TECHNICAL BULLETIN

UV-C: Failed Technology, confirmed by ASHRAE

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Background:
CaptiveAire has known for nearly a decade that UV light, specifically UV-C, has little to no effectiveness in reducing the amount of effluent exhausted from commercial kitchen hoods mainly due to the very short residence time the UV-C light has to interact with the particle in the effluent. This was known from internal company testing as well as peer-reviewed industry articles like, “Analysis of Chemical and Physical Effects of Ultraviolet Bulbs on Cooking Emissions” which was published in 2011 [1].

Though published and peer-reviewed research has existed for almost a decade, some manufacturers in the commercial kitchen ventilation (CKV) industry continued to insist that UV was very effective. In reality, and as is readily admitted in their literature, the ineffective and expensive UV technology must first be paired with more efficient hood filters which will pull more grease out of the cooking effluent, leaving less for the UV lights to process [2].

ASHRAE, or the American Society of Heating, Refrigeration and Air Conditioning Engineers, is a not-for-profit professional organization focused on research, standards writing, publishing and continued education [3]. The organization has numerous Technical Committees, with TC 5.10 specifically focused on Kitchen Ventilation [4]. It is this committee, and it’s recently released Research Project 1614 report, “Developing a Test Method to Determine the Effectiveness of UV-C Systems on Commercial Cooking Effluent” that is the focus of this Technical Bulletin. **The results show UV technology is ineffective for grease particle capture in CKV.**

ASHRAE Testing:
The goal of the ASHRAE research was to evaluate UV-C effectiveness in kitchen exhaust hoods and determine the performance of the UV-C hood in terms of reduction of grease deposition, gaseous and particulate emission, solubility and flammability of the deposition. Testing was performed with a back-shelf hood with an exhaust flow rate of 800 CFM. A 100-foot-long round duct with 2 sampling ports was used for testing with three deposition coupons placed at 5, 50 and 100 ft downstream from the hood.

Findings:
- The existence of the UV-C lamp imposed limited effects on the reduction of grease deposition in the interior surface of the duct.
- Particle concentrations with and without UV-C lamp were similar since reaction conditions and residence time in UV-C hoods are “substantially insufficient to drive organic reactions to the end”. Performance of UV-C lamp in terms of reducing particulate emission is very limited.
- In 80% of tests, flammability of grease deposition with and without UV-C yielded differences of less than 5%, and 40% of tests yielded no measurable difference.
- The majority of the grease capture was done by primary filters in the hood. Secondary filters in the UV-C hood outperform the UV-C lamp in terms of grease and particulate capture.

Conclusions:
CaptiveAire would strongly recommend engineers and food service consultants instead focus on better filtration at the hood to reduce grease deposition in the duct. To this end, the Captrate line of filters from CaptiveAire offers industry leading performance with Captrate Solos offering 75% capture at 5 microns and 85% capture at 7 microns or the multi-stage Captrate Combo filter offering 97% capture of the total mass of grease particles emitted and 60% capture of particles 2 microns or larger [5].

References:

[1] F.M. Farrell. “Analysis of Chemical and Physical Effects of Ultraviolet Bulbs on Cooking Emissions” Journal Air Waste Management Association. 2011.
[2] “Halton - Capture Ray – Shining a bright light on the performance of UV on kitchen emissions.” https://www.halton.com/dh/AQAzhgIQISbMvdtHv65zq1JdznMba5AYgkJjlZeDN5cTq8977yYl40ERN5aO9cB2mb34xKHq0uZ0ZHBsqgf18e-0s6Cdu4PvaROCa4RuG0uWItRkiRA/HaltonCaptureRayBrochure.pdf
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