Smoke density and Toxicity of ABS based plastics EN-45545 (ISO 5659-2)

1. TEST OBJECTIVE

Assessment of smoke density and toxicity levels of 3 ABS samples from different producers – within Europe
Based on EN 45545 R6 (HL2/HL3), only ISO 5659-2 part.

2. PEOPLE INVOLVED IN THE TEST

1. Aleksander Zięcina

3. SAMPLES, WORKSTATION AND TOOLS USED

For samples, ABS plates with dimensions cut according to the ISO 5659 requirements, 75 mm x 75 mm, were used.
Polymer plates were produced by three (3) different manufacturer in Europe
All of the tests were conducted on test stations made and prepared according to the ISO-5659-2 standard.
Gases listed for the toxicity assessment: CO, CO_2, NO, NO_2, SO_2, HCN, HCl, HBr, HF

4. TESTING CONDITIONS

Temperature: 20-22°C
Humidity: 30-35%
Pressure: 1000-1004 hPa

5. TEST RESULTS

Man. 1: Moderate smoke density was observed. Soot was observed on a moderate level as well. Any other listed gases than CO and CO_2 did not occurred on the spectra during the test.
Man. 2: Very high smoke emission and density with accompanying appearance of soot particles/flakes. Besides CO and CO_2, HCN IR band was observed on the beginning of test and was included to CIT calculation.
Man. 3: Very high smoke emission and density with accompanying appearance of soot particles/flakes.. Besides CO and CO_2, high level of NO and NO_2 concentration was observed and included to CIT calculation.

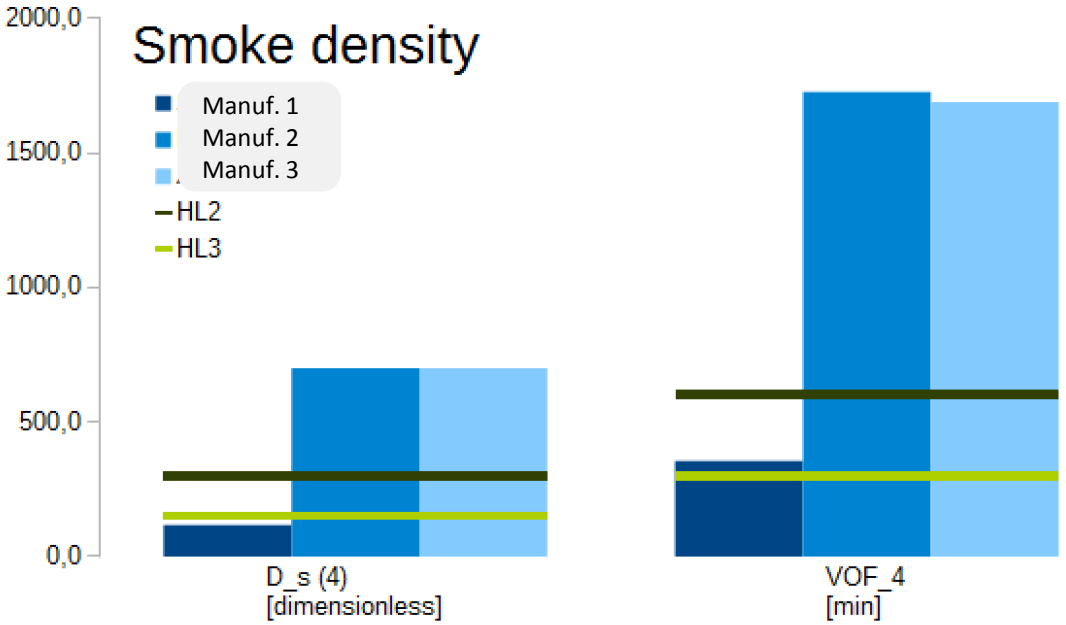
General:
Only **Man. 1:** samples achieved values under the HL2 limit when considering smoke density.
In terms of toxicity after the 4th minute all samples were acceptable, after the 8th minute only **Man. 2:** sample achieved value higher than test maximum.

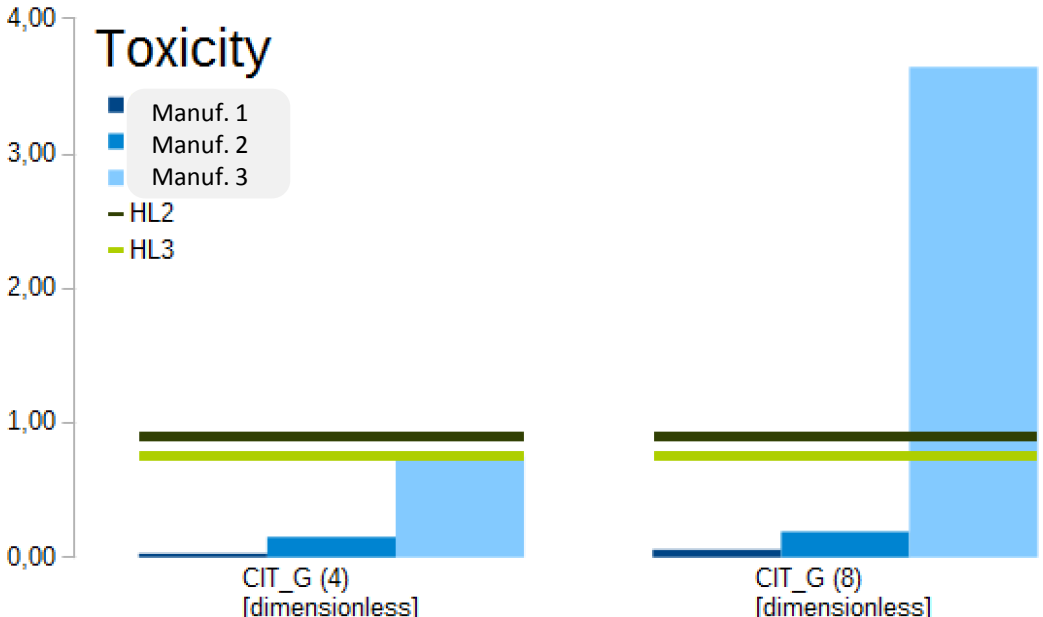
Table 1. Test data for all samples with averages

Producer	Sample	$D_s(4)$	VOF_4	$CIT_G(4)$	$CIT_G(8)$
Manufacturer 1	1	88,0	275,94	N/A	N/A
	2	139,3	423,67	0,03	0,06
	3	118,5	351,55	0,03	0,06
	4	121,5	371,45	0,03	0,05
	average	116,8	355,65	0,03	0,06
Manufacturer 2	1	699,7	1777,30	N/A	N/A
	2	699,7	1676,31	0,15	0,19
	average*	699,7	1726,81	0,15	0,19
Manufacturer 3	1	699,7	1783,57	N/A	N/A
	2	699,7	1596,99	0,75	3,65
	average*	699,7	1690,28	0,75	3,65
EN 45545 requirements	HL2	300	600	0,9	0,9
	HL3	150	300	0,75	0,75

average* - only two samples were tested due to high smoke density - **D_s = 699,7 is the maximum reading.**

N/A values occur because the first sample CIT assessment takes into consideration all gases listed in EN 45545. Next CIT values are based on calculations for gases visible on spectra from the first sample of given producer.


Smoke density
Manuf. 1
Manuf. 2
Manuf. 3
HL2
HL3
2000,0
1500,0
1000,0
500,0
0,0
D_s (4)
[dimensionless]
VOF_4
[min]


Toxicity
Manuf. 1
Manuf. 2
Manuf. 3
HL2
HL3
4,00
3,00
2,00
1,00
0,00
CIT_G (4)
[dimensionless]
CIT_G (8)
[dimensionless]

Pic. 1. Manufacturer 1 samples after test

Pic. 2. Manufacturer 2 samples after test

Pic. 3. Manufacturer 3 samples after test