PROFESSIONAL

Innovative Kitchen Concept

Odour
Grease
Removal Series

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OGR

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Introduction of cooking emission

Commercial food cooking is a known source of air pollution, in which cooking fume is generated when food is heated with oil at high temperatures by various cooking methods, for examples, frying and grilling. Cooking fume, technically known as 'cooking emission', involves a complex mixture of substances such as aerosol grease and oil droplets, combustion products, particulate matter, volatile organic compounds, water vapour as well as odours.[1]

Production of various harmful organic compounds

During cooking, the pyrolysis of proteins and degradation of sugars and lipids lead to the formation of fatty acids, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), including aldehydes, alcohols, ketones, alkanes, phenols and acids.[2] In particular, significant concentrations of polycyclic aromatic hydrocarbons (PAHs), aromatic amines (AAs) and heterocyclic amines (HCAs) are also found in cooking emission.[3]

Cooking emission can be hazardous as it contains many mutagens and carcinogens such as HCAs and PAHs as mentioned. A number of epidemiological studies indicate that there is strong correlation between direct exposure to cooking emission and the development of rhinitis, reduced lung function[4], heart diseases as well as lung cancer.[5] Moreover, particulate matter generated during the cooking process exhibits toxic effects in pulmonary, cardiac and reproductive levels.[6]

Fire risks due to accumulation of grease

Oils and fats are altered from solid or semi-solid state to vapours during cooking, and they are carried from the cooking surface into the kitchen hood by negative pressure generated by the ventilation system. The oil vapours then condense when temperature drops. These grease residues are combustible, with the ignition temperatures generally lower than that of the original cooking oil. Eventually, once these grease residues accumulate in sufficient amount, they form flammable mixtures and cause the outbreak of fires easily.[7] Therefore, accumulation of grease in the kitchen exhaust system is one of the most serious hazards to a commercial cooking area.

Common solutions to cooking emission

A wide range of cooking emission control equipment is available, mainly by means of physical filtration or adsorption. However, each of them has its own strengths and drawbacks, and the cooking emission removal efficiency is variable.

Control Equipment	Advantages	Disadvantages
Grease Filters	· Simple installation and operation · Easy to clean and maintain	· The removal efficiency is low. · Filters need to be regularly maintained and cleaned.
Electrostatic Precipitators	· High removal efficiency with proper maintenance	· Frequent cleaning is required if no auto-cleaning system is installed. · No gaseous odour removal · Potential fire risk · High voltage safety hazard · Creates secondary pollution
Hydrovents	· Simple installation and operation · Easy to clean and maintain	· The removal efficiency is low. · Small oil droplets cannot be removed effectively. · Potential fire risk · Creates secondary pollution
Water Scrubbers	· Effective to control oil and odour if appropriate scrubbing agent is used	· Occupies more space · Relatively high pressure drop · Generates waste water discharge · May generate secondary odour

Source : Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems prepared by Department of Environment, Food and Rural Affairs, UK.

1. IARC (2002). Vol 95. Household use of solid fuels and high temperature frying.
2. Svendsen et al. (2002). Exposure to cooking fumes in restaurant kitchens in Norway. Ann Occup. Hyg.
3. Felton J (1995). Food mutagens: the cooking makes a difference. Sci. Technol. Rev.
4. Ng et al. (1994). Epidemiology of allergic rhinitis and its associated risk factors in Singapore. Int J Epidemiol.
5. Dubrow and Wegman (1984). Cancer and occupation in Massachusetts: A death certificate study. Am. J. Ind. Med.
6. Ostiguy et al. (2008). Health effects of nanoparticles. Report IRSST R-589, Montreal.
7. A Guide for Commercial Kitchen Fires. (2012) Phillip Ackland Holdings Ltd.

Odour Grease Removal Series

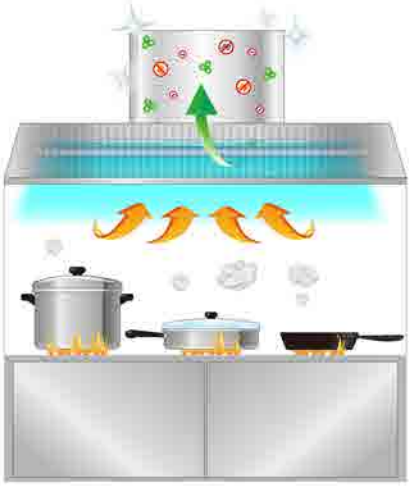
Principle of BioZone OGR Series

The BioZone OGR Device has been specially designed for kitchen exhaust system to remove the cooking emission effectively.

PhotoPlasma™ are generated by BioZone OGR Device, which are reactive oxygen species, free radicals and photons that actively destroy and break down the biological and chemical structures of airborne contaminants.

In the food industry, oil and grease in cooking emission are largely composed of edible fats of plant and animal origin, which are made up of fatty acids. Fatty acid is characterized as a long aliphatic hydrocarbon chain with a carboxylate group at the end.

Therefore, the grease and oil produced during cooking process are readily decomposed by PhotoPlasma™, which eventually convert them into harmless end-products such as carbon dioxide, water molecules and a small amount of polymerized, powder-like grease molecules. Meanwhile, the hazardous organic pollutants including PAHs and VOCs, as well as unpleasant odours created in the cooking process can also be eliminated quickly by the action of PhotoPlasma™.

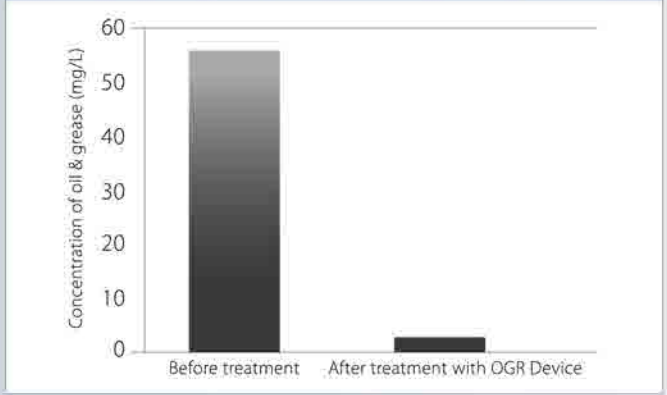


Performance Analysis of OGR Series

Case Study 1

A large-scale Food Production Centre released large amount of cooking odour and fumes from the exhaust system. OGR Device was installed and glass plates were placed inside the exhaust system for collecting oil and grease passing through.

Reduction oil & grease before and after BioZone Treatment*



Also, the odour intensity of cooking exhaust was greatly reduced by olfactory assessment.

Case Study 2

A Commercial Kitchen of a luxury hotel emitted large amount of cooking fumes and caused the accumulation of grease and oil at the ductwork. OGR Device was installed at the kitchen hood and glass plates were placed at the exhaust duct for collecting oil and grease accumulated.

Concentration of oil & grease before and after OGR installation*		
Conc. of oil & grease (mg/L)#	With OGR	Without OGR
1 day after set up of OGR	<7	48
2 days after set up of OGR	<7	54
10 days after set up of OGR	7	49

** Validation reports are prepared by SGS Hong Kong Limited.*
 # The saturation point of glass collector plate for oil & grease is approximately at 50mg/L.

OGR

Competitive Features of BioZone OGR Series

- High removal efficiency of oil and grease, thus significantly reduces ductwork cleaning.
- Minimizes fire risks : Large amount of oil and grease generated by cooking area are quickly decomposed by PhotoPlasma™ before reaching the exhaust air duct. Thus there is less risk of accumulating combustible residues within the kitchen exhaust system.
- Capability of removing biological, chemical contaminants and unpleasant odours.

Capability of removing biological, chemical contaminants and unpleasant odours			
H5N1 Avian Influenza	*99.9998%*	*Benzene*	*95%*
Surface bacteria	*99.99%*	*Benzo [a] pyrene*	*97.5%*
TVOCs	*96%*	*Hydrogen sulphide*	*100%*
Formaldehyde	*100%*	*Ammonia*	*99%*

- Safe :
  Oil and grease, as well as other hazardous chemical compounds, are broken down and converted into harmless products such as carbon dioxide and water. No secondary contamination produced throughout the purifying process.
- Low pressure drop and noise nuisance
- Energy-saving
- Easy to install, operate and maintain

Technical Specification of BioZone OGR Series		
Model	*BSI-OGR10-40*	*BSI-OGR10-60*
*Air flow rate**	*1,600 CMH*	*2,400 CMH*
Electrical power	*210 W*	*320 W*
Electrical current	*2.1A*	*2.1A*
Lamp length	*1,000 mm*	*1,555 mm*
Lamp diameter	*19 mm*	*19 mm*
Operating temperature	*0-100 °C*	*0-100 °C*
Operating hours	*>10,000 hrs*	*>10,000 hrs*

** Calculation based on typical Western commercial kitchens*