

Test report

3042889

Client: IMEX CO., LTD.
1630-8 Mitsu-takatsu,
Okayama-shi, Okayama-ken,
709-2124 Japan

Date of commission: January 27, 2012
(Contact: Mr. Goto)

Sample received: January 26, 2012
(Glass bottle)

Nature of commission: Material examination of a toner sample
MSK Toner in Jan. 2012 (Monochrome)
according to the requirements of the
certificate "LGA tested for contaminants"
(reprocessed print modules with toner)

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1 Nature of commission

TÜV Rheinland LGA Products GmbH (TRLP) was commissioned to conduct a material test on a toner sample according to the requirements of the certificate "LGA tested for contaminants", product group – reprocessed print modules with toner. The parameters to be tested comprise volatile organic compounds in total (TVOC), benzene, styrene, volatile CMR compounds, cobalt, nickel and tin organic compounds.

2 Description of the sample

The sample (toner powder) was packed in a glass bottle and delivered on January 26, 2012.

| Name of the toner | Color |
|-------------------------|------------|
| MSK sample in Jan. 2012 | Monochrome |

3 Examination methods

3.1 Benzene, Styrene, TVOC (total volatile organic compounds) and volatile CMR compounds (carcinogenic, mutagenic, reprod.-toxic substances)

The sample was analyzed by means of thermoextraction and subsequent thermodesorption GC/MS.

Volatile CMR compounds are classified as carcinogenic, mutagenic or reprod.-toxic pursuant to

- categories Carc. 1A, Carc. 1B; Muta. 1A, Muta. 1B; Repr. 1A, Repr. 1B according to the EU classification with reference to Annex VI of Regulation (EC) No. 1272/2008 (GHS) and/or
- the national classification in compliance with TRGS 905 or MAK and BAT Value List of the DFG (German Research Foundation) – (Categories 1 and 2).

3.2 Heavy metals

Cobalt, Nickel

Digestion with microwave following determination with inductively coupled plasma spectrometry (ICP).

3.3 Tin-organic compounds

Extraction with methanol (method A)

Extraction of the sample with methanol, derivatisation with sodium tetraethyl borate.

The quantification is based on capillary gas chromatography (GC).

Extraction with artificial sweat solution (method B)

Extraction of the sample with artificial sweat solution, derivatisation with sodium tetraethyl borate.

The quantification is based on capillary gas chromatography (GC).

Tin-organic compounds: n-butyl tin, di-n-butyl tin, tri-n-butyl tin, tetra-n-butyl tin, n-octyl tin, di-n-octyl tin, tri-cyclohexyl tin and triphenyltin.

4 Results of the examination

The following table 1 shows measured test results and fixed limit values due to the certification criteria of the TRLP certificate "LGA tested for contaminants" for reprocessed print modules with toner. Values that are exceeding the threshold limits are printed in bold letters. The individual substances are listed in appendix table 2.

Table 1: Material examination

| No. | Test | Requirements | Test result | Comment |
|-----|--|-----------------------------|----------------------------------|---------|
| 1. | Volatile organic compounds: | | | |
| 1.1 | TVOC ¹⁾ | < 300 ³⁾ mg/kg | 78 mg/kg | met |
| 1.2 | Benzene | < 0.35 mg/kg | < 0.3 mg/kg | met |
| 1.3 | Styrene | < 40 ³⁾ mg/kg | 7.7 mg/kg | met |
| 1.4 | volatile CMR ²⁾ -substances (Cat. 1+2) | each < 1 mg/kg | each < 0.3 mg/kg | met |
| 2. | Heavy metals: | | | |
| 2.1 | Cobalt | < 25 mg/kg | 18 mg/kg | met |
| 2.2 | Nickel | < 70 mg/kg | 20 mg/kg | met |
| 3. | Tin-organic compounds: | | | |
| 3.1 | Total of tin-organic compounds Method A ⁴⁾ (Methanol extraction) Method B ⁴⁾ (artificial sweat solution) | < 5 mg/kg < 0.5 mg/kg | < 0.05 mg/kg -- ⁵⁾ | met |
| 3.2 | Sum of dibutyltin (DBT) and tributyltin (TBT) Method A (Methanol extraction) Method B (artificial sweat solution) | < 0.5 mg/kg < 0.05 mg/kg | < 0.05 mg/kg -- ⁵⁾ | met |
| 4. | Azo dyes (only for color toner, mixed sample) | < 15 mg/kg | -- ⁵⁾ | |

¹⁾ TVOC = Total Volatile Organic Compounds

²⁾ CMR = carcinogenic, mutagenic, reprod.-toxic

³⁾ Exceeding the limits of both TVOC and styrene value is permissible if the requirements (target values) of the emission test (TVOC resp. styrene) are fulfilled.

⁴⁾ Method A is valid when extracting using methanol. If this value is exceeded, method B is authoritative (extraction using artificial sweat solution, DIN EN ISO 105 E04).

⁵⁾ not necessary

5 Evaluation

The prerequisite in order to award the "LGA tested for contaminants" certificate for reprocessed printer modules with toner is a passed material examination for benzene, volatile CMR substances, Cobalt, Nickel and Tin-organic compounds, a material examination for TVOC and styrene (exceeding the limits of the TVOC and styrene value is permissible) and a passed emission test in the test chamber as well as a signed monitoring contract. The determination of azo dyes is additionally required for a color toner.

The results of the emission test in the test chamber – calculated as emission rates – are decisive for awarding the certificate. It is possible to issue a certificate if specified emission rates are in compliance with fixed upper limits even if individual values of the material examination are slightly exceeded for TVOC and styrene. The higher the exceedance in the scope of the material test the lower the likelihood that the emission requirements of the certificate will be adhered to.

Nuremberg, February 15, 2012

TÜV Rheinland LGA Products GmbH
LFGB / Consumer Products
Emission Testing

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Table 2: Single compounds

| 3042889 / Thermoextraction | | MSK sample in Jan. 2012 Monochrome |
|---|------------|---------------------------------------|
| Compounds | CAS # | mg/kg |
| Benzene | 71-43-2 | < 0.3 |
| Toluene | 108-88-3 | 0.5 |
| Isopropylbenzene | 98-82-8 | 0.3 |
| 1,2,4-Trimethylbenzene | 95-63-6 | 0.3 |
| Styrene | 100-42-5 | 7.7 |
| n-Hexane | 110-54-3 | 0.6 |
| n-Heptane | 142-82-5 | 0.9 |
| n-Tridecane | 629-50-5 | 0.4 |
| n-Tetradecane | 629-59-4 | 0.8 |
| n-Pentadecane | 629-62-9 | 0.9 |
| n-Hexadecane | 544-76-3 | 1.9 |
| n-Heptadecane | 629-78-7 | 1.5 |
| n-Octadecane | 593-45-3 | 1.6 |
| n-Nonadecane | 629-92-5 | 1.7 |
| 3-Methylhexane | 589-34-4 | 0.5 |
| Methylcyclohexane | 108-87-2 | 0.7 |
| n-Butanol | 71-36-5 | 1.0 |
| 2-Ethyl-1-hexanol | 104-76-7 | 0.9 |
| 2,6-Di-tert-butyl-p-cresol | 128-37-0 | 6.3 |
| Acetone | 67-64-1 | 1.3 |
| Ethanol ⁶⁾ | 64-17-5 | 0.4 |
| 2-Methylpentane ⁶⁾ | 107-83-5 | 2.1 |
| 3-Methylpentane ⁶⁾ | 96-37-7 | 0.7 |
| tert-Butylmethylether | 1634-04-4 | 1.2 |
| Methyl acetate | 79-20-9 | 0.4 |
| 2-Phenylpropene | 98-83-9 | 0.5 |
| Benzaldehyde | 100-52-7 | 2.9 |
| Acetophenone | 98-86-2 | 7.5 |
| Stilbene ⁷⁾ | 588-59-0 | 1.2 |
| 1,3-Diphenylpropane ⁷⁾ | 1081-75-0 | 5.2 |
| Diphenylamine ⁷⁾ | 122-39-4 | 5.9 |
| 1,1'-(2-Butene-1,4-diyl)bisbenzene ⁷⁾ | 13657-49-3 | 37 |
| Diphenylcyclobutane ⁷⁾ | -- | 4.2 |
| substituted Benzene | -- | 4.3 |
| Not identified compounds (SVOC ⁷⁾) | -- | 16 |
| Not identified compounds | -- | 42 |
| TVOC (the sum of all detected compounds and VVOC and SVOC) | -- | 161.3 |
| TVOC to the Requirements of the certificate "LGA tested for contaminants" (the sum of all detected compounds, having retention times between n-hexane and n-hexadecane) | -- | 77.5 |

⁶⁾ VVOC - very volatile organic compounds

⁷⁾ SVOC - semi volatile organic compounds