

# E-Cigarette Aerosol Collection: 44 mm Cambridge Filter Pad Capacity

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## ABSTRACT

CORESTA has developed recommended (or standardized) methodologies to measure harmful and potentially harmful constituents (HPHCs) in cigarette smoke. CORESTA Recommended Methods (CRMs) specify the collection of cigarette smoke under standardized conditions referred to as ISO and/or Canadian Intense (CI) conditions where smoke particulate matter is trapped on 44 mm Cambridge filter pads (CFP). Many of the methodologies being developed to collect and measure constituents in e-cigarette aerosols are based on CRMs developed for cigarette smoke. However, there are fundamental differences between the processes of generating tobacco cigarette smoke compared to e-cigarette aerosol. For example, cigarettes are burned and the puff counts collected under standardized puffing regimes range from ~5 to ~14 puffs per cigarette depending upon design and puffing conditions. E-cigarettes provide far more puffs than conventional cigarettes, and it is common to collect up to or more than 100 to 150 puffs per device with 5- and 3-second puff durations, respectively.

## METHOD

- Two commercial MarkTen® XL e-cigarettes were evaluated and are designated as “Menthol” and “Non-Menthol” formulations for this study.
- Two different puff regimes were evaluated (Table 1).
- Fresh cartridge with fully charged battery was used for each 20-puff collection to ensure maximum amount of aerosol would be collected for each puff block.
- For device mass loss, the cartridge and batteries were weighted together.

Table 1. Puff Regimes

Puff Volume (mL)	Duration (seconds)	Volumetric Flow Rate (mL/sec)	Collections	Interval (seconds)	Puff Profile
55	3	18.3	20 puff collections	30	Square wave
55	5	11	20 puff collections	30	Square wave

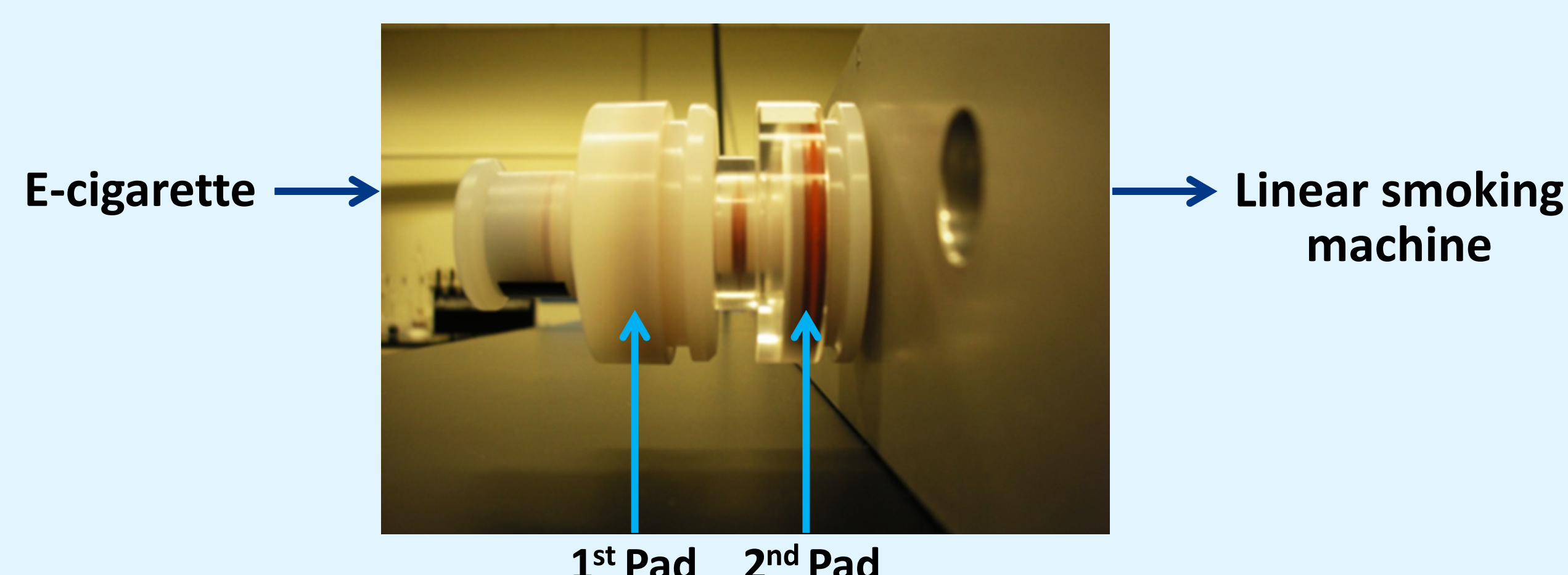
## INTRODUCTION

- Smoke condensate is typically collected on 44 mm or 95 mm Cambridge filter pads under ISO, HCl, or MDPH.
- ISO 4387:2000 indicates that 44 mm glass fiber filter pads are capable of retaining up to 150 mg of total particulate matter for cigarette smoke condensate.<sup>1</sup>
- Aerosol from e-cigarettes is dramatically different in composition compared to cigarette smoke.
- Capacity of a 44 mm Cambridge filter pad has not been thoroughly evaluated for e-cigarette aerosol.
- FDA recommends that e-cigarettes are tested under multiple puffing regimes and throughout the life of the device.<sup>2</sup>

## OBJECTIVES

- Evaluate the capacity of a 44 mm Cambridge filter pad for collecting e-cigarette aerosol with different formula compositions (i.e., Menthol versus Non-Menthol formulations).
- Determine if the Cambridge filter pad capacity is affected by different puffing regimes.

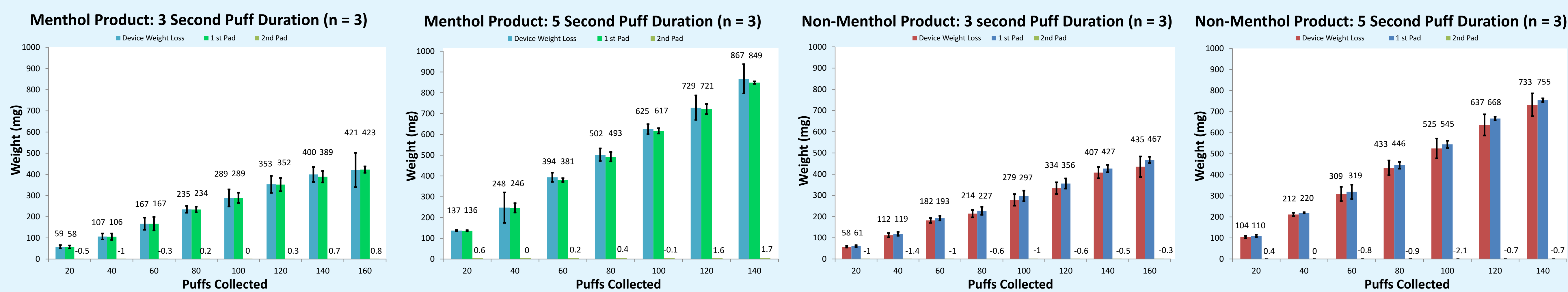
Figure 1. Aerosol Collection Configuration



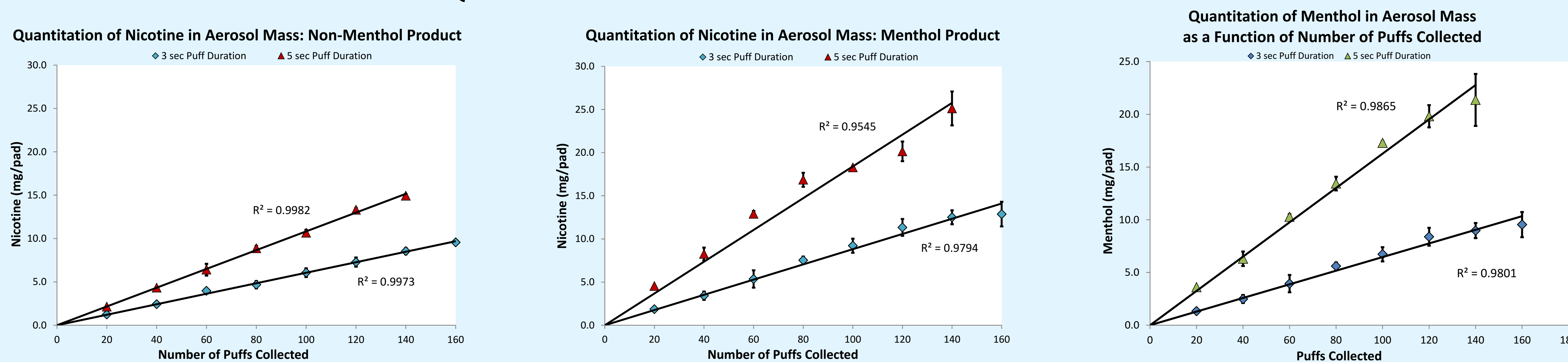
Two 44 mm Cambridge filter pads in series

## RESULTS

### Collected Aerosol Mass



### Quantitation of Nicotine and Menthol in Aerosol Mass



## REFERENCES

1. ISO4387:2000, Determination of total and nicotine-free particulate matter using a routine analytical smoking machine 04/01/2000
2. Draft Guidance for Industry Applications for Premarket Review of New Tobacco Products
3. Standard Operating Procedure for Intense Smoking of Cigarettes – WHO TobLabNet Official Method SOP 01, April 2012
4. ISO 3308:2012 Routing analytical cigarette-smoking machine – Definitions and standard conditions, 10/15/2012
5. 105 CMR 660.000. Cigarette and smokeless tobacco products: Reports of added constituents and nicotine ratings. Boston, MA: Commonwealth of Massachusetts, Department of Public Health.
6. CORESTA Recommended Method N° 81 “Routine Analytical Machine for E-cigarette Aerosol Generation and Collection – Definitions and Standard Conditions, June 2015

## SUMMARY

- A single 44 mm Cambridge Filter pad was able to trap up to 850 mg of aerosol mass with a 5 second puff duration.
- Device mass loss confirms trapping capacity of aerosol mass with 44 mm Cambridge filter pads.
- Difference in a 3 and 5 second puff duration results in different total amounts of aerosol collected.
- There were no measurable levels of Nicotine or Menthol detected on second Cambridge filter pads.
- Our data suggest that nicotine and menthol may not be trapped as efficiently at higher puff counts.

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