The Commercial Kitchen Fire Challenge – Protecting property and people

Restaurant fires typically start in the kitchen. Annually they cost millions of dollars in lost revenue and repairs, risk the lives of staff and diners, and cost tens of thousands of jobs. However, restaurant kitchen fires are preventable if appropriate suppression systems are installed, tested and maintained, and if management implements effective cleaning and grease removal regimes and safe working practices.

There are between 14,000 and 15,000 cafes and restaurants in Australia, providing employment for over 145,000 people and generating a total revenue in 2010 of an estimated Aud $9,877 million. That being said, many in the industry argue that there has never been a more challenging time to make an acceptable profit, due to fast-escalating costs, so, the need to maximise productivity and customer throughput has never been more important. However, that is an endeavour that can be easily thwarted – either temporarily or permanently – by an out-of-control kitchen fire.

And make no mistake – commercial kitchen fires do occur. Australian kitchen fire statistics are difficult to come by but, according to USA's NFPA [National Fire Prevention Association] findings, an average of 11,100 fires take place in eating and drinking establishments every year in the USA. Half of these have their origin in

the kitchen. Cooking materials are the most frequent first item ignited in a kitchen fire; a view shared by many Australian fire safety experts and confirmed by the majority of post-fire reports.

For example, deep-fat fryers use flammable cooking oil, which can result in grease build-up in hoods and ducts thatshould be cleaned and maintained on a regular basis. If this grease build-up ignites, it can contribute to the swift spreading of a fire. The three primary types of equipment involved in restaurant cooking fires, again according to the NFPA, are deep-fat fryers, cooking ranges and cooking grills.

However, it is important to appreciate that protecting the cooking equipment is only part of the kitchen fire safety equation. It is equally vital to protect the ductwork. Grease vapours given off during the cooking of nearly all types of food will accumulate on the hood, in the duct and fan of the exhaust system. This grease residue is combustible at approximately 370 degrees C and the heat within a cooking appliance flare-up can easily reach 1100 degrees C. So, if the flames linger long enough in the hood or duct, the internal grease build-up will ignite, with the potential to develop into an uncontrolled fire that can be quickly "sucked" through the entire length of the duct.

It is important to appreciate that protecting the cooking equipment is only part of the kitchen fire safety equation. It is equally vital to protect the ductwork.

These challenges demand careful and detailed consideration, particularly as there are advocates of a number of different solutions. These include: "tailored", bespoke or engineered systems; pre-engineered systems; and portable hand-held extinguishers.

"Tailored" fixed fire suppression systems are, as the term implies, design specific, while pre-engineered systems do not require the involvement of a design engineer beyond the original product and system configuration. Pre-engineered systems are made of pre-designed components and are, by far, the most popular solution for commercial kitchen fire suppression. Probably the best known systems in this category are Amerex Corporation's KP and ZD and Ansul's R-102 restaurant fire suppression system. Portable extinguishers are no substitute for pre-engineered fixed suppression, but they do have a valuable role to play in ensuring kitchen fire safety.

While some advocate the use of water sprinkler heads over deep fat fryers, their use can, in some cases, be shown to be ineffective, particularly when compared with the quick knock-down, cooling and smothering action of wet chemical systems. A report by FEMA (Fire Equipment Manufacturers' Association) entitled "Wet Chemical Pre-Engineered Restaurant System / Water Sprinkler System Comparison" concluded that:

"…water sprinkler systems do not always compare favourably with wet chemical systems and, in fact, there are some important reasons why wet chemical systems are most often preferred by the industry's authorities having jurisdiction and end users."

The report went on to conclude that: *"The most important factor to be borne in mind is that pre-engineered wet chemical systems provide complete*

protection to all hazards simultaneously and are UL tested and listed specifically for restaurant hazard applications. Agent characteristics, simultaneous coverage, and specific test criteria make pre-engineered wet chemical systems the state-of-the-art fire protection system for restaurant application and the choice of the industry's buying influences."

Regulatory Compliance

In terms of fixed systems, there are a number of standards that need to be taken into account, depending on the type of system installed. These include Underwriters Laboratories Standard UL 300 [Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment] that was introduced in 1994 and has been subsequently amended and updated.

The relevant Australian standards are AS/NZ 1668 Set: 2005 (The use of ventilation and air-conditioning in buildings) and AS 1851: 2005 (Maintenance of Fire Protection Systems and Equipment) and AS 3772: 2008 (Pre-engineered fire protection systems for cooking equipment).

Overseas, there are three of the USA's National Fire Prevention Association's Standards: NFPA 96: 2011 [Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations]; NFPA 13: 2010 [Standard for the Installation of Sprinkler Systems]; and NFPA 17a: 2009 [Standard for Wet Chemical Extinguishing Systems]. The relevant UK standard is the LPCB's (Loss Prevention Certification Board's) LPS 1223 [Requirements and Testing Procedures for the LPCB Certification and Listing of Fixed Fire Extinguishing Systems for Catering Equipment].

The UL 300 Standard is a fire test method that applies to pre-engineered extinguishing system intended for the protection of commercial cooking areas. In addition to fire test methods and requirements to protect the various types of cooking appliances, this Standard includes tests and criteria for evaluating the ability of the pre-engineered equipment to protect plenums and ducts.

The requirements in UL 300 take into consideration the characteristics of pre-engineered systems, including its self-contained supply of extinguishing agent. Since the quantity of extinguishing agent is generally limited, and the effective discharge of the agent is over a short period of time, these systems are required to quickly extinguish test fires as part of the UL 300 evaluation. It is therefore essential for specifiers, installers and restaurant owners, when selecting such a kitchen fire suppression, to ensure that it is tested to UL 300 and installed to AS 3772, as so many regulatory authorities, fire services and insurance providers are unfamiliar with benefits of a wet chemical suppression system and with this standard.

Assured Reliability.

A careful reading of these standards, and particularly those relating specifically to commercial kitchens, highlights a vital important requirement, namely the need for systems to be performance tested. Indeed, UL 300 even refers to "fire testing" in its title. In reality, this testing can be achieved only with a pre-

engineered system. By its very definition a tailored, bespoke or engineered solution cannot undergo any performance testing regime; performance can be substantiated only by theoretical calculation and so cannot possibly be claimed to comply with UL 300.

The most sophisticated of these pre-engineered systems can be triggered automatically or manually and offer the option of either an "appliance-specific" design, where nozzles are aimed at particular fire hazard areas of each appliance, or an "overlapping" design, where discharge nozzles are configured to overlap and provide a "fire-free zone" across a group of appliances. Both types are renowned for quickly detecting and suppressing high temperature cooking oil fires, using proven fusible-link or pneumatic tubing detection and release system technology. Immediately the system detects a fire, the gas or electric power to appliances is cut-off.

By definition a tailored, bespoke or engineered solution cannot undergo any performance testing regime; performance can be substantiated only by theoretical calculation and so cannot possibly be claimed to comply with UL 300.

The "appliance-specific" design invariably provides the most economical use of the suppression agent, as it reduces the size or number of storage cylinders and associated hardware. However, when flexibility and simplicity are particularly important considerations, "overlapping" design nozzles are placed in a straight-line arrangement, providing overlapping agent discharge patterns. This creates a virtual fire-free zone where appliances of various types and sizes are protected, even if they are replaced or rearranged under the hood.

Agent Selection.

Until the early 1990s, the predominant fire suppression agent for kitchen systems was dry chemical powder. However, with the advent of UL 300 this has been superseded by higher-performing wet chemical systems. Indeed, I believe it is correct to state that no dry chemical systems have ever passed the UL 300 testing standard.

The most advanced wet chemical suppression agents used in pre-engineered kitchen fire suppression systems are designed to ensure vapour containment and cooling of the cooking appliance, plenum, and ductwork areas to help prevent re-ignition after initial flame knockdown. These advanced formulations quickly knock down flames and cool hot surfaces, while generating a robust vapour-securing blanket that helps prevent re-ignition. A bonus is that, with a nearly neutral pH, this suppressant is exceptionally friendly to cooking equipment and does no harm to stainless steel surfaces.

Portable Suppression.

Agent selection is equally important when considering portable hand-held extinguishers, due to the nature of Class F fires that involve cooking oils and fats such as olive oil, maize oil, sunflower oil, lard and butter.

Portable extinguishers perform a valuable “first line of defence” role in achieving fire safety in kitchens and, like fixed kitchen fire suppression systems, have a number of regulations and standards to which they must comply. These include: AS/NZS 1850: 2009 (Portable fire extinguishers - Classification, rating and performance testing); AS 2444: 2001 (Portable fire extinguishers and fire blankets - selection and location); AS/NZS 1841.1: 2007 (Portable fire extinguishers - general requirements); AS/NZS 1841.3: 2007 (Portable fire extinguishers - specific requirements for wet chemical type extinguishers); and UL 300, which stipulates that a Class K portable – the US classification for Australia’s Class F – fire extinguisher is now required in all commercial kitchens.

About Delta Fire

Delta Fire are safety experts that serve the firefighting and rescue sectors along with commercial and industrial organisations. Our specialisation is in high-hazard fire protection and our customers include numerous fire and rescue organisations and blue-chip organisations. These include Virgin Blue, Qantas, Thiess Construction, Shell, Fremantle Ports, BP Petroleum, Neumann Petroleum, and Royal Vopak.

We are national fire safety organisation with headquarters in Queensland and operation in Brisbane, Sydney and Melbourne. Along with our authorised distributors in South Australia and Perth, we are able to provide a consistently high level of service all across Australia.

Our outstanding industry reputation has gained us the trust that has allowed us to partner with some of the world's premier fire safety and firefighting equipment manufacturers. These include Amerex, Firetrace International, Janus Fire Systems, Shilla Fire Equipment, and Tyco's Svenska Skum and Ansul businesses.

Free Call : 1800 335 823 473
Phone: +61 7 3349 7817
Email: sales@deltafire.com.au
Web: www.deltafire.com.au

DELTAFIRE®
AUSTRALASIA PTY LTD