Closing the Gap[8]

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Commercial Kitchen Ventilation

Part 1

Commercial Kitchen Ventilation is drawing greater attention the given cost of operating a commercial (type I) exhaust hood. The cost of acquisition for a ventilation system belies its cost of ownership. The least first cost alternative may well give you the greatest operating costs while increasing your exposure to risk. A poorly designed, installed and or maintained system can cost plenty both in energy and in the latent risk of catastrophic loss due to a fire related to grease ladened vapors. Heating, cooling and de-humidifying the make up air (MUA) necessary to replace exhausted air is expensive. Though efficient natural gas direct and indirect in-line furnaces are common for meeting tempering requirements, many food service operations do nothing to cool or dehumidify their MUA. Temperatures soar during the summer in many kitchens as heat produced by cooking equipment is piled on top of ambient air temperatures.

Background

The topic of Commercial Kitchen Ventilation is complex and, for whatever reason, little research has been done until recently. Lacking sound research data that accurately identifies and quantifies the variables that drive the process, our laws are worst case codes based upon averages, excess, and opinion. The net result is a tremendous amount of waste and certain code sections that case unnecessary environmental impact with little if any enhancement to public safety. Commercial Kitchen Ventilation requirements are defined by cross-jurisdictional authority. NFPA, UL, NSF, ASHRAE, Basic National Mechanical Code (BOCA), the Standard Mechanical Code (SBCCI), and the Uniform Mechanical Code (ICBO), all combine to define what is acceptable according to model codes and standards, nationwide. The new International Mechanical Code (IMC) is the evolution of these and other “model” codes into a single, definitive code to be used across the country and, internationally. Model codes do not carry the force of law until they are adopted by a State or other Jurisdictional Authority. While the interpretation of these model laws may vary from city to city or inspector, the laws of science (physics, microbiology, chemistry, etc.) remain constant. Operators that open facilities in different municipalities find that the requirements change by State, by city, and sometimes by inspector. Many operators “give-up” trying to fight city hall over code related issues and budget their projects anticipating regulatory confusion. The confusion is the result of laws based upon opinions rather than facts. The food service equipment industry is made up of hundreds of small manufacturers with highly specialized products. In fact, 80% of the members of The North American Food Equipment Manufacturers Association (NAFEM) had sales last year of less than $12 million. What resources they have are used on R&D and testing their products with the various certification laboratories, such as UL, NSF and ETL. Health, sanitation, and food codes are responsible for the existence of the industry, as operators are only allowed to use equipment that meets their requirements

Fundamental Research

Funded by the Electric Power Research Institute (EPRI) and the AGA Research (AGAR), the Association of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) has contracted with The University of Minnesota to do a study titled: **The Identification and characterization of effluents from various cooking processes.** It is the first in a series of studies that together will provide the facts needed to change our laws. ASHRAE establishes standards that engineers and design professionals defer to as they develop a project. These standards are trusted as they are based upon exhaustive research done by professional engineers (PE) and PH.D’s. Their conclusions are facts. It was AHSRAE that blew the whistle on ozone depletion and was the

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catalyst for the Montreal protocol and the subsequent Kyoto agreements relative to global warming, greenhouse gases, and ozone depletion. Among ASHRAE standards is standard 55, which relates to indoor air quality (IAQ). Where ASHRAE standards are based upon quantifiable science, model building codes may or may not be supported by empirical data and studies. The International Conference of Building Officials (ICBO) authors the Uniform Mechanical Code (UMC) which is the model code that States in the western United States adopt legislatively, giving them the force of law. Many sections of UMC were developed by extrapolation and in some cases have little to no correlation to the laws of physics and the science of public safety. Such is the case with the next study to be commissioned, which is very important as it will deal with the duct velocity requirements found in the International Mechanical Code section 2003(a)-(g) as it relates to hood capacities and ducts serving type I hoods. This is the code section that establishes minimum and maximum duct velocities (1500FPM-2500FPM). The requirements for minimum velocities are suspect, and often are the only reason an operator must ventilate an excessive amount of air. If the original design for a kitchen included a large char-broiler which was replaced with a steamer or oven, this section of code will prevent the operator from reducing his exhaust volumes to only those needed to provide adequate ventilation for the new equipment lineup.

Regulatory pressures
City and State inspectors and building authorities have different ideas about what an operator needs to do in order to protect the public's safety based upon their own knowledge, experience, and common sense. Scientific and technological advancement has placed huge burdens on regulatory authorities that are already reeling from cuts in staff and funding. Little money is available for the massive amount of training and education that is needed to assure public safety and, lacking data, we find curious regulatory situations develop. The municipal fire inspector in one community may rigorously enforce his/her notion of fire code at the expense of environmental Health or mechanical code. Meanwhile in the neighboring community the Environmental Health Dept may hold the keys to the project and enforce a requirement that violates mechanical code, a fire code, or OSHA requirements. No one "inspector" or building official is qualified to do a cross disciplined, total inspection. Opinions and decisions of convenience become law at the expense of public safety and operational efficiency.

The National Fire Protection Association (NFPA) is the entity that creates model codes relevant to fire protection and suppression. Commercial exhaust hoods remove heat and by-products of combustion that are created from gas-fired burners and from the combustion of organic compounds, in addition to grease ladened vapors. **NFPA 96** defines two different types, or classifications for hood's for foodservice, which is mirrored in UMC and the new IMC:
Type I For venting grease ladened vapors
Type II For venting everything else

NFPA 211 is a standard that deals with class A chimneys. They differ from type I ducts in that class A chimneys cannot be used to vent grease ladened vapors which are created by cooking foods at temperatures above 212^{0}F. They are intended to be used to vent by-products of combustion which are created when you burn natural or LP gas, wood, coal or any other fuel for that matter. Class A chimneys can serve equipment such as water heaters, boosters and in some cases, smoker ovens, where the primary fuel is natural gas and wood is used for flavor only. These smoker ovens typically cook at temps below 225^{0}F and they feature oven doors with gasket seals. The doors are sealed to retain product moisture and flavor during the low temperature cooking process, which is usually anywhere from 3-8hours.

Both **NFPA 96 type I and II** hood classifications require that hoods be formed of Stainless Steel (where exposed). But that is where their similarity stops. A very important difference between

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hood types relates to their ducts. Ducts that serve type I hoods must be in a vacuum (expressed in terms of inches water column; "W.C.) from the filter or, extractor on the hood, to the fan which MUST be on the roof. Ducts or chimneys for all other purposes (including type II) can be either at atmosphere, or under pressure (natural or forced) without restrictions for back-draft dampers. By requiring ducts serving type I hoods to be in a vacuum, there is no opportunity for condensed or liquefied grease to seep out of a small hole or crack in the ductwork. Type I hoods, ductwork, fans, and control logic are designed to mitigate the very real danger of fire created by condensed grease. Type II hoods on the other hand merely provide for the ventilation requirements of individual equipment pieces that do not present or create a fire hazard due to grease accumulations. Some examples of equipment commonly found beneath a type II hood would be a dish machine or possibly a convection steamer, a steam jacketed kettle or maybe a steam table (baines marie). Generally speaking, if a menu item contains more than 5% meat (by weight) and it is prepared in a unit that is "open" and is designed to cook that item at temperatures in excess of 230^{0}F, a type I hood will be required. Units designed to cook foods in grease, shortening, or vegetable oil (of course) must also be covered by type I hoods with an approved fire suppression system.

The law you must comply with is what your local authority having jurisdiction says it is. If the official has not been updated about statutory amendments and exceptions, or lacks understanding of the inter-relationships of various requirements and associated public safety hazards, then chances are the operator get by with the cheapest alternative the contractor is willing to provide. Model building, construction, mechanical, fire and health codes and interpretations evolve as politics, personal stakes and knowledge reshape regulatory acceptance. The new International Fire Code and the International Mechanical Code (IMC) are similar in that they replace the model codes formerly authored by a number of different groups. Both the industry and the public has a stake in seeing to it that model codes are based upon facts and sound science and are a proper match for the public safety issues they are intended to protect. Requirements that are not rooted in science or those that do nothing to enhance public safety or the public's interests are worthless and wasteful.

Summary

This first in a series of three article's provides a thumb nail sketch of the complexity of CKV. A cross disciplined, integrated approach is required for optimization. Other areas of interest and developing conversation relate to the enthalpy of heat and evaporative pre-cooling, desiccant dehumidification, energy reclamation, and cross flow heat exchangers. California is leading the charge with regard to tobacco restrictions in public places and already the courts are considering changes that will allow operators to have smoking sections in bars and restaurants, provided they continuously meet minimum air quality requirements. Operators that want to pursue smoking areas will likely have to provide ventilation and control systems that enable the automated controls to insure air quality standards are met continuously. Next month, in the second of our three part series, we will take a closer look at the hazards associated with CKV and how well our building codes mitigate these hazards. We will also review UMC sect 2003, and its "exceptions" i.e., products that have passed UL 710 testing. Finally, we will explore some other natural science laws to better understand the condensation and precipitation of grease on filters, in ducts and on the roof. Please send any comments or suggestions for future articles to: tomj@jdpinc.com