



Case Study

# Indoor Air Quality Performance of Toner Cartridges



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## Indoor Air Quality Performance of Toner Cartridges

Image reproduction equipment such as laser printers and multi-function devices are widely used in business, commercial, industrial and public sector environments around the world. Before market introduction devices of leading printing product manufacturers are often thoroughly checked for their performance for indoor air quality (IAQ) aspects.

Accordingly, manufacturers design and test their printer systems for compliance with applicable guidelines, as defined by the widely recognized EPEAT, UL ECOLOGO®, and the Blue Angel (“der Blaue Engel”) eco-label programs. Such certification requires testing of printers together with original toner cartridges.

The Blue Angel is the oldest eco-label program in the world and has been used by the federal government of Germany since 1978. The printer standard (DE UZ 205) sets criteria in resource conservation, use of hazardous substances, chemical emissions, energy consumption and noise emissions. The chemical emissions criteria from the Blue Angel standard for printers are also referenced in EPEAT, UL ECOLOGO® and other global eco-label standards.

Several aftermarket toner options are also available on the market including imitations/new build compatibles. These cartridges are intended for use with popular printing systems but they are filled with different toner than the original cartridges. Therefore, if depleted original cartridges are replaced by these alternatives, it may no longer be verified that the printing systems’ performance lives up to the strict certification guidelines. In fact, testing performed by a team of UL scientists, researchers and engineers demonstrates that the devices’ IAQ performance can be substantially altered by the use of imitation cartridges. While some of the global eco-label standards are applicable to remanufactured cartridges, there are no existing environmental standards for imitation/new build compatibles.

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# Why does indoor air quality matter?

In today's industrial societies, people spend an estimated 90% of their time indoors. Accordingly, there is a notable interest in the IAQ performance of devices designed for use in offices and other commercial indoor environments.

As is the case for other technical equipment, environmental features of printers can be characterized by the use of eco-label programs and certification requirements. Testing according to such programs, and comparison against guidelines of such programs, yields good insights into the IAQ performance of the devices.

## What did UL do?

UL conducted testing to evaluate the emissions profile of an HP LaserJet Pro M402d printer used with original and imitation cartridges. Measurements were performed in accordance with the methods described in Appendix S-M of the DE UZ 205 Blue Angel award criteria, including several emissions evaluations using different toner cartridges. This HP laser printer model had previously been evaluated for compliance with Blue Angel requirements using original toner cartridges, and was awarded certification.

Results revealed substantial differences in the emissions profiles of the printer using original toner cartridges and using imitation cartridges. Measured emissions of volatile organic compounds (VOCs) and ultrafine particles from the printer were different for each toner set. A summary of the imitation cartridge tests results that exceeded the Blue Angel substance emission limits is shown in Figure 1.

### PARTICLES

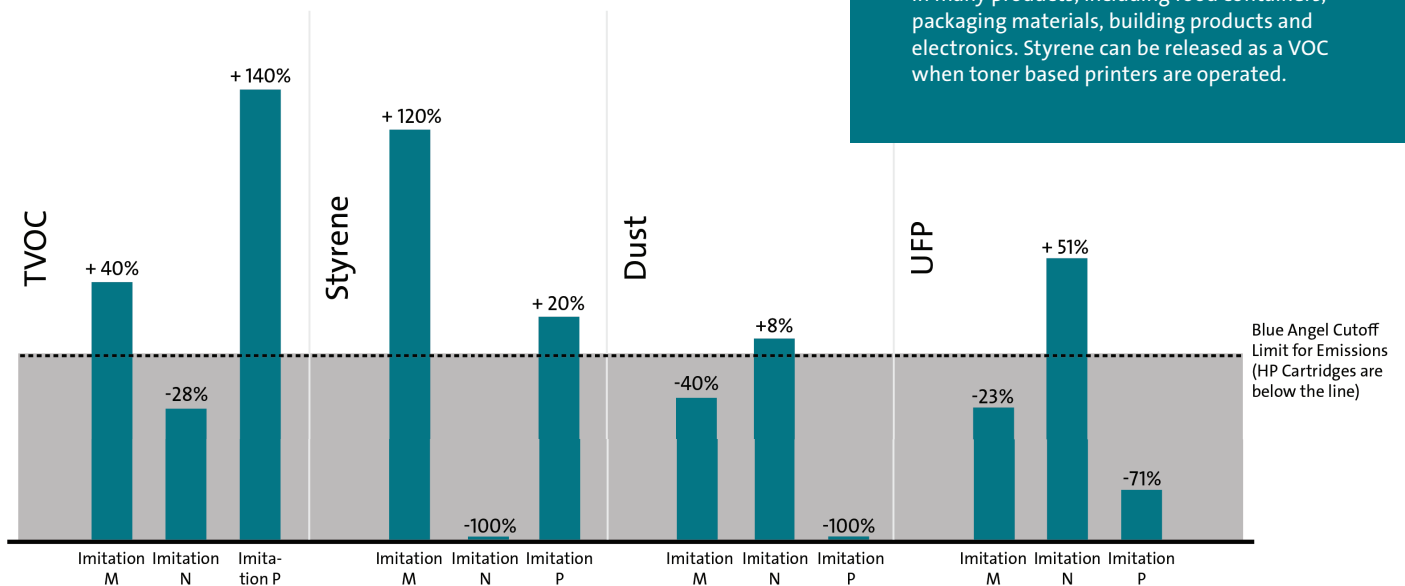
Airborne particles are extremely small liquid or solid substances that are suspended in air. This may include dust, dirt, soot or smoke. Common sources of particle emissions include electronic devices, pets, and everyday household activities like cooking or vacuuming.

### VOCS

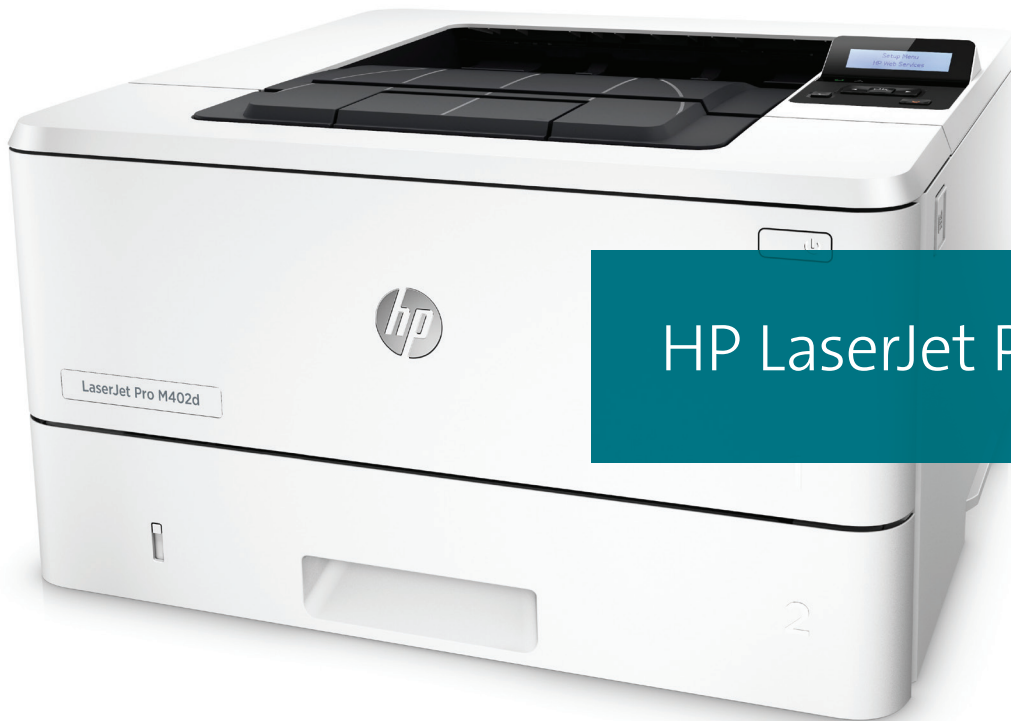
VOCs are emitted as gases from certain solids or liquids. Many household and office products may emit VOCs. Common sources include paints, aerosol sprays, cleaners and disinfectants, building materials and furnishings such as carpets and furniture, or office equipment such as copiers and printers.

### STYRENE

Styrene is a clear, colorless liquid that is derived from petroleum and natural gas by-products. Styrene helps create the plastic materials used in many products, including food containers, packaging materials, building products and electronics. Styrene can be released as a VOC when toner based printers are operated.



1. Emission limit for Total Volatile Organic Compounds (TVOC) is 10 mg/h.
2. Emission limit for styrene is 1.0 mg/h.
3. Emission limit for dust is 4.0 mg/h.
4. Emission limit for Ultrafine Particles (UFP) is  $3.5 \times 10^{11}$  / 10-min printing.



## HP LaserJet Pro M402d



In summary, this leads to the conclusion that end-users cannot ensure that their IAQ performance requirements are met when their printers are not operated with original toner cartridges. The same holds true for meeting the criteria of relevant certification programs such as the EPEAT, UL ECOLOGO® and the Blue Angel for original printing systems.

### Implications of UL's research findings

Overall, UL's testing demonstrates that, in many cases, the use of imitation toner cartridge alternatives may substantially impair the printing behavior of printers that have been previously certified for their favorable IAQ performance. Taking into account that UL's testing was limited in scope and scale, there are, however, several potential implications from the testing results, as well as a number of recommendations for manufacturers, buyers and consumers.

First, users should know that manufacturers can only ensure a consistently high level of IAQ performance of their printers when operated with original toner cartridges. If the printing system is operated with an imitation cartridge, this might not be ensured anymore.

Second, users should be aware that testing and certification requirements for printing systems are most comprehensive and closest to real-life operating conditions as they include evaluation of the whole printing system (printer, cartridges and paper) under worst case operating conditions. Should imitation cartridges be used, the performance attested by Blue Angel certification of the printing system might be substantially altered.

Third, manufacturers of printing products should provide clear, unambiguous information and documentation regarding environmental certification for their products.

And finally, procurement organizations and purchasers should seek complete and detailed information regarding the printing products they purchase, such as IAQ data sheets and other safety documentation. Especially for printing systems, it is good due diligence to verify that environmental certifications for original printing systems, operated with original toner cartridges, have been obtained.



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