

When it's too hot in the kitchen

You know the old saying – if you can't stand the heat, get out of the kitchen! While its meaning may ring true, in the modern world of safe working environments and occupational health and safety, an overheating kitchen can be a sign that all is not as it should be. This month, Sean McGowan peers into the world of commercial kitchens.



If you've ever walked into a restaurant, café or take away food outlet and been hit by the horrible aroma of dirty grease rather than the alluring smell of your favourite food, then I hope you've walked straight back out the door and into another establishment.

Because that smell can only mean one thing – someone is not doing their job and the kitchen's exhaust system is in serious need of a good clean, and perhaps, overhaul. Furthermore, the kitchen may be a high fire risk and a not so safe environment for both staff and patrons.

It's a subject many kitchen owners don't seem to fully appreciate. And because kitchen exhaust systems are largely out of view from the general public – like so many other HVAC&R services – their cleanliness and safety is often taken for granted.

Kitchen exhaust systems play an incredibly important role in the commercial kitchen. Not only do they remove

heat, odours and grease from the kitchen environment. They also remove some very serious gases, including carbon dioxide, carbon monoxide and nitrogen dioxide; which may be produced while the kitchen cooking equipment is in use.

While good design, equipment selection and installation all remain important pieces of the puzzle, the real key is regular maintenance – which takes time and money – and unfortunately for some, goes on the back burner (excuse the pun!).

Maintaining a healthy system

A typical kitchen ventilation system has four main components – a rangehood canopy located above the cooking equipment (grill, hot plate, gas burners, fryers

etc); filters installed within the rangehood; ductwork connecting the rangehood to the exhaust fan; and the exhaust fan itself.

These all work together to extract any polluted air out of a busy kitchen, allowing fresh air to replace it. But when one thing breaks down, inevitably the rest tends to follow.

As such, each component requires a degree of maintenance to ensure they operate as required, and on the frontline of the system are the rangehood and filters which require the most maintenance.

"Filtering plays a very important function in removing fatty vapours from the extracted air above the cooking appliances and preventing vapours being deposited within the ducts and to a lesser extent, to the atmosphere. Fats lodged within the ductwork are a serious fire risk," explains Greg Payne, general manager of the Hendry Group.



It's widely considered that an average kitchen should be cleaning their filters every second or third week, with weekly cleaning required where the size and use of the kitchen demands it.

According to Payne, "kitchen exhaust system maintenance needs to be based around Australian Standard AS 1851.6 which details the minimum standard for the Maintenance of Fire Protection Systems and Equipment, although in New South Wales, the installation standard sets the level at which the kitchen exhaust system must be maintained to. Fire safety schedules or essential safety measures schedules for the applicable building will set out the maintenance compliance requirements.

"Maintenance is a real issue over the long term. A regular routine, balanced to have regard to the nature of the cooking process, is a must for the filters. For example, a high percentage of deep frying or grilling will require a more regular filter cleaning regime. Canopies over ovens and dish washers could have longer periods between filters being changed," Payne says.

The maintenance schedules are usually produced at the time of the approval (New South Wales) or at the completion of work (Victoria), with the regulatory body, such as the local council or private certifier or building surveyor issuing these schedules.

While maintenance requirements are specified, it still remains that many kitchen operators go about their business with scant regard for the levels of maintenance required, and the risks associated with non-compliance. Payne says this can, in part, be attributed to the cost.

"As with the maintenance of any other fire safety feature installed in a building, maintenance to specified mandatory and regulated requirements is problematic and cost dependent," he says.

"Owners who lease food premises are particularly at risk from tenants who have little regard to maintenance. The owner and the tenant can be liable where a fire in the kitchen exhaust duct subsequently causes the whole building to be fire damaged beyond repair. Other tenants and their livelihood are affected and litigation is a common path taken to recoup losses.

"Contractors who perform non compliant work can also be liable if it is shown their work contributed to the fire expanding into the rest of the building," he says.

Kitchen nightmares

One man who sees the best and worst of kitchen maintenance is Richard Fudge, operations manager for Metropolitan Filter Services in Parramatta, which services over 4000 restaurants across Sydney, Newcastle and the Blue Mountains.

He says that when filters are full of grease, it is transferred to the hood and released into the gutter for cleaning out – but when too much grease is in the hood it can travel up the duct and spill out, creating an environmental issue and a fire risk.

And unfortunately, there are many restaurants which allow this to happen.

"The easiest way to keep your system going is to keep your filters clean. A record of this process must be kept in case of fire, and the cheapest and easiest way is to get a qualified professional to do it for you," Fudge explains.

He believes the best way to clean filters effectively is with high pressure water. His company has worked with Sydney Water to develop an enclosed system to ensure the waste water does not contaminate the environment.

Instead, it is pumped out twice weekly and used in the manufacture of fertiliser.

"Unfortunately there are many companies that don't take so much care, and flush highly dangerous acids, grease and waste into our water ways. I've even seen people cleaning filters at car washes," he says.

Aside from regular filter cleaning, ductwork also requires regular cleaning to prevent the build-up of grease, which can become a fire hazard.

"Once again the simplest way to avoid these problems is to get a service company to create a maintenance schedule," says Metropolitan Filter Services' Fudge. "This should involve ongoing regular filter exchange, quarterly hood clean inside and out, and six or twelve monthly full system cleans of the ductwork and fans."

However, Fudge says the regular maintenance of ductwork is a major problem that needs urgent attention by the authorities.

"There is an Australian Standard for the cleaning of ducts but nobody follows up on people's work to check they comply. It's too easy to be told its all clean, but in reality very few people check the work has been done," he says.

According to Essential Property Services, a division of the Hendry Group, the maintenance routine of a commercial kitchen in most jurisdictions where it needs to meet the minimum standards set out in AS 1851.6, should reflect the following:

Level 1 (1 to 6 month intervals depending on the volume of usage)

The items required for a level 1 routine should include the following:

- Check grease-arresting filters for excessive grease accumulation.
- Check hood and its exhaust plenum for excessive grease accumulation.
- Check that grease-arresting filters are secured in position and free of damage.
- Check grease gutters for any excessive grease accumulation.

Level 2 (1 to 6 month intervals depending on volume usage)

- Clean or change over grease-arresting filters.

Note: Due to the wide variation in usage, the frequency of this routine is subject to the requirements of the relevant regulatory authority. Level 2 routines may be required more frequently than a level 1 in some circumstances.

Level 3 (Annually or more often should usage be of high volume)

The action items required for a level 3 routine should include the following:

- Clean hood and its exhaust plenum.
- Check for excessive air leaks at grease-arresting filters.
- Check duct back to motor for accumulated grease and clean it.

In New South Wales, the fire safety measures attributable to the kitchen exhaust systems is the installation standard AS 1668.1 under BCA F4.12 and AS/NZS 1668.1 which establishes the level of performance to be achieved by the maintenance regimes adopted. An owner who uses competent people and strictly complies with AS 1851.6 could be regarded as meeting the above requirements.

Note: Fire protection or suppression systems installed within kitchen exhaust systems may have special requirements requiring additional mandatory maintenance.



"Restaurants are insured and all policies (require) a minimum annual full system clean to be done, but I know of busy restaurants in the city that haven't been cleaned for the 20 years they have been open. How can this happen?"

If it all sounds a little too much like Gordon Ramsay's *Kitchen Nightmares*, then you are on the money!

He says councils or other authorities need to monitor maintenance more closely, and that all HVAC systems should have a pink slip policy which requires they are checked annually for efficiency and safety.

"Education on the matter is needed and people need to be aware of how dangerous it is to be left (without regular maintenance)."

Design, selection and installation

Sizing of exhaust hoods, duct work and exhaust velocities are critical issues in the design, selection and installation of commercial kitchen exhaust systems.

Undersized rangehoods inevitably lead to positive pressure, which manifests itself into smoke and effluent from cooking remaining in the kitchen, making it both a hot and uncomfortable working environment. It can also lead to odours entering the restaurant dining space.

According to Peter Britton of Stoddart Manufacturing, manufacturers of the Halton range of exhaust systems under licence in Australia, the key to an effective system is to keep the exhaust volumes as low as possible to ensure you are exhausting all the polluted air, without removing the fresh air from the kitchen.

"You need to be able to balance the effective capture of the (heat) plume, with makeup air and also the cool environment of the kitchen."

Exhaust rates should be directly related to the quantity of convective heat produced by the cooking equipment. If excess heat and impurities are not captured by the hood and are spread through the rest of the kitchen area, then the exhaust rate needs to be increased.

Another component critical in the makeup of the exhaust system is the fan, which again when incorrectly sized, can result in the entire system not functioning as intended.

"The size of the fan is very critical depending on the size of the canopy, the size of the ducting and the

distance of the ducting away from the canopy before exhausting out. The type of filter also has to be taken into consideration," says Shab Ticklay of Kaleya Filters.

One of the common reasons behind undersized kitchen exhaust systems is the high level of turnover in restaurant spaces, and subsequent remodelling upon the space being re-let.

Where once systems were designed to meet the requirements of an original setup (calculating floor space, cooking appliances etc); new owners subsequently knock down walls and add windows and doors without making any changes to the existing exhaust system. This has obvious consequences.

"It disturbs the balance," says Fudge.

"Some hoods don't work at all and others struggle to keep up (with the new demand). People then turn up the air conditioning to compensate and subsequently ruin entire HVAC systems."

Another common design error rests in the selection and installation of duct work. According to Britton, ductwork used for extraction should always be installed so it slopes backwards, ensuring it is self draining.

"The Australian Standards call for the duct to slope back to the filter, and this is always a problem. It's one of those contributing factors to fat being stored in the duct, and as soon as fire starts, off it goes. It can be very quick," Britton warns.

Other common faults include the discharge being at the incorrect height above a roof, the location of the discharge in relation to outside air intakes, and the reticulation of ductwork on the face of a building which is not usually allowed and can have significant planning consequences.

Payne suggests that some manufacturers and installers do not have regard to code requirements and statutory permit requirements, or are simply unaware that these are in place.

"We also find occasions where the ductwork is not fire rated when it is within proximity to combustible materials or if it is within a shaft, the shaft also tends to be used for other services. This is not permitted as the

kitchen exhaust must be in its own fire rated shaft because duct penetrations are not allowed to be protected by fire dampers," he explains.

He says other issues regularly encountered include a lack of access panels provided to enable effective cleaning of the duct, particularly at changes in direction; and for access to sprinklers and detectors when installed.

Keeping cool in the kitchen

A 2005 US report by the Restaurant Opportunities Centre of New York, and the New York City Restaurant Industry Coalition found that nearly half of the 530 kitchen workers surveyed reported unsafe temperatures in the kitchens where they worked.

This report has triggered the American Society for Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) to fund research into thermal comfort in commercial kitchens.

"Understanding thermal comfort in commercial kitchens is paramount to understanding and providing a controlled and comfortable environment for kitchen workers," says Greg Duchane, a member of ASHRAE's technical committee 5.10 on kitchen ventilation that is overseeing the project.

"This research can be used by engineers and kitchen consultants in designing HVAC systems and in the operation of restaurants. It will give us more accurate understanding of employee comfort and how employees are impacted by heat loads."

In Australia, there are no regulations specifying standards for maximum temperatures in kitchens. However, according to most state OH&S guidelines, the most comprehensive heat stress index is measured by the Wet Bulb Globe Thermometer (WBGT), which takes into account factors likely to be significant in effecting a person performing work in a hot environment.

These include factors which interact with each other to determine the level of heat-related risk to a worker, and include environmental conditions; the type of work being done; the way in which the work is organised; and the clothing being worn.

As such, it remains the responsibility of the employer under state OH&S legislation to provide and maintain a safe working environment for employees with a temperature range that is comfortable and suitable to the work.

Furthermore, employers need to ensure workplaces that are buildings must also provide natural ventilation or mechanical ventilation in accordance with AS1668, and that in enclosed workspaces comfortable rates of air movement are maintained.

According to a Queensland Government Department of Industrial Relations fact sheet on heat stress in the café and restaurant industry, "an ideal working environment should have a temperature range of 20°C to 26°C and a relative humidity between 40% and 70%."

To this end, Britton is of the opinion that when installing a cooling system for a kitchen area, an evaporative system is preferable over the more common split system solution.

"I'd be putting in evaporative cooling which has a bit more moisture and humidity in the air, because you've got so much radiant heat with cooking that you really need to keep some moisture in the air," he explains.

So next time you eat out and smell grease before your meal being cooked, or see kitchen staff dripping from perspiration, it might be time to find another restaurant. ▲