

# HANDMADE PREMIUM CIGARS SMOKE EMISSIONS LIMITATIONS RELATED TO TNCO DETERMINATION VARIABILITY

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## ABSTRACT

The assembly process of a premium cigar involves combining natural leaves which are then rolled by hand. This results in an inherently variable product. In this study, a range of handmade premium cigars were analysed for tar, nicotine and carbon monoxide (TNCO) according to CORESTA recommended methods. These methods were initially developed for testing machine made cigars. Variable results were obtained when applied to premium cigars.

Challenges were faced due to variation in the diameters of the cigars, measured at 33 mm from the mouth end after cutting. Discrepancies between calculated puff volumes of up to 3 mL per puff were observed for a given ring gauge. In addition, puff counts were highly variable, as high as double for a given product. The yield variability observed ranged from 52 to 160% for tar, 60 to 160 % for nicotine and from 32 to 120% for carbon monoxide.

As a consequence, it was not possible to distinguish between different handmade premium cigars, with the exception of the TNCO value for the smallest cigar format when compared to the largest one.

The limitations of TNCO results for premium cigars and the need for method improvement and further investigations are discussed.

## INTRODUCTION

The CORESTA recommended method 64 for cigars is a well established protocol for assessing smoke emissions from machine-made cigars; however, few studies have investigated its application to premium cigars.

In this short study, the objective is to assess the variability of NFDPM, nicotine and carbon monoxide emissions using various sizes of commercial hand made premium cigars.

## MATERIALS & METHODS

Six sizes of hand made premium cigars were selected to cover diameters from 15.1 to 19.8 mm and length from 101.6 to 177.8 mm (Table I). Sampling was performed at a single point of time.

commercial sizes	Diameters (mm)	Length (mm)
38 x 4	15.1	101.6
38 x 6 1/2	15.1	165.1
44 x 5 1/2	17.5	139.7
44 x 6 1/2	17.5	165.1
50 x 5	19.8	127.0
50 x 7	19.8	177.8

Table I: Cigars investigated

Diameter was measured after cutting 5 mm of the mouth end, at 33 mm using Size tester S10C (Borgwaldt) according to CRM65 (ISO2971).

Nicotine free dry Particular Matter (NFDPM), nicotine, carbon monoxide were determined in smoke according to the CORESTA recommended methods 46, 64-68 using a linear smoking machine.

8 replicates per size were performed with 1 replicate = 1 cigar smoked.

## RESULTS

Figure 1 shows the results for NFDPM (a), Smoke nicotine (b) and carbon monoxide (c).

Despite the wide range of sizes, smoke emissions cannot be distinguished between products, except when the smallest and the largest are compared.

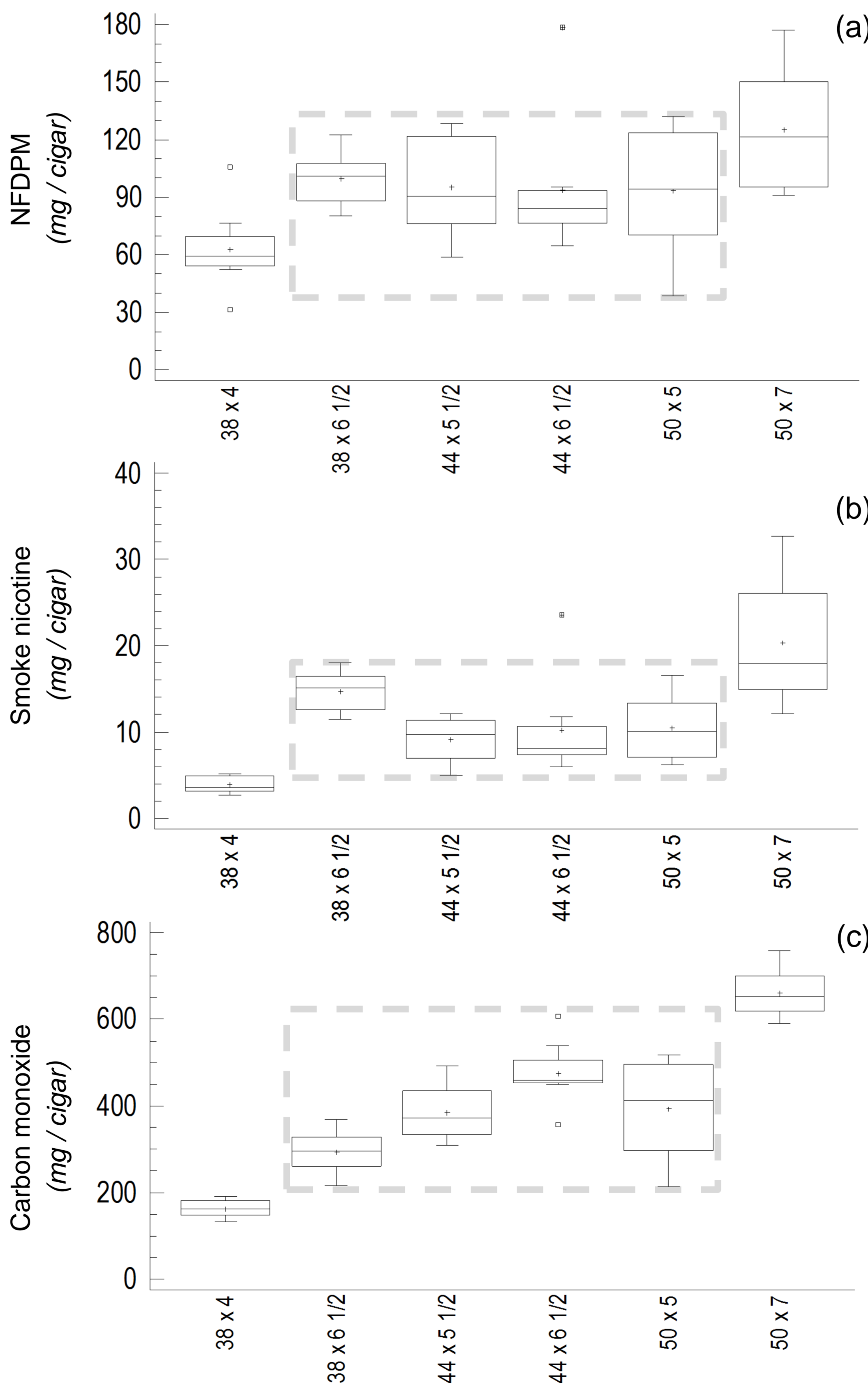


Figure 1: Smoke emissions of hand made premium cigars

## DISCUSSION

Smoke emissions for premium cigars remains a challenge for laboratories, with the results here clearly demonstrating how the smoking can be variable.

The challenge starts with the measurement of the diameter to determine the puff volume.

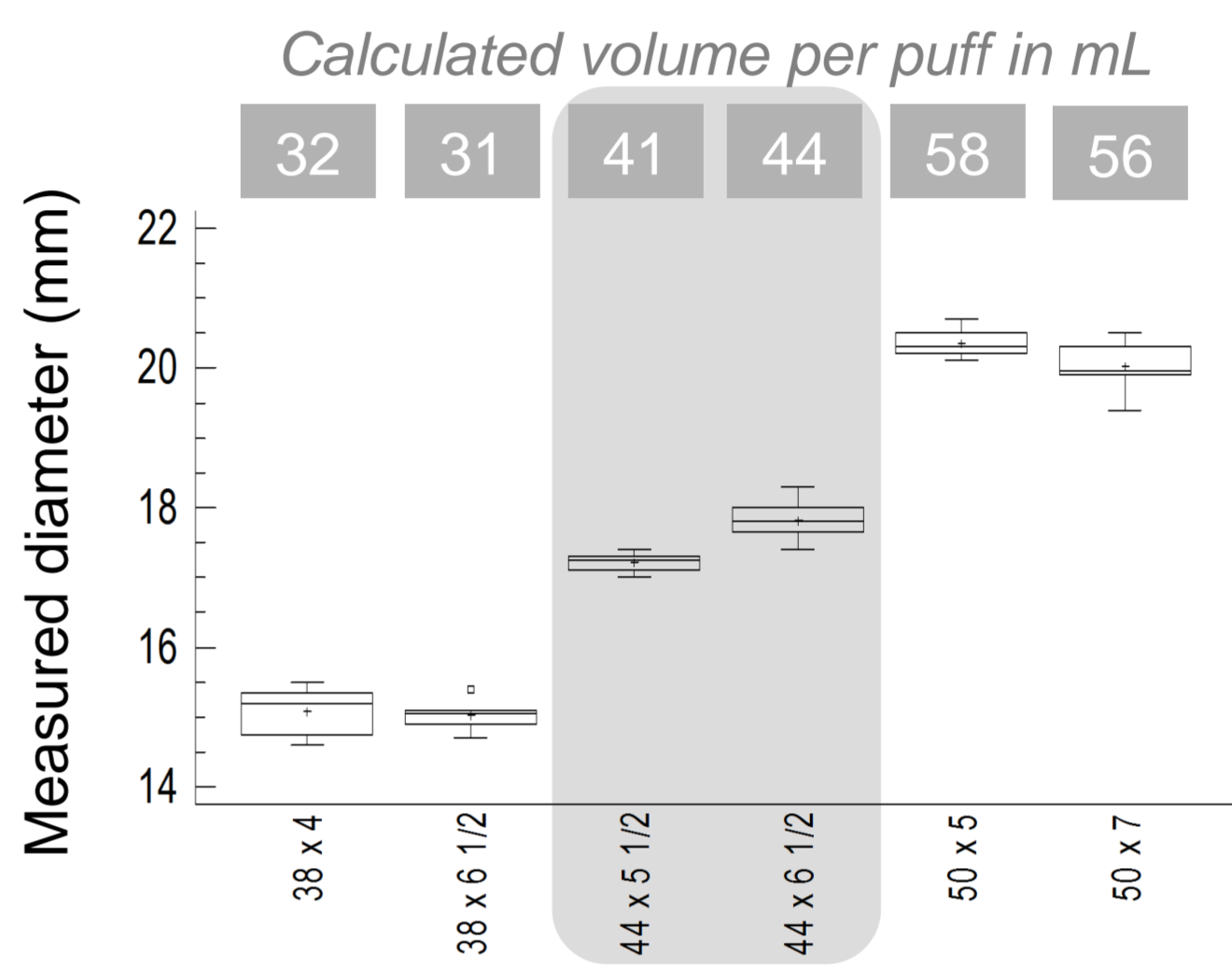


Figure 2: Diameter & puff volume

Figure 2 shows the variation in the measurement of the diameter and consequently the calculated puff volume from the CRM. It can be seen that even if cigars have the same ring gauge, variation in calculated puff volume can be up to 3 mL per puff.

Puff count can also help in understanding the variability of the smoking.

Figure 3 shows the variation in puff count per unit of cigar.

For example, the size 50 x 7 provide puff count per cigar from 121 to 323. This variation in puff counts highlights burning instability during the smoking of premium cigars.

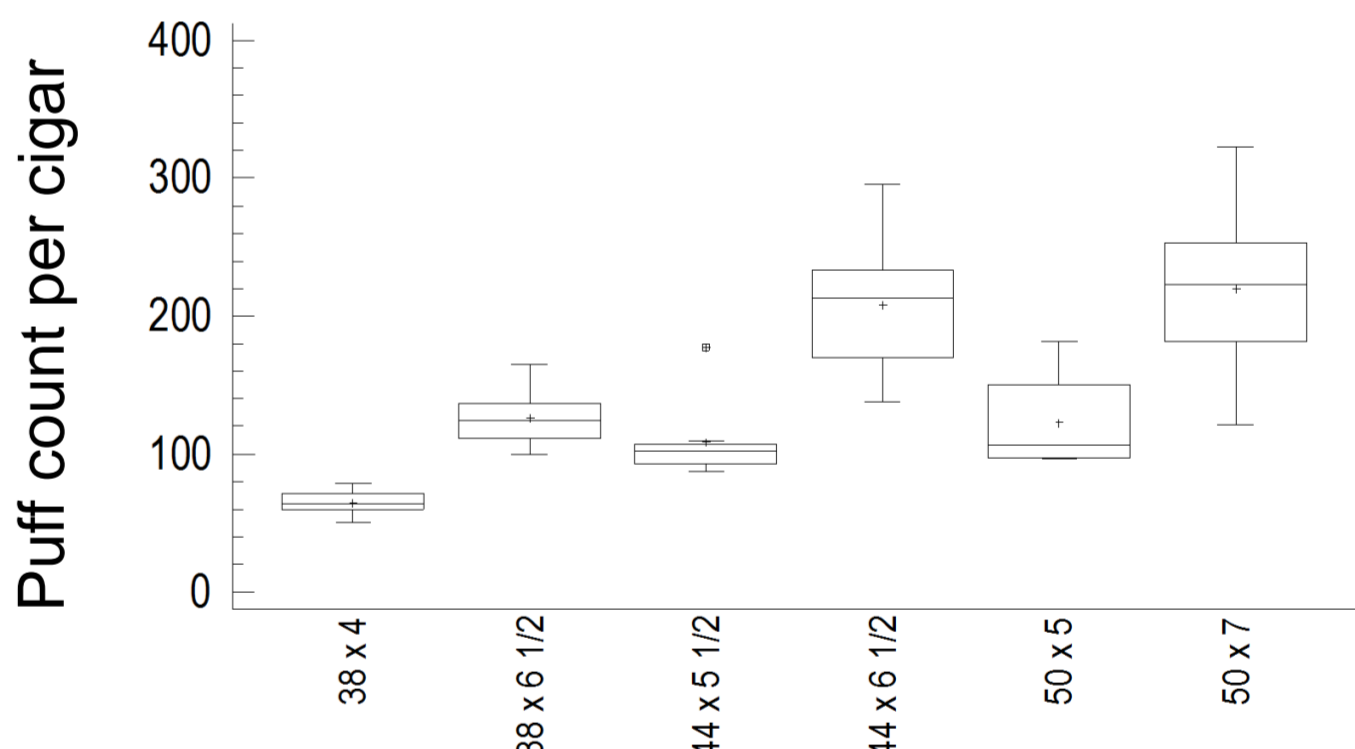


Figure 3: Puff counts per unit of cigar

## CONCLUSIONS/FUTURE DIRECTIONS

Hand made premium cigars are, by nature of composition and assembly, inherently unique.

Additionally, CORESTA recommended methods were mostly developed for machine made cigars and have never been fully assessed for handmade premium cigars.

Considering the current smoking methods, the resulting data are highly variable and their value can be questionable for premium cigars product comparison. There is a need for further improvement of the smoking methods applied to premium cigar. Some works are currently conducted by CORESTA to investigate this issues.

The next step is to extend the study to other sizes, especially those with diameter above 22 mm using a new dedicated holder.

## References

- CRM 46, Atmosphere for Conditioning and Testing Cigars of all Sizes and Shapes (May 1998)
- CRM 64, Routine Analytical Cigar-Smoking Machine - Specifications, Definitions and Standard Conditions (Nov. 2005)
- CRM 65, Determination of Total and Nicotine-Free Dry Particulate Matter using a Routine Analytical Cigar-Smoking Machine – Determination of Total Particulate Matter and Preparation for Water and Nicotine Measurements (Fourth updated edition) (June 2010)
- CRM 66, Determination of Nicotine in the Mainstream Smoke of Cigars by Gas Chromatographic Analysis (Nov. 2005)
- CRM 67, Determination of Water in the Mainstream Smoke of Cigars by Gas Chromatographic Analysis (Nov. 2005)
- CRM 68, Determination of Carbon Monoxide in the Mainstream Smoke of Cigars by Non-Dispersive Infrared Analysis (Jan. 2010)