

空氣質素指標檢討
業界諮詢會議

Review of the Air Quality Objectives (AQO)
Stakeholders Engagement Meeting

控制飲食業油煙排放

Cooking emission control

AECOM



**Environmental Protection
Department**

28 August 2017

會議議程 Agenda

1. 空氣質素指標檢討 - 背景資料

AQO Review - Background

2. 探討進一步減少控制飲食業油煙的排放措施的可行性

Discuss the practicability to further control the emissions from cooking

3. 其他事項

Any Other Business

空氣質素指標檢討 - 背景資料

The AQO Review - Background

空氣質素指標 vs 世衛的《空氣質素指引》及中期目標

AQO vs WHO Air Quality Guidelines (AQG) and Interim Targets (IT)

綠色方格為現行空氣質素指標
Current AQOs in Green

		世衛中期目標 (微克/立方米) WHO Interim Targets (ug/m ³)			世衛《指引》 (微克/立方米) WHO AQG (ug/m ³)
		IT-1	IT-2	IT-3	
	10分鐘 min		--		500
二氧化硫 SO ₂	24小時 hr	125	50		20
可吸入懸浮粒子 RSP(PM ₁₀)	24小時 hr	150	100	75	50
	1年 Annual	70	50	30	20
微細懸浮粒子 FSP (PM _{2.5})	24小時 hr	75	50	37.5	25
	1年 Annual	35	25	15	10
二氧化氮 NO ₂	1小時 hr		--		200
	1年 Annual		--		40
臭氧 O ₃	8小時 hr		160		100
一氧化碳 CO	1小時 hr		--		30,000
	8小時 hr		--		10,000
鉛 Pb	1年 Annual		--		0.5

檢討空氣質素指標 The AQO Review

- 《空氣污染管制條例》 的要求
Requirement in the Air Pollution Control Ordinance (APCO)
- 環境局局長最少每五年檢討一次
Secretary for the Environment to review at least once every five year
- 向環境諮詢委員會(環諮會)呈交檢討報告
Submit review report to the Advisory Council on the Environment (ACE)



工作展望 Action Ahead

持份者及各專家透過工作小組參與討論
Engaged experts and stakeholders to form working group



- 建議切實可行的空氣質素改善措施(主要污染源)
- Identify Potential measures for improving air quality (Key Sources)

進行中
In progress

- 評估現時空氣質素狀況、排放估算
- Evaluation of current air quality data, emission reduction estimation, etc.



Q2
2016 –
Q3 2017

- 檢視及評估已建議的措施
- Review & Assessment of the proposed measures

公眾參與
Public Engagement

Q3-Q4
2017

- 提供檢討結果初稿
- Draft the review findings



Q4 2017

- 向環境局局長匯報檢討結果
- Report to Secretary for the Environment



Mid 2018

- 向環境諮詢委員會及環境事務委員會報告
- Report to Advisory Council on Environment and LegCo EA Panel

Q3 2018

- 公眾諮詢
- Public Consultation



2019

- 建議新的空氣質素指標
- Propose New AQOs



空氣質素指標檢討工作小組

AQO Review Working Group



實施可行性

Practicability for Implementation



短期措施 Short term	可能在2025年或以前可見成效 Likely to produce results by 2025 or earlier
中期措施 Medium term	於下一次檢討期間再作考慮 Maybe ready for consideration in the next AOQ Review period
長期措施 Long term	需要更詳細規劃或進一步研究以確定在下一個檢討期以後的實施可行性 Require detailed planning or further study to ascertain the practicability for implementation beyond the next Review period
其他 Others	非切實可行, 不具改善空氣質素的效益或合乎是次檢討範圍 Considered as not practicable, short of air quality improvement benefits or not suitable to be considered under the current scope of the Review

其他排放源

Other Emission Sources



含揮發性有機化
合物的產品

VOC-
containing
Products

非道路移動機械

Non-Road
Mobile
Machinery



煮食油煙

Cooking Fumes

民用航空

Civil Aviation



持份者的參與 Stakeholders' Engagement

在檢討空氣質素指標過程中，與相關持份者探討減少飲食業油煙的排放措施的可行性。

Engage the relevant stakeholders to explore the possibility of reducing emissions from cooking in the AQO Review.

**探討進一步減少控制飲食業油煙
的排放措施的可行性**

**Discuss the practicability to further
control the emissions from cooking**

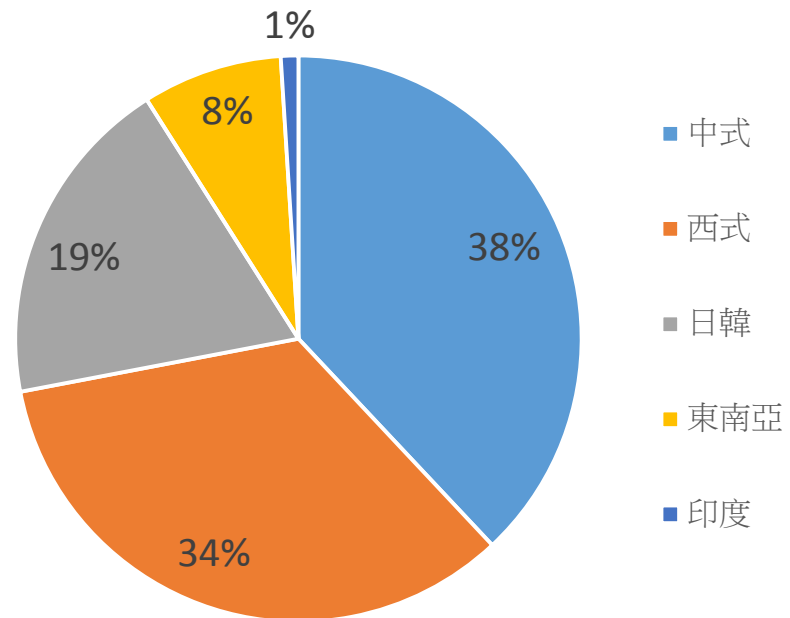
背景: 飲食業油煙在香港的排放

Background : Emission in Hong Kong

烹飪過程可產生大量空氣污染物，包括懸浮粒子 (PM)，超細懸浮粒子 (UFP)，多環芳香烴 (PAH)，揮發性有機化合物 (VOC) 和羰基 (carbonyls)。其中一些更是致癌的。

Cooking process can generate large quantities of air pollutants include particulate matters (PM), ultrafine particles (UFPs), polycyclic aromatic hydrocarbons (PAHs), VOCs and carbonyls some of which are carcinogenic

不同類型餐廳在香港的分佈



背景: 飲食業油煙在香港的排放 (2015)

Background : Emission in Hong Kong (2015)

	可吸入懸浮粒子 RSP (tonnes)	微細懸浮粒子 FSP (tonnes)	揮發性有機化合物 VOC (tonnes)
2015 香港空氣污染物總排放 2015 Hong Kong Air Pollutant Emission Inventory	5,430	4,300	26,610
非燃燒源總排放 Total emission under "Non-Combustion" source sector	910	470	15,320
煮食油煙排放 Cooking emission	210 (全港比率 HK : 4%) (類別比率 Source sector 23%)	140 (全港比率 HK : 3%) (類別比率 Source sector: 30%)	490 (全港比率 HK : 2%) (類別比率 Source sector: 3%)

背景: 現行控制油煙排放的措施

Current practice in Controlling cooking emission

• 法規Regulatory Process:

- ① 環保署:《空氣污染管制(火爐、烘爐及煙囪)(安裝及更改)規例》APC (Furnaces, Ovens and Chimneys) (Installation and Alteration) Regulations (IR Regulations)

	每小時總耗量 Fuel consumption per hour
液體燃料 conventional liquid fuel	25公升(litres) 或or
固體燃料 conventional solid fuel	35千克(kg) 或or
氣體燃料 gaseous fuel	1150兆焦耳(MJ)

- ② 規劃署:香港規劃標準與準則Hong Kong Planning guidelines;
- ③ 食物環境衛生署申請食肆牌照要求FEHD licensing requirement

• 飲食業夥伴計劃Partnership:

工作 與業界進行夥伴計劃提供技術支援有關問題改善食肆的環保表現和環境
Co-operation with trade to provide technical support and improve the environmental performance

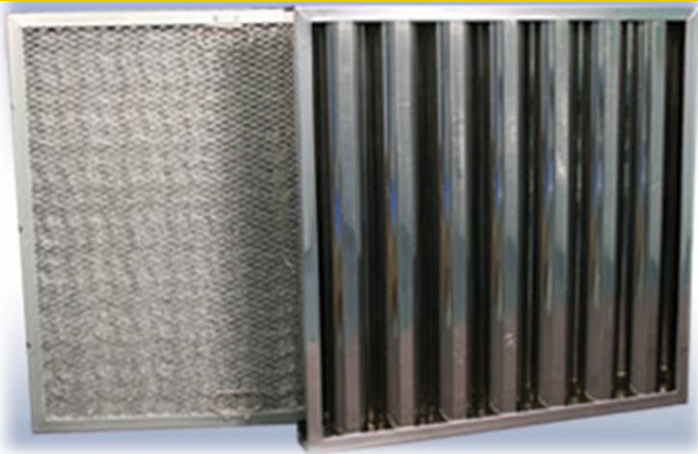
可能實施的新措施

New possible measures

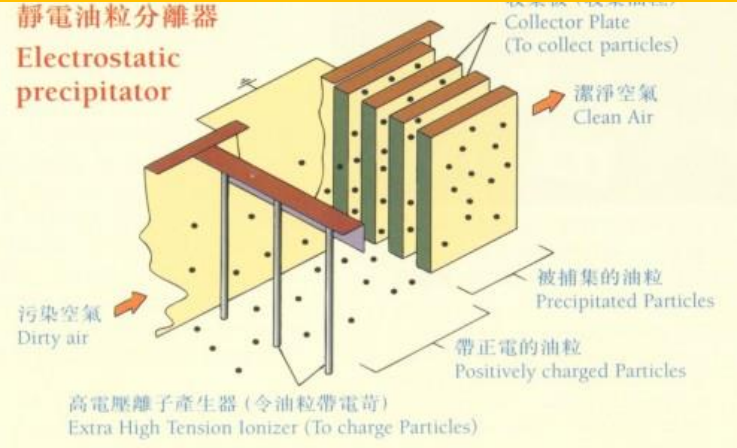
- 1. 研究新式飲食業防污設備 (例如: 一次性濾網、紫外光/臭氧洗滌法系統)於不同類型餐廳的應用的可行性**
Explore the feasibility of using new types of air pollution control equipment (e.g. disposable wool-fiber filter, UV-Ozone system) for cooking fume control in different types of restaurants
- 2. 推廣「低排放」煮食 (例如: 使用潔淨和高效爐頭及健康煮食方法等)**
Promote "low-emission" cooking (e.g. use of clean and efficient cooking stoves and healthy cooking style, etc.)

常用的飲食業防污設備

Existing filtration and air cleaning systems



油煙隔 Grease filters



靜電除塵器
Electrostatic precipitators



洗滌器 Water scrubber



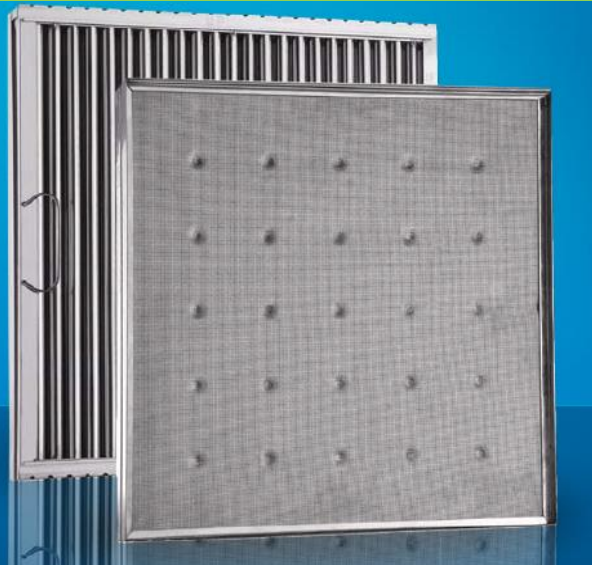
運水煙罩 Hydrovents

新式飲食業防污設備

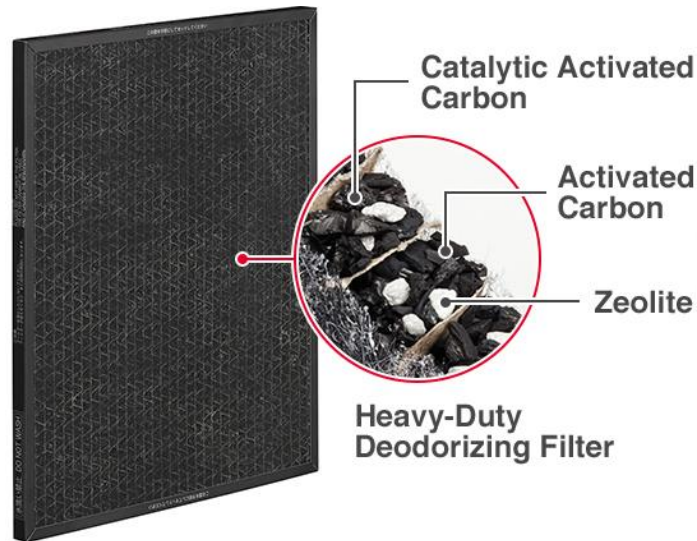
New types of air pollution control equipment

多層組合式濾網

Multi-stage combo filter

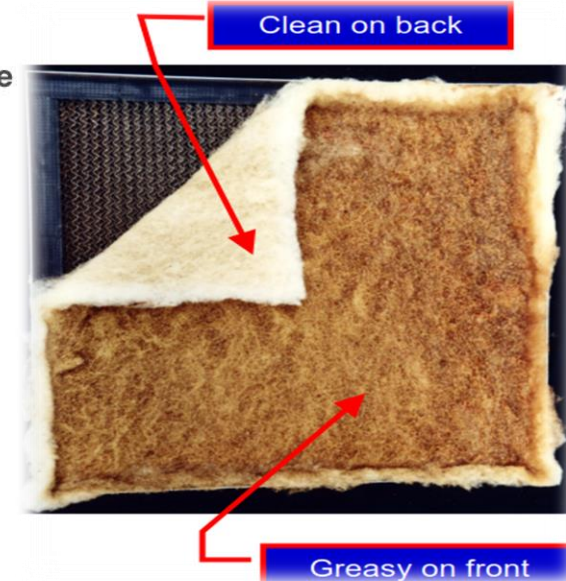


蜂巢式活性炭除臭濾網/陶瓷濾網
Honeycomb activated Carbon
Deodorize Filter/ceramic filter



羊毛纖維濾網

Wool-fiber type filter



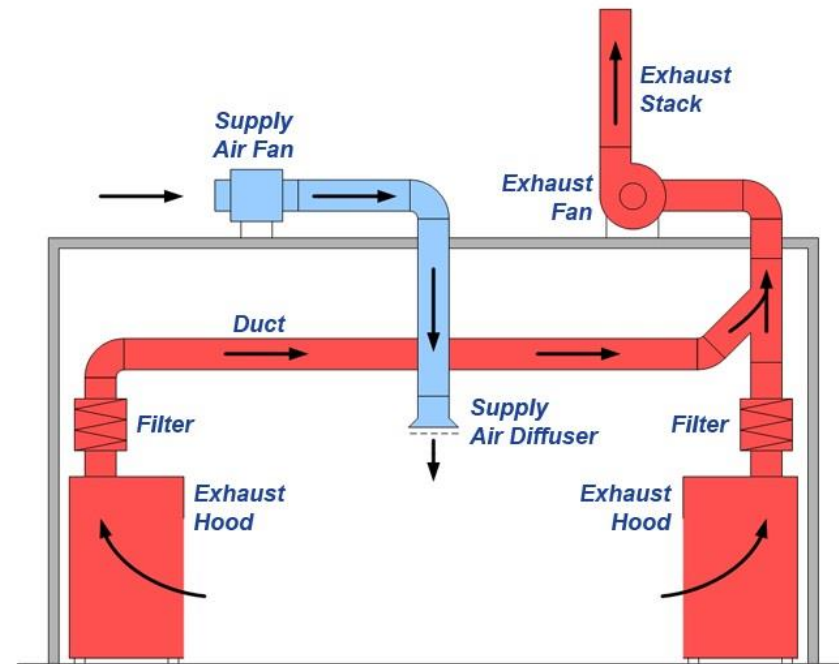
空氣稀釋系統 Air Dilution System (1)

- 香港普遍使用 “強制通風” 或空調系統

Hong Kong is using “forced ventilation” or air condition system

- 空氣稀釋系統不同之處是在風扇入口之前，將新鮮的外部空氣引入排氣管或廚房空間

Involves introducing fresh outside air into exhausts ducts or into kitchen space before the fan inlet



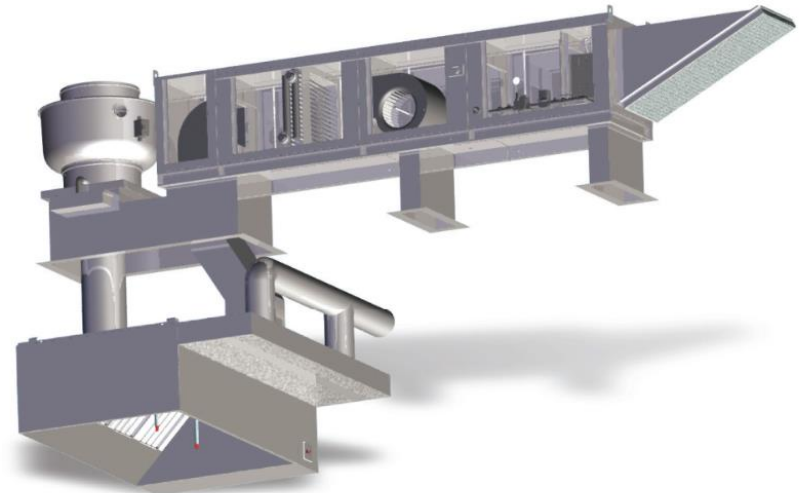
空氣稀釋系統 Air Dilution System (2)

- 一般而言，混合兩成(20%)室外空氣並配合適當的排放速度可稀釋油煙濃度

Generally speaking a 20% mixture of outside air would be induced in diluting the fume concentration and paired with proper discharge speed

- 在歐洲和美國已有廚房排氣管和廚房空間稀釋系統的設計

The matured design of air dilution system for both kitchen exhaust duct and kitchen space had been seen in Europe and US



中和氣味洗滌法 Odour Neutralization System

- 原理是把中和氣味的化學品引入氣流

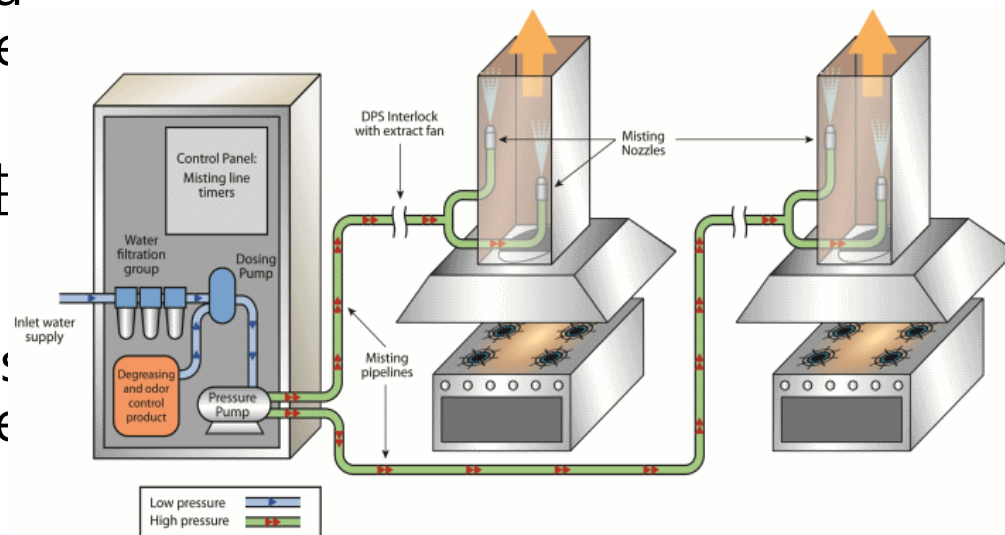
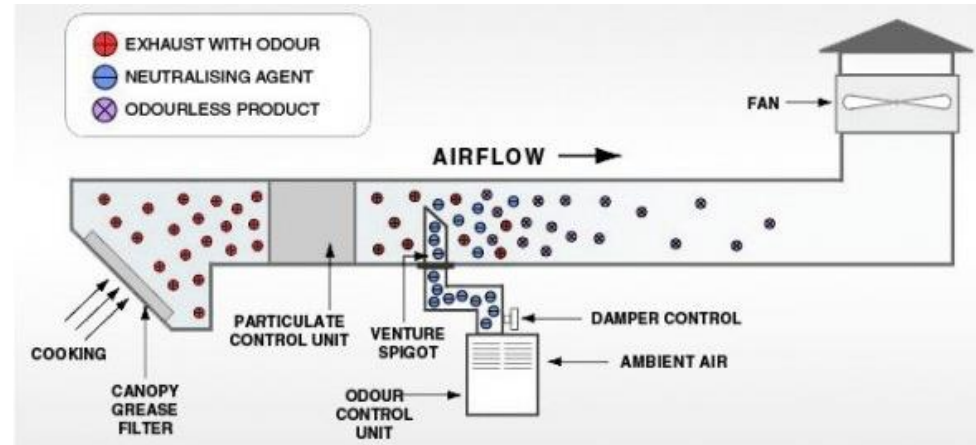
Working principle: Spraying an odour neutralizing chemical into the air stream

- 「中和劑」能與排放中的廢氣發生化學反應

“Neutralizing agents” would trigger chemical reactions in the exhausted air

- 可處理能滲透油煙隔的細小油脂顆粒

Likely to handle smaller particles which can penetrate the grease filter



氣味中和洗滌法 Odour Neutralization System

- 與油煙隔和木炭濾網不同，這種方法將需要安裝附加結構

Unlike those grease filter and charcoal filter, this method would require the installation of additional structures

- 中和劑的典型尺寸

0.5m×0.5m×0.3m

Typical dimension of neutralizer

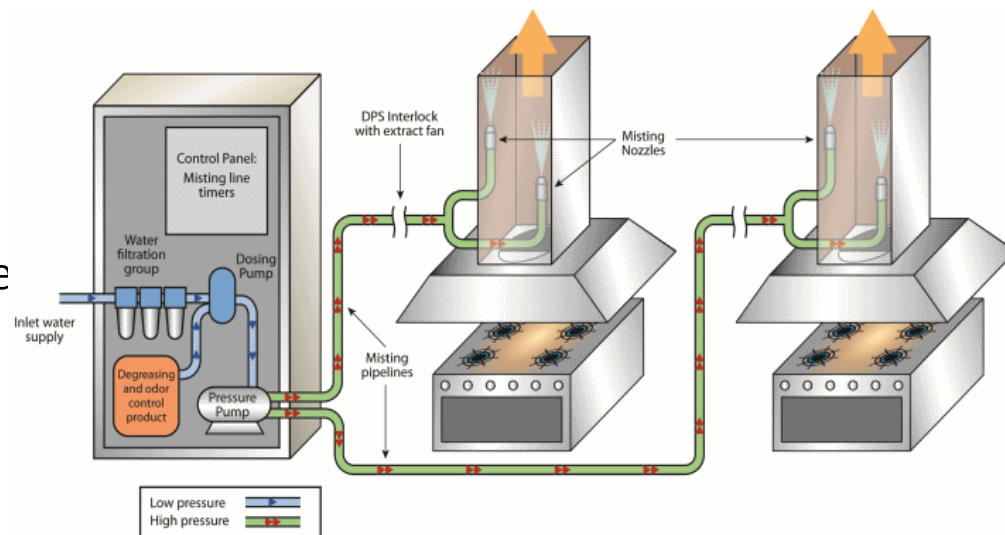
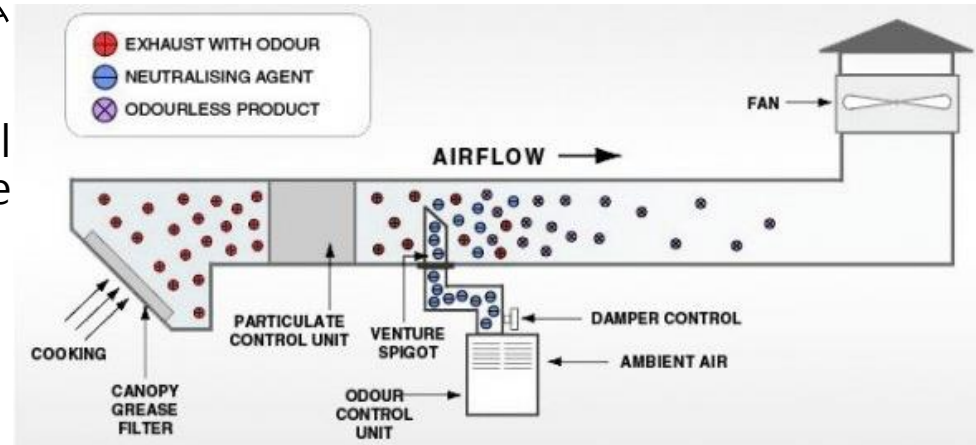
- 0.5m x 0.5m x 0.3m

- 控制系統及其他相關設備,例如:泵

1.8m x 1.00m x 0.50m

The control system and other associate equipment such as the pump

- 1.8m x 1.00m x 0.50m



紫外線-臭氧系統 UV-ozone system (1)

- 真空紫外光燈作為排放管道的二次處理

- 光和中和氣味和脂肪分子，效率高達90%以上

Vacuum UV lamp as secondary treatment for the emission in the exhaust duct

- Photolyzes and neutralizes the odour and fat molecules, efficiency of more than 90%

- 利用紫外線-臭氧不會同時產生污染物(如氮氧化物)，亦不受濕度的影響

UV-ozone generation would not produce collateral pollutants like NO_x, not be affected by humidity



紫外線-臭氧系統 UV-ozone system (2)

- 耐用，可以達13000個工作小時
Long life-time, can reach 13000 working hours
- 對於需要長期清除油脂和氣味而言，紫外光燈可能是更具成本效益的設備
UV lamp probably a more cost-effective equipment in removing grease and odour in the long term



種類 Types	蜂巢式活性炭除臭 過濾器/陶瓷過濾 器 Honeycomb activated Carbon Deodorize Filter / ceramic filter	多層組合過濾 器 Multi-stage combo filter	羊毛纖維過濾 器 Wool-fibre type filter	空氣稀釋系 統 Air Dilution system	中和氣味洗 滌法 Odour Neutralizati on system	紫外線/臭 氧洗滌法 UV-ozone system
技術 Technology	前端 Fore-end	前端 或後端 Fore-end or Rear-end	前端 Fore-end	後端 Rear-end	後端 Rear-end	前端 Fore-end
去除粒子效率 Particulate removal efficiency	約 90% Around 90%	約 90% Around 90%	約 95% Around 95%	0%	N/A 不適用	> 90%
除臭效率 Odour removal efficiency	Around 90% 大約 90%	Around 90% 大約 90%	Around 95% 大約 95%	Around 17% 大約 17%	N/A 不適用	> 90%
安裝位置 Area for installation	與抽油煙罩相連 Associated with hood	與抽油煙罩相連 或 排氣管中 Associated with hood or in exhaust ducts	與抽油煙罩相連 Associated with hood	排氣管中 或 安裝在廚房 Associated with exhaust ducts or in kitchen	與排氣管相連 Associated with exhaust ducts	在抽油煙罩 內 In the hood
需要專業人士安裝 或維修 Specialist for installation or maintenance						
成本 Capital costs						
維修及保養成本 Maintenance costs						
在小型食肆的應用 性 Applicability						

考慮要點 (有可能的措施1)

Key Considerations (Possible Measure 1)

- 市場上相關技術的成熟程度及使用趨勢
Technology maturity and trend of usage
- 在不同類型食肆的應用
Applications to different types of restaurants
- 對成本的影響
Capital and maintenance costs
- 保養方面的考慮
Maintenance and durability
- 業界反應
Trade reaction

可能實施的新措施

New possible measures

1. 研究新式飲食業防污設備 (例如: 一次性濾網、紫外光/臭氧洗滌法系統)於不同類型餐廳的應用的可行性
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Promote "low-emission" cooking (e.g. use of clean and efficient cooking stoves and healthy cooking style, etc.)

煮食方法 Method of cooking



Stir-fry



Pan-fry



Deep-fry



Soups



BBQ



Bake



Steam



Grill

不同的烹煮方式會釋放不同量和總類污染物

Different ways of cooking would have a significant impact on the amount of "unwanted" material released.

煮食爐頭的選擇 Choices of cooking Stoves

- 香港兩種主要的爐頭在Two major types of cooking stoves in Hong Kong
 - 煤氣爐頭
Town-gas cooking stoves
 - 電爐頭
Electric cooking stoves



考慮要點 (有可能的措施2)

Key Considerations (Possible Measure 2)

- 國際趨勢 International trend
- 對成本的影響 Cost implication
- 安全考慮及其他因素 Safety consideration and others
- 節省電力 Energy saving

謝謝

Thank You

