Efficient kitchen ventilation with grease destroying ultraviolet technology

Air quality is a major concern for both the indoor environment and atmospheric discharge in commercial kitchens. In keeping with it's position as the technology leader in commercial kitchen ventilation, Halton has incorporated Ultra Violet light technology in it's High Efficiency Capture Jet series of ventilation systems, creating the Capture Ray line of UV hoods.

There are two primary chemical reactions that take place in the UV oxidation process. The UV lights emit radiation in the UV-C band and also create ozone in the vicinity immediately surrounding the lamps. The chemical process taking place when UV-C directly hits molecular chains and breaks them into smaller compounds is called Photolysis.
The photolysis reaction is most effective on small grease particles (especially vapor) since the light can only break the chemical bonds on the outer surface of the grease particle if it is large.
The second chemical process that takes place is when the ozone, created from the interaction of the UV light with the oxygen molecules in the air, continues to react with the grease molecules as they move through the exhaust ducts to the outside. This process is called Ozonolysis.
The byproducts of the oxidation process (the modified grease molecules, CO_2 and water) does not adhere to the duct surfaces and will be carried away by exhaust airflow.

Total system efficiency is the starting point for a fully operable UV system. The system design evaluates both exhaust and supply based on actual heat loads and Capture Jet efficiency.

Halton Capture Jet^{TM} patented high efficiency hoods are equipped with Capture Ray UV-technology.
Critical to the effectiveness of the UV system is the first stage grease extraction.
The Halton KSA multi cyclone extractor is the most efficient mechanical extractor available. It removes the larger grease particles (5 microns and above) allowing the UV system to act on the smaller particles for effectively.

It is important to maximize exposure of the exhaust airflow to UV light. The computational fluid dynamics (CFD) simulation was used to optimise the airflow in the UV chamber for the KVL hood (fig 3).

Grease Emissions By Cooking Operation
Cooking Emissions
ASHRAE research project documented the emissions from different cooking processes. The results are presented on Figures 1, 2. Figure 1 shows total emissions and the chart on Figure 2 illustrates the ratio of vapor and particulate in cooking emissions. Percentage of particulate on this chart corresponds to the theoretically maximum efficiency of a mechanical grease extractor.

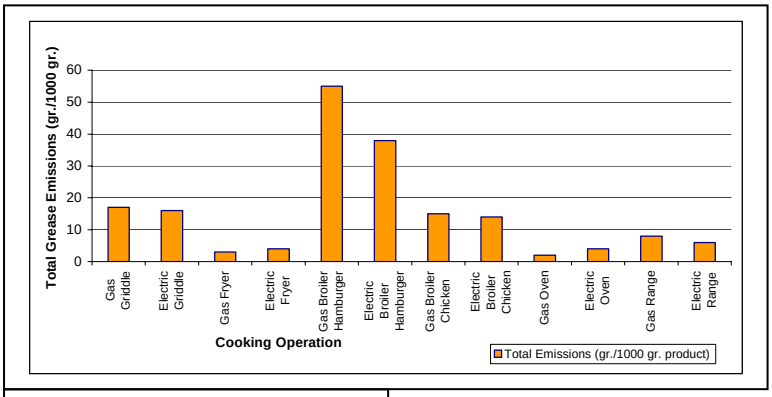

Figure1 : Total emission

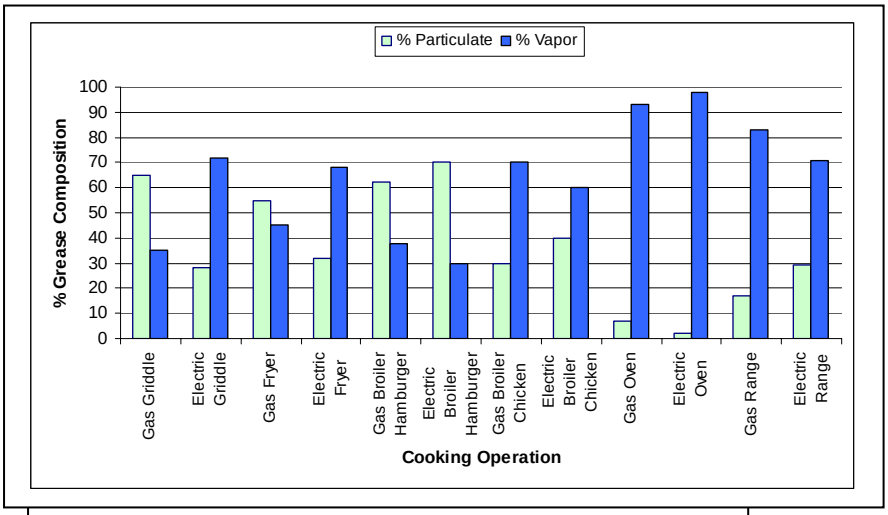

Figure 2 The ratio of vapor and particulate in cooking emissions as function of cooking process.

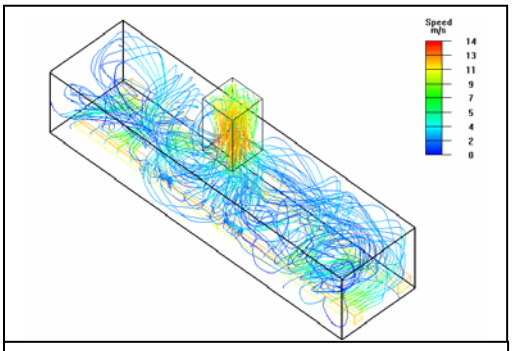

Figure 3
This initial concept was studied in detail using a computational fluid dynamics (CFD) model to investigate the airflow within the plenum that holds the UV lamps