CELFX™ CARBON TECHNOLOGY: PUFF-BY-PUFF PROFILE

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Celanese

Introduction

The CelFX™ Matrix Technology offers high loadings of carbon, with low pressure drops. A unique binder creates a solid, clean carbon block with almost no deactivation of the carbon. The technology has been shown to reduce main stream smoke vapour phase components significantly better than any other carbon filter technology while not impacting tar and nicotine delivery.

The objective of this work is to investigate the puff by puff profile of a Kentucky 3R4F cigarette with cellulose acetate filters and with CelFX™ carbon/acetate filters. Published work by *Wagner et al*,[1] demonstrated the delivery puff profile for tar, nicotine, water and various carbonyl/volatiles compounds using the Kentucky reference 2R4F cigarette. Similar trends were observed with the 3R4F cigarette with a cellulose acetate filter (nicotine free dry particle matter, nicotine, water). The CelFX™ carbon/acetate puff profile demonstrated significant reductions for carbonyls and volatiles while have no impact on NFDPM, nicotine or water deliveries.

Experimental

The Kentucky Reference 3R4F, with the acetate filter, was used as the control. Machine combined CelFX™ carbon/acetate rods were hand cut to 27 mm (10 mm CelFX™ carbon, 17 mm acetate). The carbon was 30x70, 60% activity with140 mg per tip. The 3R4F filters were removed and the CelFX™/acetate filters were inserted. All cigarettes were smoked using the ISO 3088 smoking protocol with ventilation holes blocked. The cigarettes were smoked on a Cerulean CR20i rotary smoke machine

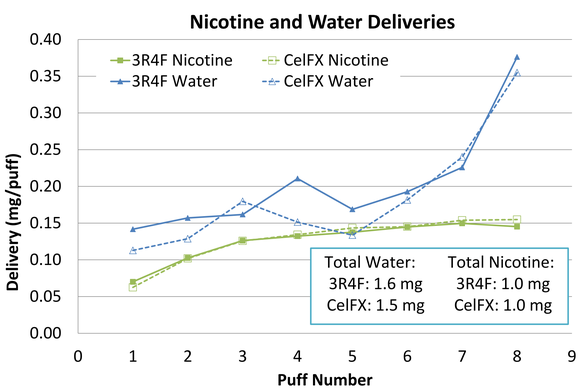
The carbonyl testing was done with 10 cigarettes. This sample size allowed the analyst time to switch between trapping impingers to collect 1-8 puffs from each smoke run. The volatiles trapping required 2x10 cigarette samples to collect the 8 puffs. Puffs 1-4 were collected with the first 10 cigarettes and then a second 10 cigarettes collected puffs 5-8. The Dewar trapping system was too cumbersome to collect 8 puffs from one 10 cigarette sample set. Puffs 1-4 were discarded for the second set, followed by puffs 5-8 collection. All testing was done in triplicate. Coresta recommended methods 70 and 74 were used.

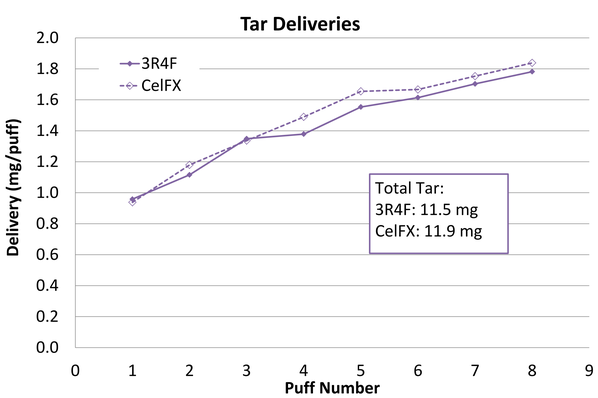
Conclusions

The CelFX™ carbon/acetate puff by puff profile shows there is no impact on NFDPM, water or nicotine deliveries. The profile matches the cellulose acetate filter. The observed profiles/trends agreed with published works.[1] Additionally the summed puff data was in good agreement with the linear smoking results.

Significant reductions were observed for carbonyls and volatiles in puffs 1-6. CelFX™ carbon reduces the formaldehyde in the first puff to a concentration similar to the second puff of the control. Constituents, like acetaldehyde and isoprene, increased in the latter puffs. CelFX™ filter optimization would be a means to mitigate the increase in the latter puffs through, for example, increased CelFX™ carbon segment length, higher activity carbon, higher carbon loadings, etc.

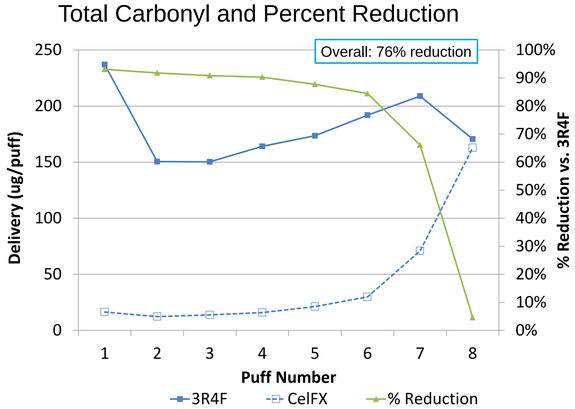
Water Nicotine, NFDPM, ISO Vents Blocked

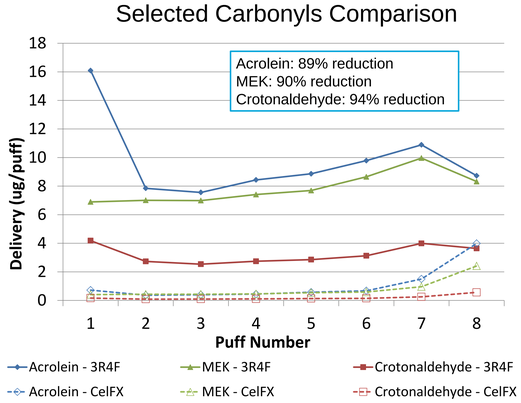


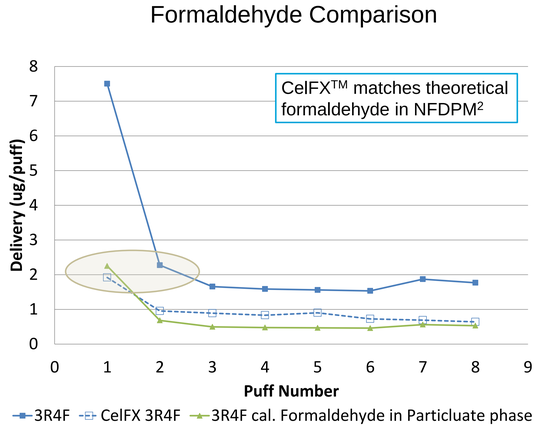


1. Wagner, K.A, Higby, R., Stutt, K., Puff-by-Puff Analysis of Selected Mainstream Smoke Constituents in the Kentucky Reference 2R4F Cigarette, Beiträge zur Tabakforschung International, Vol. 21, No. 5, (2005), 273-279.
2. Sakuma, H., Kusama, M., Shimojima, N., Sugawara, S., 1978. Gas chromatographic analysis of the p-nitrophenylhydrazines of low boiling carbonyl compounds in cigarette smoke. Tobacco Sci. 22, 158–160.

Carbonyls: ISO, Vents Blocked







Volatiles: ISO, Vents Blocked