Indoor Air Chemistry
Comparative study between conventional cigarette and heat-not-burn technology

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Introduction & Scope

Operation of PMI's heat-not-burn product THS2.2 results in significantly reduced formation of harmful and potentially harmful constituents, compared to conventional cigarettes, and no sidestream aerosol. The objective of the study was to assess the impact of using THS2.2 on Indoor Air Chemistry (IAC) based on 18 markers of Indoor Air Quality (IAQ).

Study Design

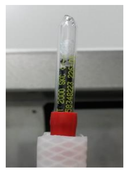
- Dedicated IAQ room and four Model Environmental conditions tested (EN 15251:2007).

Model Environment	Ventilation [m³/h]	Air change [L/h]	# of smokers	Cig/pers/h	Cig/h
Office	156	2.16	2	2	4
Hospitality	555	7.68	4	2	8
Residential I/II	121/87	1.68/1.20	2	1.5	3

- Eighteen IAQ markers: Environmental Tobacco Smoke (ETS) markers, carbonyls, Volatile Organic Compounds (VOCs), gases. All methods were ISO 17024 accredited.
- Products: Marlboro Gold (MLG) Swiss market, THS2.2, Background (BKG).
- Four hours collection, four trapping systems, on-line measurement for gases.

RSP, UVPM-THBP
FPM-scopoletin
Solanesol

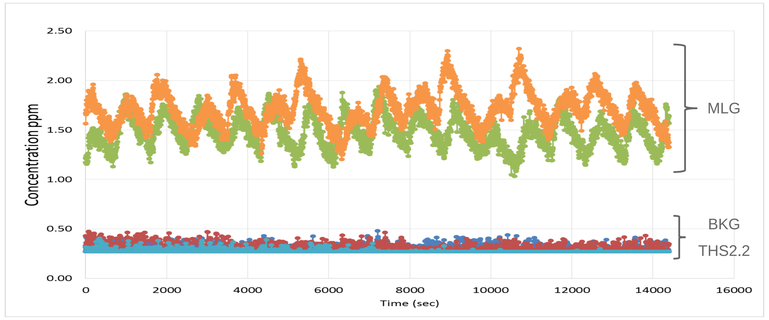
Carbonyles



VOCs

3-Ethenylpyridine
Nicotine

Results - CO on-line measurements

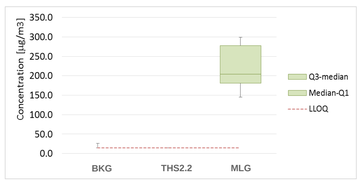


The online signal for ETS of MLG has several maxima, reflecting the smoking pattern of the panelists
The online signals for BKG and THS2.2: median levels below LOD.

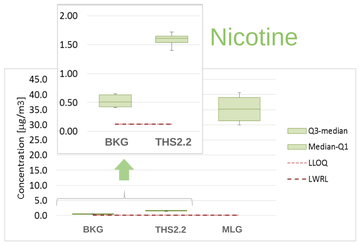
Results - RSP, nicotine, carbonyl, VOC

Background (BKG), THS2.2, MLG under 'office' environmental conditions

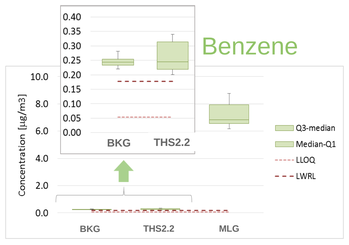
Respirable Particulate Matter (RSP)



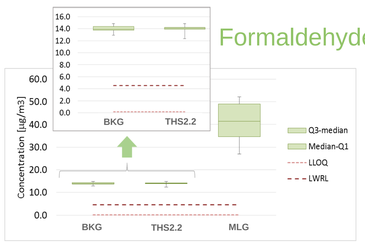
Nicotine



Benzene



Formaldehyde



Impact on IAQ

	Analyte	THS2.2$_{adjusted}$ (THS2.2 – BKG) (-): THS2.2 equivalent to BKG			MLG$_{adjusted}$ (MLG – BKG) (*): BKG not subtracted (<LWRL)		
		Residential	Office	Hospitality	Residential	Office	Hospitality
ETS markers	RSP gravimetric [µg/m³]	-	-	-	236*	204*	147*
	UVPM-THBP [µg/m³]	-	-	-	39.6*	38.5*	18.4*
	FPM-scopoletin [µg/m³]	-	-	-	8.05*	7.88*	4.04*
	Solanesol [µg/m³]	-	-	-	10.2*	10.2*	4.68*
	3-Ethenylpyridine [µg/m³]	-	-	-	6.02*	6.39*	3.94*
	Nicotine [µg/m³]	0.69	1.10	0.66	29.7	34.7	34.6
Carbonyls	Acetaldehyde [µg/m³]	2.66	3.65	1.40	70.2	58.8	33.1
	Acrolein [µg/m³]	-	-	-	6.94*	6.42*	3.03*
	Crotonaldehyde [µg/m³]	-	-	-	2.19*	2.04*	0.99*
	Formaldehyde [µg/m³]	-	-	-	25.2	27.5	17.5
VOCs	Acrylonitrile [µg/m³]	-	-	-	2.53*	2.61*	1.36*
	Benzene [µg/m³]	-	-	-	7.09	6.58	3.50
	1,3-Butadiene [µg/m³]	-	-	-	13.0*	12.6*	5.79*
	Isoprene [µg/m³]	-	-	-	71.5	75.9	37.0
	Toluene [µg/m³]	-	-	-	11.1	14.9	8.76
Gases	Carbon monoxide [ppm]	-	-	-	1.63*	1.59*	<0.92*
	Nitrogen oxide (NO) [ppb]	-	-	-	26.2	27.0	14.5
	Nitrogen oxides (NOx) [ppb]	-	-	0.52	29.4	29.4	15.0

No difference between BKG & THS2.2 for 15 of the 18 analytes investigated, irrespective of the environmental conditions applied.
For the 3 remaining analytes, the increase in levels was only slight for IQOS compared to the BKG and 1 or 2 order of magnitude lower than those measured for MLG.

IAC during use of THS2.2 and the BKG IAC was essentially similar suggesting little impact on the overall IAQ when using THS2.2 in an indoor environment.

Next steps

- Conduct IAC for Nicotine-containing products.
- Develop, validate methods for Total Volatile Organic Compounds (TVOC), TSNAs, Aerosol Formers, Phenols for additional assessment of IAQ.

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