GERSTEL TDS hunts down hidden office pollutants

* www.blauer-engel.de

Printers and copiers emit volatile organic compounds (VOCs); some, mainly older models, generate ozone. VOCs and ozone form a reactive cocktail that can bring tears to anyone's eyes in the office – in addition to causing wheezing, coughing and general irritation of mucus membranes. Recently, changes were made to the requirements for obtaining "Der Blaue Engel" (The Blue Angel) – the German environmental label. Copiers and printers must now meet emission standards for a whole list of VOCs that can heavily influence indoor air quality. While testing printers and copiers, the German Federal Institute of Materials Research and Testing (BAM) recently found an unexpected source of semi-volatile organic compounds (SVOCs): Recycled paper! Kaj Petersen reports.

Well done to all those printers and copiers with very low emissions of chemicals – they've really earned the German environmental seal of approval: "Der Blaue Engel" (The Blue Angel). Recycled paper also can be given the "Blue Angel" label for being environmentally friendly if it meets test criteria specified in the German regulations for recycled paper RAL-UZ 14.

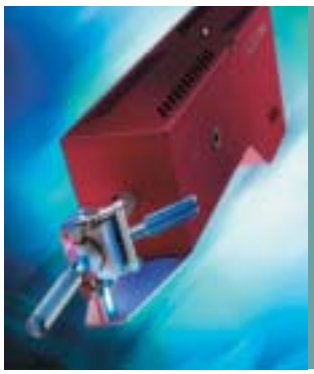
A brief search of the internet confirms that the Blue Angel has been awarded to a staggering 212 types of recycled paper for various uses including copying and printing. However, printers, copiers and multi-purpose office machines that currently wear the Blue Angel badge of honor are barely mentioned. Here's why.

At the beginning of 2004, new test criteria came into force for printers and copiers. According to the German Federal Environmental Ministry, it is no longer sufficient just to test for ozone, dust and styrene emissions. As of late, testing includes how much benzene and other volatile organic compounds (VOCs) these machines emit into their environment during operation. Based on an article released by the German Federal Institute of Materials Research and Testing (BAM), the question arises whether current test criteria for granting the Blue Angel for recycled paper are adequate, or if they are due for revision as is the case for printers and copiers.

Thermal Desorption using the GERSTEL TDS led to the discovery

While performing emissions testing using environmental test chambers, the BAM scientists came across not only VOCs emitted from laser printers and copiers, but also large amounts of semi-volatile organic compounds (SVOCs) that were not emitted from the machines themselves. Further detailed testing revealed the source of the emissions: The recycled paper being used.

The analytical method used for emissions testing of printers and copiers is based on the Standard Method 328 from the European Computer Manufacturers Association (ECMA). The ECMA 328 method was developed to measure VOC emissions from electronic and semiconductor products in order to determine the impact of such products on indoor air. A GERSTEL Thermal Desorption System (TDS) in combination with a GERSTEL Cooled Injection System (CIS) is required in order to comply with the ECMA 328 method parameters.



Official documentation in English is available from BAM for the Blue Angel test-method for printers and copiers: Text 88/03; ISSN 0722 186X "Development of a test method for an investigation into limiting the emissions from printers and copiers within the framework of assigning the environmental label". The official test method is included: "Test Method for the determination of emissions from hardcopy devices with respect to awarding the environmental label for office devices RAL-UZ 62, RAL-UZ 85 and RAL-UZ 114. (BAM, June 2003)". Further information: Werbung und Vertrieb, Wolframstraße 95-96, 12105 Berlin, Germany, fax: +49 30 218 13 79; E-mail: berlin@wundv.com.

To track down the source of SVOC emissions from the recycled paper, the BAM scientists relied on the GERSTEL TDS 2 and direct thermal extraction inside the TDS tube.

The paper was cut into strips that were placed inside TDS tubes and subsequently thermally extracted. The tubes were heated to 180°C inside the TDS 2 in a flow of inert gas that is used to transfer extracted VOCs and SVOCs to the GC for analysis. The desorption temperature was set at 180°C since this is the temperature used for toner fixation in laser printers and copiers.

An efficient and inexpensive alternative to environmental test chambers

As emission measurements of various solids have already shown (see page 4), direct thermal extraction leads to results comparable to those coming from environmental test chambers under properly controlled conditions.

The main difference is that emissions can be determined much more easily – and much less expensively – using direct thermal extraction.

Kaj Petersen
Marketing Manager,
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Using the TDS to determine materials emissions requires only small amounts of sample (approximately 5-12 mg).

The sample to be analyzed is placed inside the TDS tube, which is then transferred to the GERSTEL TDS 2. Thermal extraction takes place by heating the tube and sample inside the TDS 2 in a flow of inert carrier gas. Emitted analytes are swept from the TDS to the GERSTEL CIS 4, where they are concentrated prior to GC/MS analysis. Following the thermal extraction and concentration step, the CIS 4 is rapidly heated and analytes are transferred to the GC column for separation and mass spectrometric (MS) detection. Using this method, emitted organic compounds are easily identified and quantified.

When the BAM scientists analyzed the recycled paper, they found not only VOCs, but also SVOCs, including isopropyl laurate – an ink binding agent – and isopropyl naphthalene.

According to the scientists, these chemicals are probably residues of printing inks applied to the original recycled paper.

However, not only was the presence of SVOCs surprising, but also the amount: Depending on the printer or copier, up to ten times more SVOCs than VOCs were emitted.

A further aspect: Modern printers may produce little or no ozone, but many offices still have older equipment. Ozone reacts readily with unsaturated organic compounds to form free radicals that are known to irritate the eyes and respiratory tract even at low concentrations.

Reduce the temperature of the printing process or get rid of the chemicals

Perhaps one should not be overly concerned, but the BAM scientists still believe the emission of SVOCs from printing and copying with recycled paper needs monitoring.

The scientists have the following suggestions: Inks and toners should be developed that enable fixation to take place at lower temperatures. In addition, only printing inks should be used that can easily be removed from paper in the recycling process.

Questions still remain about what to do with recycled papers that have already been awarded the Blue Angel label. Should these be allowed to keep their stamp of approval in spite of these new findings, or should the supposedly environmentally friendly paper share the same fate as printers and copiers and be sent back to the environmental test bench?

The environmental labelling agency will have to come up with an answer. It is safe to say that if the rules for awarding the Blue Angel are tightened, then direct thermal extraction using the GERSTEL TDS will enable the efficient and sensitive determination of VOC and SVOC emissions according to the new regulations.

The TDS is a proven tool for determining emissions from not only paper, as in this case, but also from solid materials in general and from viscous samples such as sealants and glues.

In This Issue