with non-HP cartridges, emissions could change. For printers that obtained a Blue Angel label with OEM toner cartridges, printing with non-HP cartridges does not guarantee the Blue Angel standards will continue to be met.

In this study, the HP Color LaserJet Enterprise M553X printer and HP LaserJet Pro M404dn were operated with 35 different non-HP cartridges. In 31 out of 35 cases the Blue Angel TVOC limit was exceeded. In summary, the use of the tested non-HP cartridges caused the printer system to fail the Blue Angel DE-UZ 19 emission requirement 31 out of 35 times

Definitions

VOCs (Volatile Organic Compounds)

General: organic compounds that are emitted from the test object and are detected in the chamber air. For the purposes of this test method: identified and unidentified organic compounds which elute from gas chromatographic separation on a nonpolar column between n-hexane and n-hexadecane, including these compounds. Styrene is one of the volatile organic compounds with a chemical formula of C_8H_8 .

TVOC (Total Volatile Organic Compounds)

Total content of volatile organic compounds, i.e. the sum of the concentrations of identified and unidentified volatile organic compounds which elute from gas chromatographic separation on a nonpolar column between n-hexane and n-hexadecane.

Particles

Small bodies suspended in air or gas having specified physical boundaries and consisting of liquid and/or solid substances. The number of particles emitted was determined within the size range of 5.6-560 nanometer.