Simultaneous multisensory physical characterisation of HTP aerosol and the selection of a reference system.

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INTRODUCTION

Characterising aerosols formed by eHTPs* is not a simple prospect as there are variations between and within product types due to manufacturing variations. This is complicated by the “product” consisting of a consumable and an electronic device forming a “system”.

Conventionally, uncertainty in analytical methods or techniques used is minimised through “calibration” with a standard product with known composition or characteristics. This becomes complex for a “system” and the potential problems associated with selecting a low variability system for a standard can be illustrated through the use of a set of simple physical sensors.

EXPERIMENTAL

5 commercially available tobacco heating systems were sourced, 4 of which were used with the recommended consumable stick, the fifth (B) was a so-called “generic” electronic heater and used the same consumable as (A). A and B, used a “blade” heater, C used an internal inductive heater and D and E used external heating elements. A further “oven” system (F, 0.2g recon.) was used at two temperatures 182° and 217°C.

Each product was puffed using ISO20778 with in line sensors simultaneously measuring pressure drop, aerosol humidity, “mouth temperature” and “lip temperature”. Puff-by-puff resolution was achieved for 6 replicates.

Each product (A-F) was repeat tested 6 times or 6 distinct individual systems were used. Puff by puff resolution could be achieved.

	Mean COV			
	PD	humidity	mouth temp	lip temp
SYSTEM A	0.074	0.026	0.028	0.05
SYSTEM B	0.046	0.046	0.041	0.052
SYSTEM C	0.03	0.035	0.032	0.025
SYSTEM D	0.289	0.033	0.021	0.14
SYSTEM E	0.07	0.042	0.029	0.05
SYSTEM F	0.204	0.002	0.009	0.005

Table 1: comparison of average COV for competing eHTP systems A-F

RESULTS

Different puff-by-puff behaviours were noted for systems A-F. Similar behaviours could be observed for PD, humidity, mouth temperature and lip temperature (figure 1) . In most cases the mean value reaches a maximum after the first or second puff, and then decreases as the puffing session progresses, excepting system F which shows uniformity throughout test.

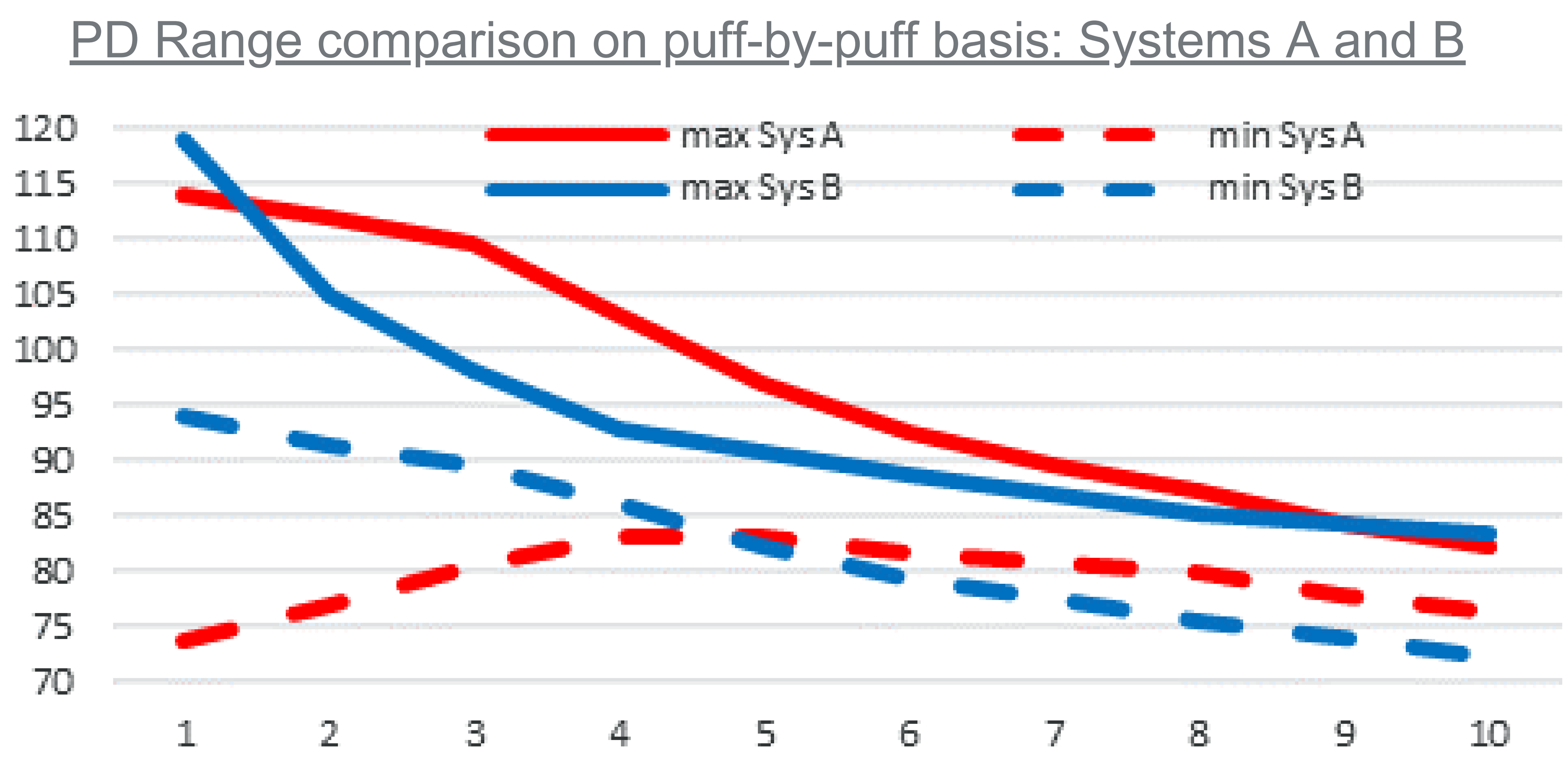

Figure 2: comparison of systems A and B using different “blade” system heaters from competing manufacturers and the same consumable stick. Initial range of responses (variability) differs markedly for the two manufacturers.

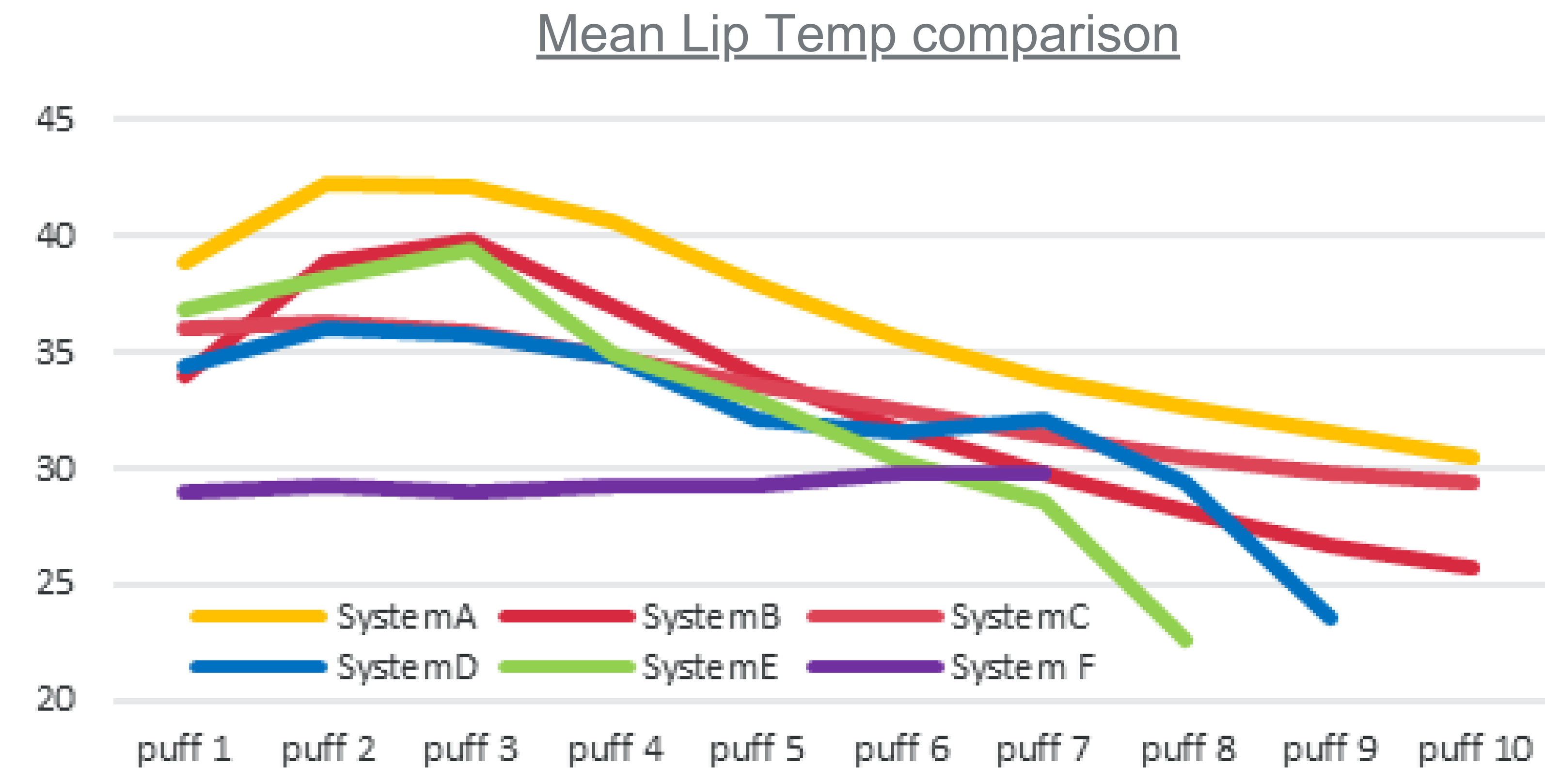

Figure1: Mean Lip temperature on a puff by puff basis for 6 competing eHTP systems

Variability as measured by the COV (SD/mean) shows the first puff with a higher COV than subsequent puffs (based on n=6). When mean COVs are considered there is no pattern of one system being significantly less variable than another see table 1

System A and system B, using the same consumable, show the dependence on both device and consumable. At the start of a puffing session (n=6) System B has a “tighter” spread of PD measurements only becoming similar to A as the session progresses (Figure2)

CONCLUSIONS

Commercially available eHTP systems exhibit different physical aerosol generation properties when in use. Aerosol temperature and PD may be indicators that yield and composition of the aerosol could be equally variable. The observed variability in use is a function of both consumable and device. System C was the least variable although the oven system (F) showed significant uniformity compared to other systems tested.

*Electrically heated tobacco products

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