Creating Nano Technologies

旭鼎奈米科技股份有限公司

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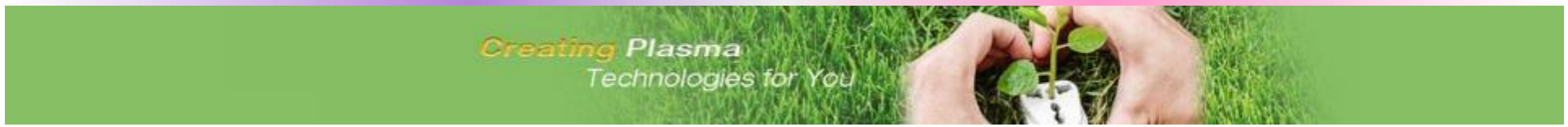
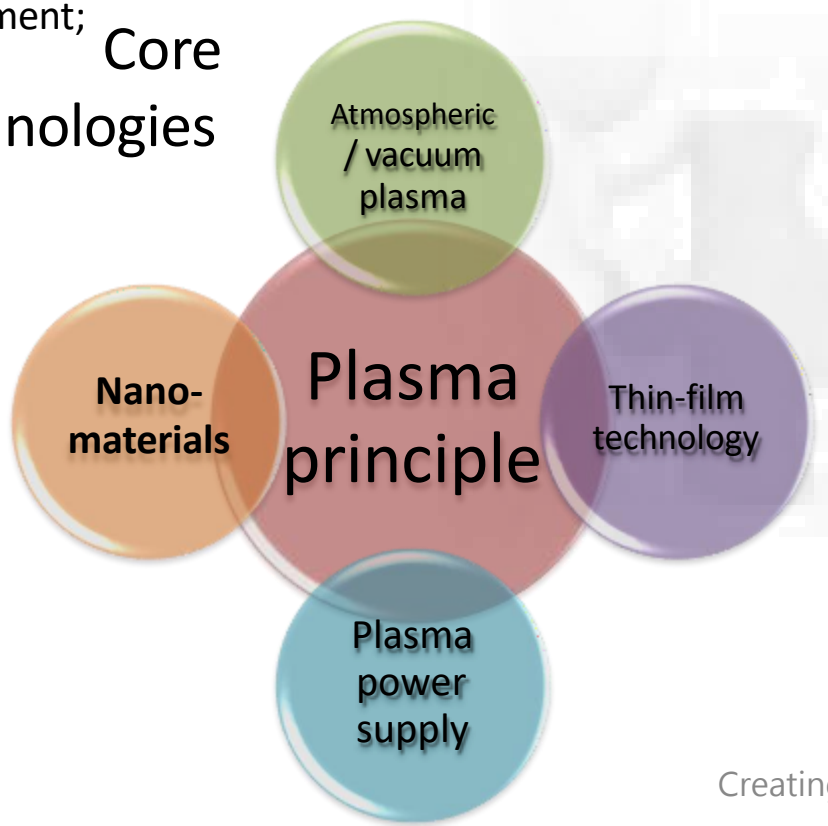


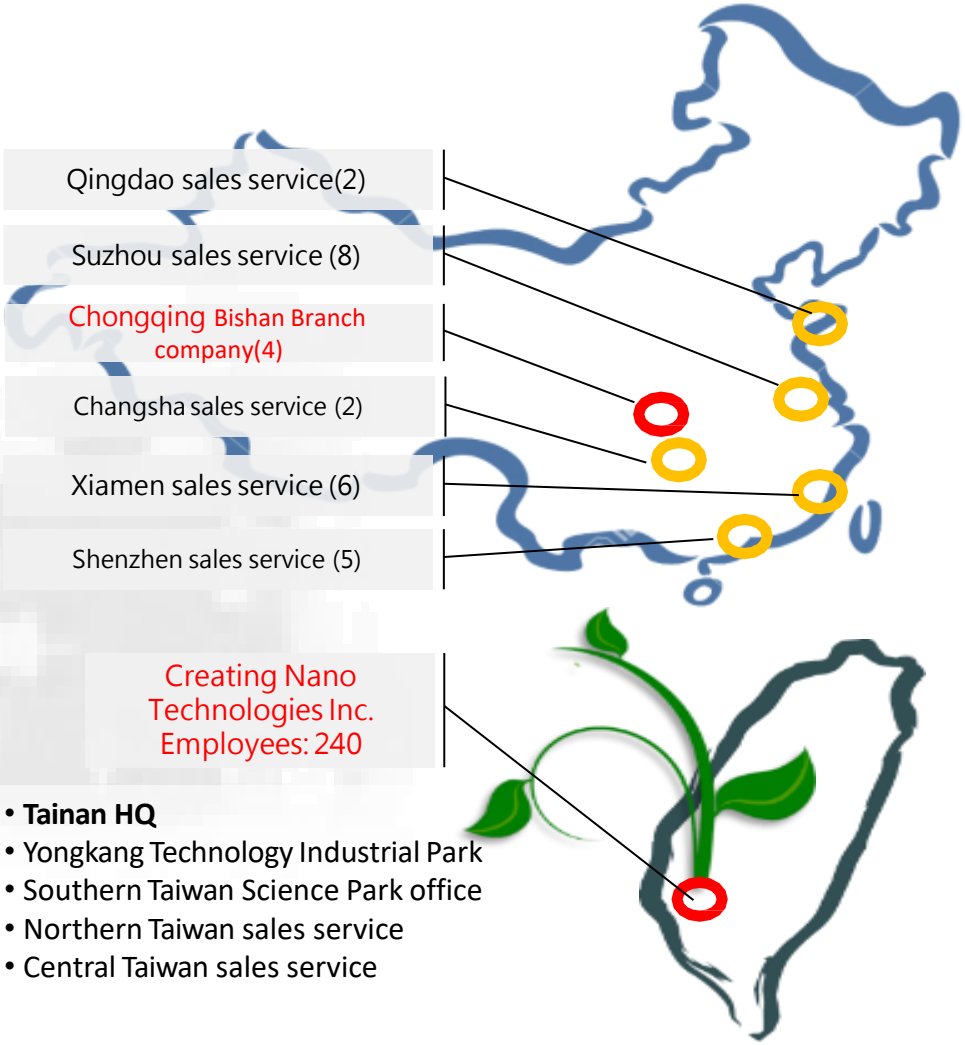
Overview

■ Creating Nano Technologies Inc.

1. Established on November 2001.
2. Main business : (1) atmospheric plasma equipment; (2) atmospheric coating equipment; (3) vacuum plasma equipment; (4) vacuum coating system; (5) plasma power supply; (6) spraying equipment;

Core Technologies





- **Tainan HQ**
- Yongkang Technology Industrial Park
- Southern Taiwan Science Park office
- Northern Taiwan sales service
- Central Taiwan sales service

Overview

■ Office

Yongkang Asia Pacific Industrial Zone

Headquarters/

Factory and assembly center

Southern Taiwan Science Park office

Branch office/

R&D Center

Overview

■ Office & factory

Chongqing Bishan High-tech Industrial Park

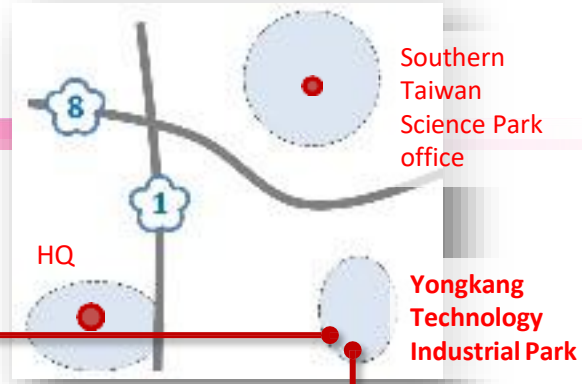
Branch company (2019)

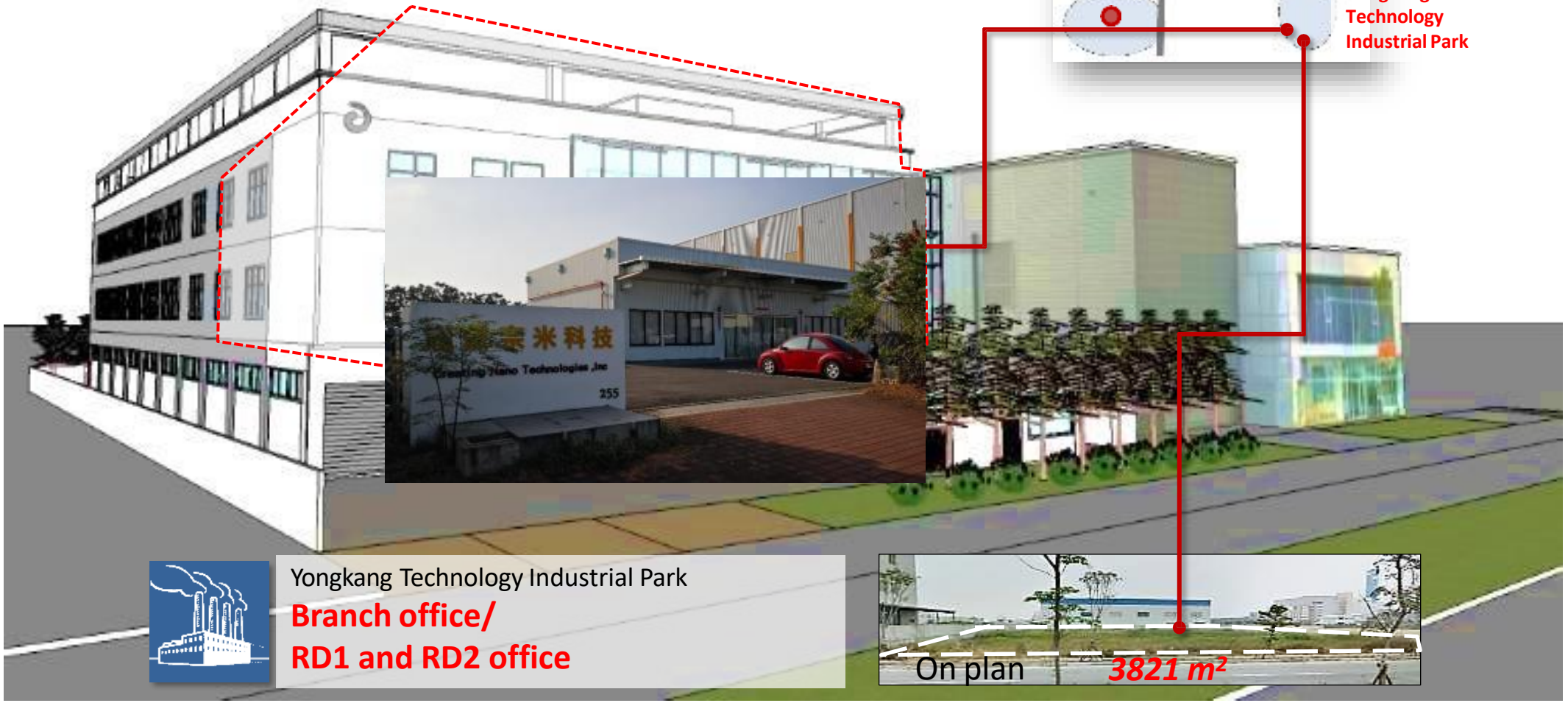
Chongqing Creating Innovative Technologies., Inc.

Overview

■ Office

First stage completed on 2017





History of CNT

2022
Plasma thinning /polishing

2001
DLC thin film

2020
Chemical/ nano-materials

2003 Atmospheric plasma power supply (point-type plasma)

2019
Piezoelectric material poling

2002
Vacuum plasma cleaner

2005 Contact angle meter

2004
Wide-area Atmospheric plasma (DBD)

2018
Plasma air purifier module

2014 Mask clean AP

2015
Deposition equipment for cutting tools

2007
Diamond thin films

2006
Plasma Desmear Equipment

2009 Hard-coating deposition for cutting tools

2014
AG/CC Spray equipment

2008
In line plasma equipment(clea ning / surface modification)

2013
Roll-to-roll cleaning equipment / surface treatment equipment

2011 Anti-fingerprint spraying equipment

2010 UV lamp

Research and Development Team

Chairman & Chief Technology Officer
Retired Prof. Franklin Chau-Nan Hong , National Cheng Kung University, Taiwan
Expertise: Plasma Principle, Thin Film Engineering, Nano Materials

Dr. Chun-Chin, Chen
Sales & R&D 7 menager

Dr. Yu-Ming Hsu
General Manager and R&D 1 manager

Ji-yung Lee
Power Supply (R&D 2 manager)

Yong-hao Chen
DBD plasma (R&D 3 manager)

Yan Zheng Chen
Automation (R&D 4 manager)

Dr. Leo Wang
Vacuum plasma (R&D 5 manager)

Dr. Shih-ming Huang
Thin-film deposition (R&D 6 manager)

Plasma Scrubber Products

Scrubber為使熱電漿分解含氟溫室氣體之設備，可與各種製程機台搭配，有效的破壞與分解產線所排出的廢氣，使其變成污染度較低的二氧化碳、二氧化氮等，以便於直接排放或後續處理。

特點

- 使用高溫電漿分解，可分解一般較難處理的全氟碳化合物等氣體。
- 使用價格低廉的N_2作為工作氣體
- 合理的耗材費用

•能快速的啟動且僅需極短的熱機時間即可開始處理廢氣 應用範圍

- 觸控面板空氣污染物的分解
- LCD面板空氣污染物的分解
- 軟性電路板空氣污染物的分解
- PCB 電路空氣污染物的分解
- 半導體產業空氣污染物的分解
- 紡織產業空氣污染物的分解
- 石化產業空氣污染物的分解
- 傳統化工產業空氣污染物的分解

Why Select Plasma scrubber

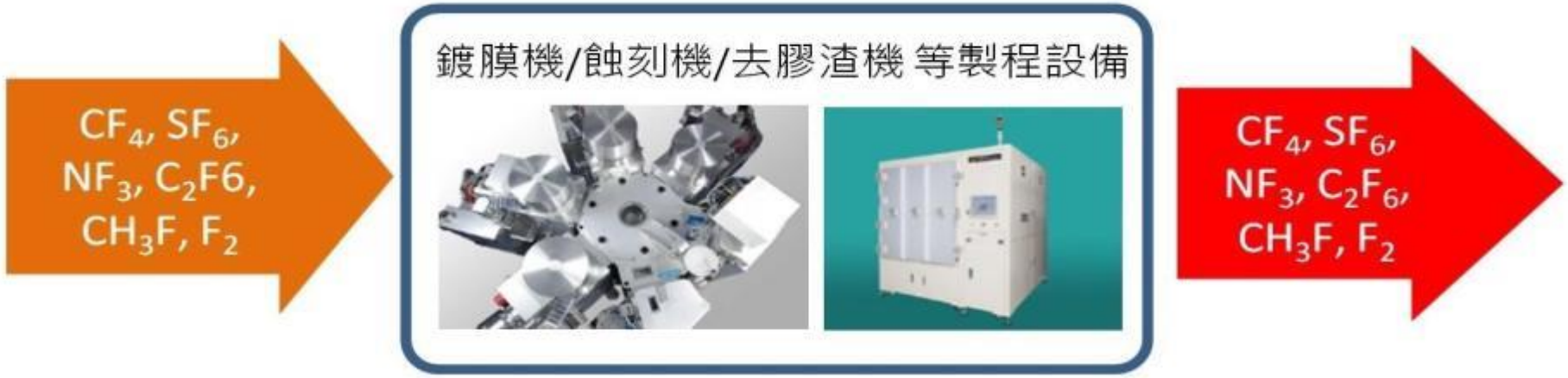


Table 1. Global warming potential and lifetime of greenhouse gases (AR6) [19].

Greenhouse Gases	Lifetime (Year)	GWP_{100}
CO_2	50–200	1
CH_4	12	27
CF_4	50,000	7380
SF_6	3200	24,300
C_2F_6	10,000	12,400
CHF_3	222	14,600
C_3F_8	2600	9290
C_4F_8	3200	10,200
NF_3	500	17,400

溫室氣體的使用與排放量

表一溫室氣體及其在空氣中的濃度

Table 1. Greenhouse gases and their atmospheric concentrations.

	CO_2	CH_4	N_2O	SF_6	CF_4	Ref.
全球變溫潛值 GWP_{100}*	1	25.0	298	23,500	6,630	[1]
在大氣中的壽命 Atmospheric lifetime, yr	30-95	12.4	121	3,200	50,000	[2]
工業化前的濃度 Pre-industrial atmospheric concentration	280 ppm	0.700 ppm	0.270 ppm	0 ppt	40 ppt	[2]
目前的濃度(C) Atmospheric concentration (C)	402 ppm	1.823 ppm	0.327 ppm	8.3 ppt	79 ppt	[2]
濃度變化率(R) Rate of concentration change (R)	2.3 ppm/yr	5 ppb/yr	0.8 ppb/yr	0.27 ppt/yr	0.7 ppt/yr	[2]
年增率(=R/C)	0.57%/yr	0.27%/yr	0.24%/yr	3.25%/yr	0.89%/yr	[this study]

2014年 全氟化物消耗量=11.7Gg

2014年 全氟化物排放量=3.375百萬公噸碳當量

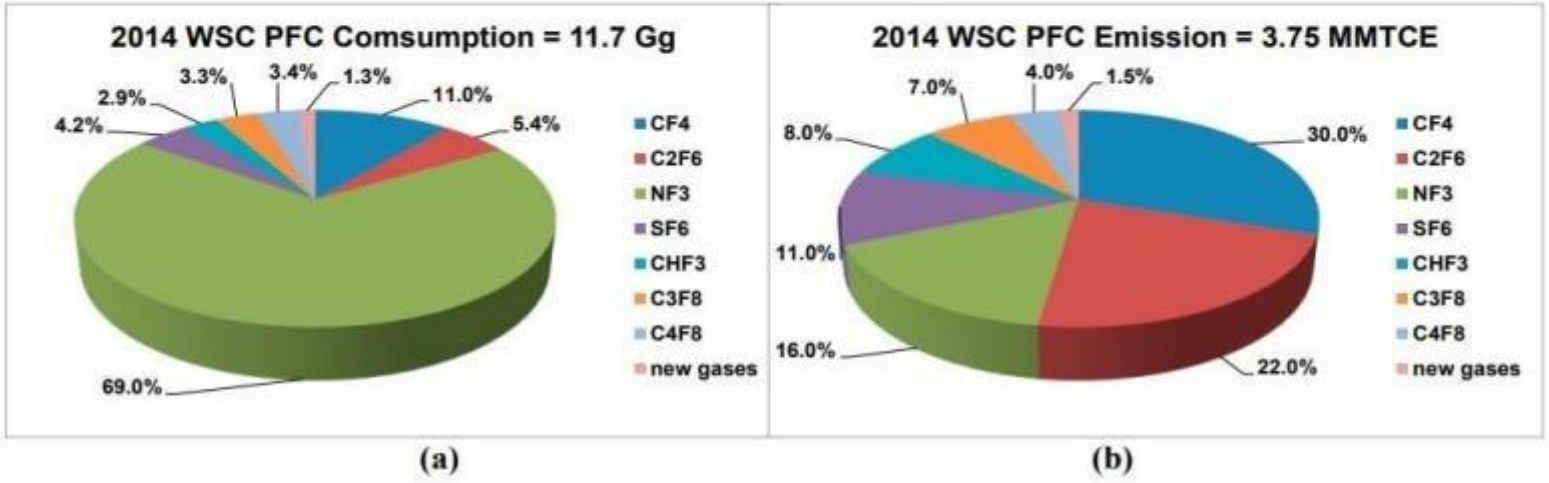


圖1.全氟化物消耗量及排放量

全氟化物的分解效率

鍵能:

N-F (272) < S-F(327) < C-F(485)

去除率:

$NF_3 > SF_6 > CF_4$

TABLE 8.6 Average Bond Dissociation Energies and Bond Lengths for Some Common Covalent Bonds

Bond	Energy (kJ/mol)	Length (pm)	Bond	Energy (kJ/mol)	Length (pm)	Bond	Energy (kJ/mol)	Length (pm)
H—H	432	75	N—H	391	101	F—F	154	142
H—F	565	92	N—F	272	136	F—Cl	253	165
H—Cl	427	127	N—Cl	200	175	F—Br	237	176
H—Br	363	141	N—Br	243	189	F—I	273	191
H—I	295	161	N—N	160	145	Cl—Cl	239	199
C—H	413	109	N=N	418	125	Cl—Br	218	214
C—F	485	135	N≡N	941	110	Cl—I	208	232
C—Cl	339	177	O—H	467	96	Br—Br	193	228
C—Br	276	194	O—F	190	142	Br—I	175	247
C—I	240	214	O—Cl	203	172	I—I	149	267
C—C	347	154	O—I	234	206	S—H	363	134
				6	148	S—F	327	156
				5	121	S—Cl	253	207
				8	143	S—Br	218	216
				5*	120	S—S	226	205
				2	113			

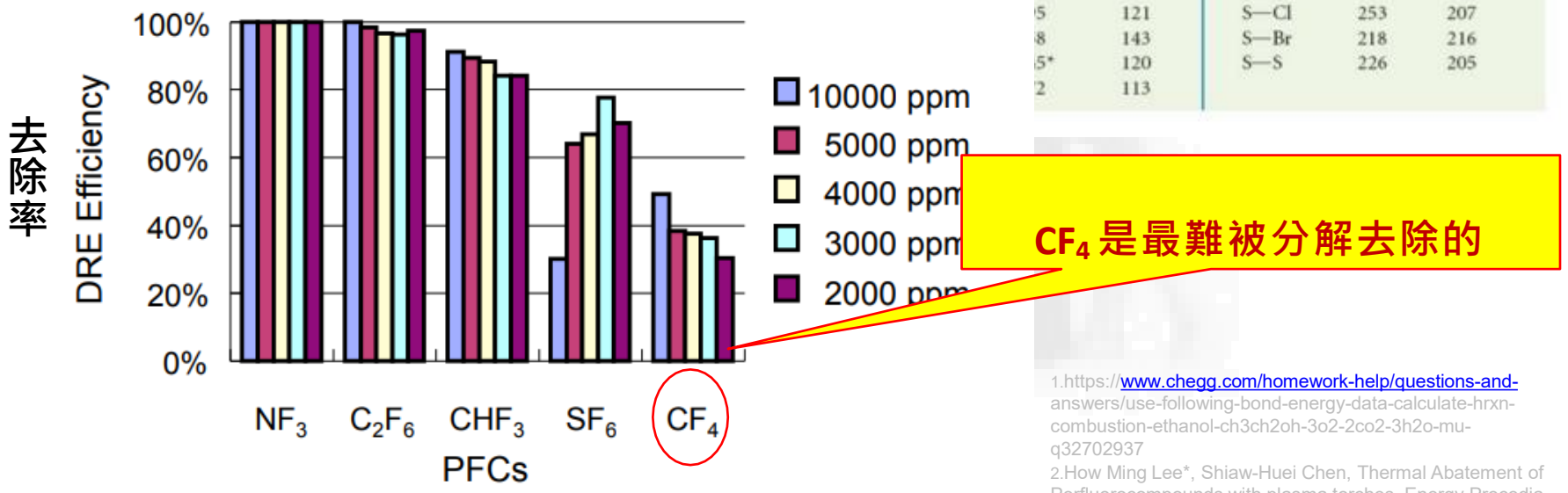


Fig. 5. Destruction and removal efficiencies (*DRE*) of five kinds of PFCs with thermal plasma torch.

1.https://www.chegg.com/homework-help/questions-and-answers/use-following-bond-energy-data-calculate-hrxn-combustion-ethanol-ch3ch2oh-3o2-2co2-3h2o-mu-q32702937

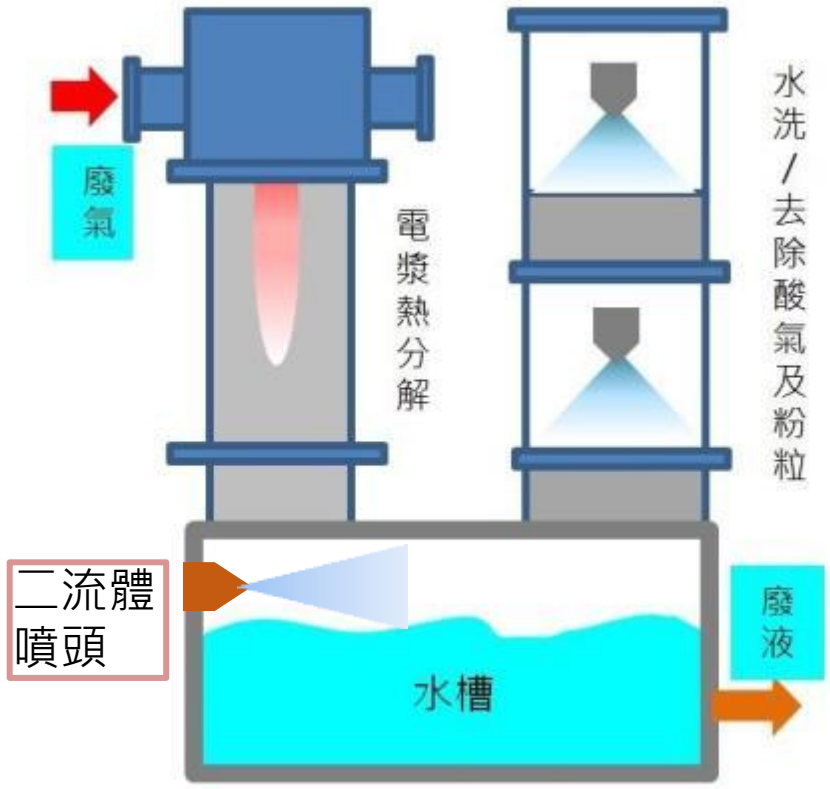
2.How Ming Lee*, Shiaw-Huei Chen, Thermal Abatement of Perfluorocompounds with plasma torches, Energy Procedia 142 (2017) 3637–3643

電熱、燃燒式與電漿式比較

洗滌方式		優點	缺點
電漿濕式 (電漿火炬)	DC電漿火炬 (低電壓高電流) (其他廠商)	• PFC 的高去除率 / 高處理能力 • 可以使用現有的公用設施管線 • 需有啟動輔助	電極壽命的限制註1
	AC電漿火炬註1 (高電壓低電流) (立達)	• PFC 的高去除率 / 高處理能力 • 可以使用現有的公用設施管線 • 易於啟動和關閉 • 電極壽命較長	**註1: 採用管式電極, 配合AC高 電壓電源,** 相較於DC電源, **能有效減 慢電極因高電流高溫造成腐蝕而提 高電極壽命。**
熱濕型 (電熱)		• 安裝成本低 • 低能耗 • 最普遍 • 簡單流程 • 可以使用現有的公用設施線路	• 電加熱器壽命的限制 • 處理能力低 • CF4 和 SF6 的 去除率不足 • 900°C以上電加熱器快速腐蝕 • 無法處理N_2O
濕燒型 (液化天然氣燃燒器)		• 技術成熟 • PFC 的高去除率 • 高處理能力	• 需要額外的燃燒氣且增加CO2排 放 • 積粉，爆炸和火災的隱患 • 需要額外的燃油管路，公用事 業線路投資高，且增加公安疑 慮。 • CF4 的 去除率不足 • 無法處理N_2O

Plasma Scrubber 電漿洗滌反應器

■ 二流體噴頭能高效率溶解HF並降低PM2.5



-電離（活化）

$CF_4 + e \rightarrow CF_3 + F + e$
$CF_4 + e \rightarrow CF_2 + 2F + e$
$CF_4 + e \rightarrow CF + F + F_2 + e$
$CF_3 + e \rightarrow CF_2 + F + e$
$CF_3 + e \rightarrow CF + 2F + e$
$CF_2 + e \rightarrow CF + F + e$
$H_2O + e \rightarrow \bullet OH + H \bullet + e$
$N_2 + e \rightarrow N_2^* + e$

$e + O_2 \rightarrow e + O_2^*(A) \rightarrow e + O(3P) + O(3P)$
$e + O_2 \rightarrow e + O_2^*(B) \rightarrow e + O(3P) + O(1D)$
$e + N_2 \rightarrow e + 2N$
$e + N_2 \rightarrow e + N_2^*(A,B)$
$e + N_2 \rightarrow e + N_2^*(C)$ (11.1eV)

-反應

$N_2^* + H_2O \rightarrow \bullet OH + H \bullet + N_2^*$
$\bullet OH + CF_3 \rightarrow COF_2 + HF$
$\bullet OH + CF_2 \rightarrow COF + HF$
$\bullet OH + CF \rightarrow CO + HF$
$\bullet OH + COF \rightarrow CO_2 + HF$
$N_2^*(A,B) + O_2 \rightarrow N_2 + 2O$
$N_2^*(A,B) + O_2 \rightarrow N2O + O$

$N_2^*(A,B) + O_2 \rightarrow NO + NO$
$O + O_2 + M \rightarrow O_3 + M$
$N + O_2 \rightarrow NO + O$
$N + NO \rightarrow N_2 + O$
$NO + O + M \rightarrow NO_2^* + M \rightarrow NO_2 + hv + M$
$(N_2O \rightarrow NO + N \text{ or } N_2 + O)$
$2NO + O_2 \rightarrow 2NO_2$
$N_2 + 2O_2 \rightarrow 2NO_2$
$O\bullet + C_nH_{2n+2(s)} \rightarrow CO_2 \text{ or } CO_{(g)} + C_xH_yO_{z\,(g)} + H_2O_{(g)}$

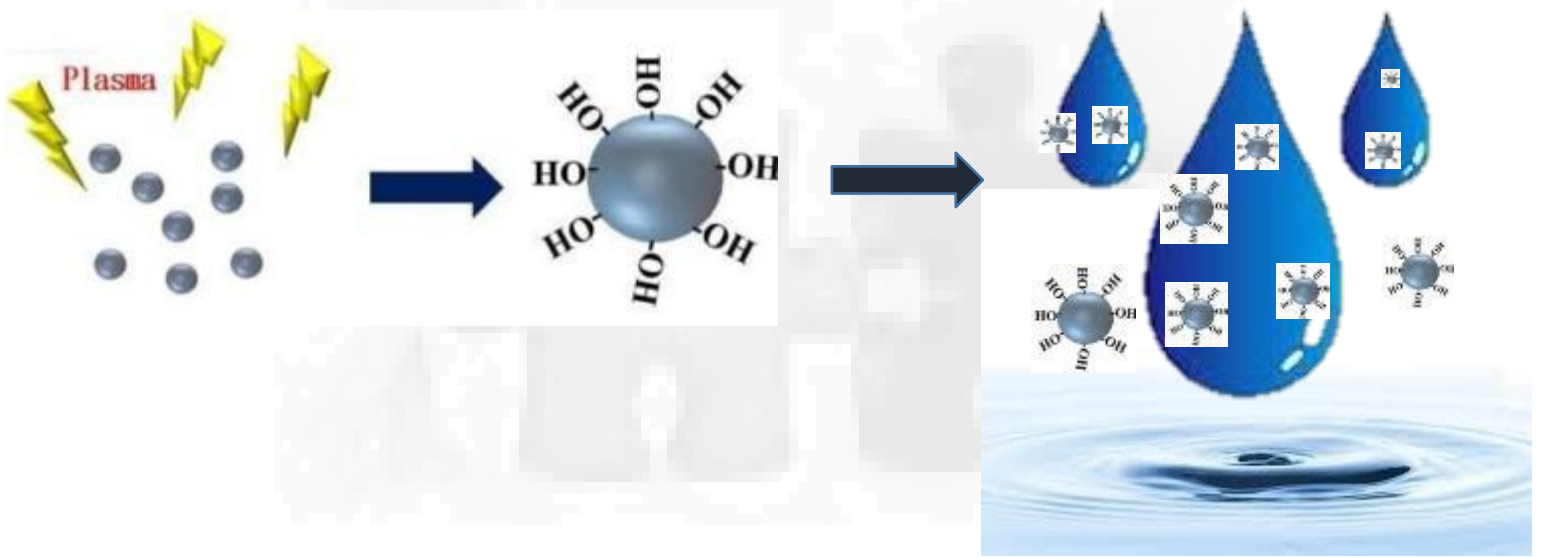
-中和和沉澱

$Ca(OH)_2 + 2HF \rightarrow CaF_2 + 2H_2O$
$Ca(OH)_{2\,(s)} + H_2O_{(l)} \rightarrow Ca^{2+} + 2OH_{(aq)} + H_2O_{(l)}$
$Ca(OH)_2 + 2HF \rightarrow CaF_2 + 2H_2O$
$Ca(OH)_2 + COF_2 \rightarrow CaF_2 + CO_2 + H_2O$
$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
$3NO_2 + H_2O_{(l)} \rightarrow 2HNO_{3\,(aq)} + NO$

Highly Efficient Thermal Plasma Scrubber Technology for the Treatment of Perfluorocompounds (PFCs) Hyun-Woo Park, Woo Byoung Cha*, and Sunghyun Uhm**,†
Development of a Combined Waterjet Plasma Scrubber for Tetrafluoromethane and By-Product Removal Young Nam Chun and Chae Hong Lee

Plasma Scrubber 電漿洗滌反應器

- PM2.3等顆粒, 經過電漿後表面接上OH管能基,這些改質過的微粒能夠輕易的溶到水裡。
- 二流體噴頭能產生更小粒徑的水滴, 增加了氣氮與液體的表面積, 進一步增加了微粒及HF溶在水滴中的溶解率



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Plasma Scrubber電漿分解機制

-水洗

$HF_{(g)} + H_2O_{(l)}$ □ $HF_{(aq)}$

$H_2O_{(l)}$ $SO_2 + H_2O_{(l)}$ H_2SO_3

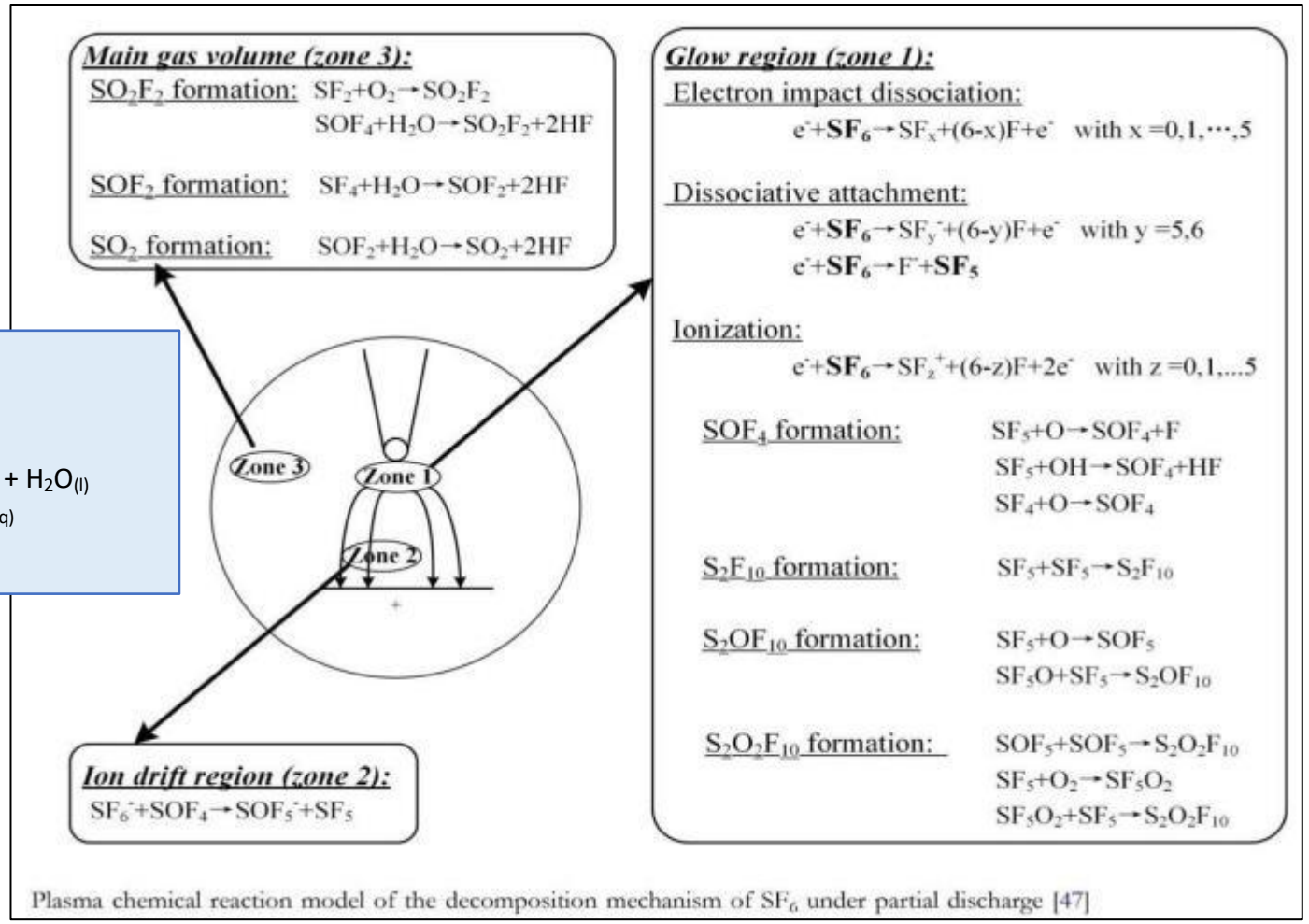
□

$SO_2 + 2NaOH_{(l)}$ $Na_2SO_{3\,(aq)} + H_2O_{(l)}$

$SO_2 + NaOH_{(l)}$ □ $NaHSO_{3\,(aq)}$

$SO_2 + Ca(OH)_2$ □ $CaSO_3$

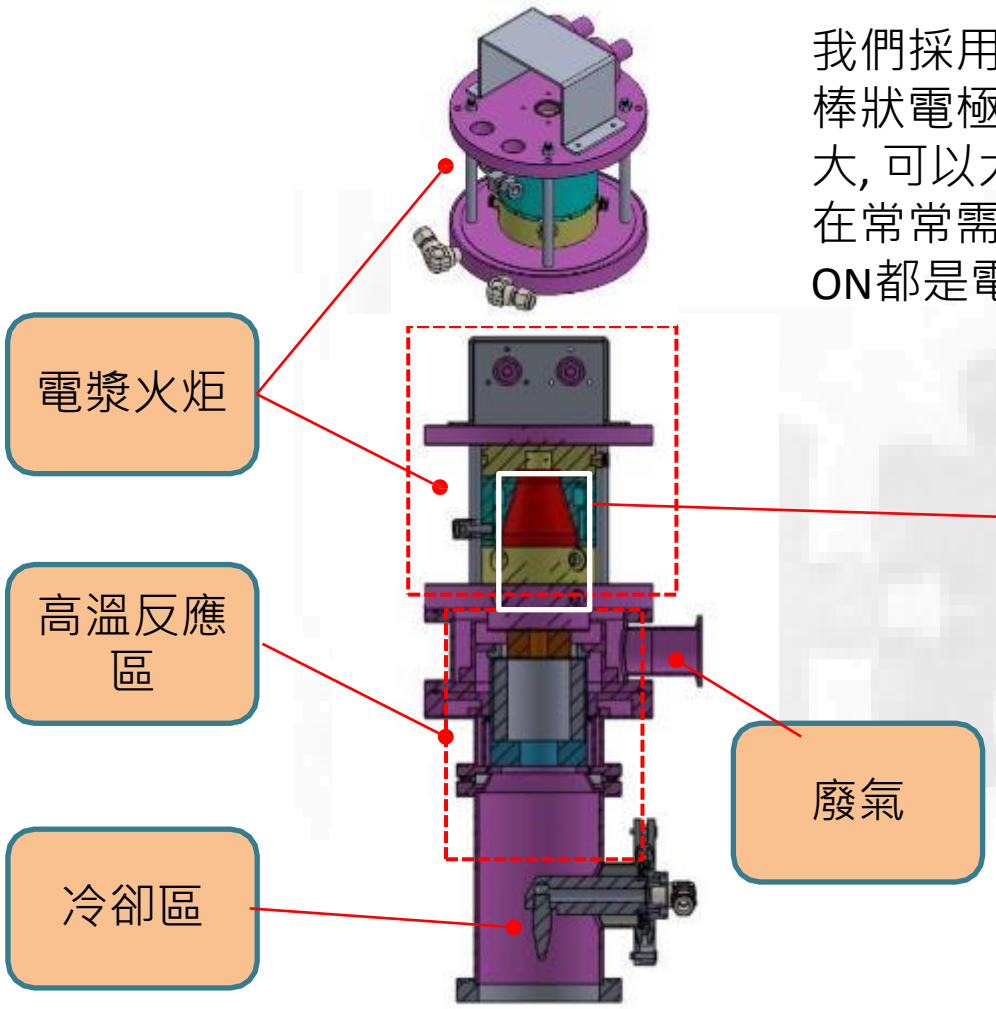
$H_2O_{(l)}$ $SO_2 + CaO$ □ $CaSO_3$



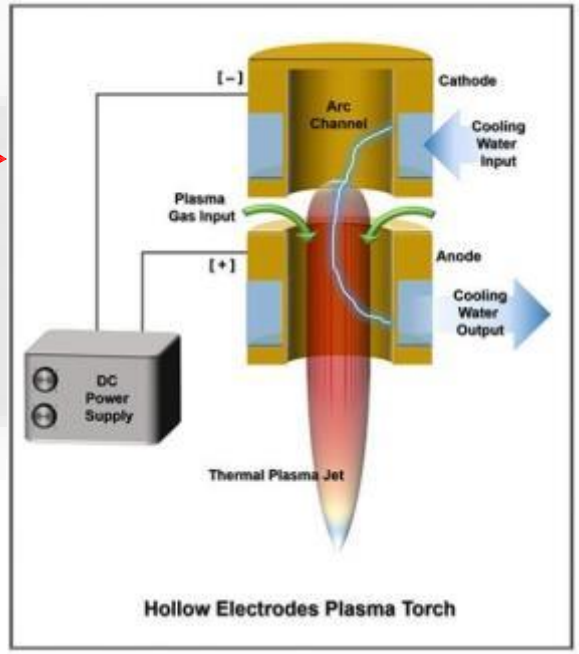
Plasma chemical reaction model of the decomposition mechanism of SF_6 under partial discharge [47]

https://ietresearch.onlinelibrary.wiley.com/doi/full/10.1049/hve2.12160

設備內部功能說明



我們採用中空陰極設計(如下圖), 將傳統棒狀電極改成水冷管狀電極, 電極體積增大, 可以大幅提升電極使用壽命, 尤其是在常常需要ON/OFF的製程, 因為每次的ON都是電極損耗最大的時候。



設備內部功能說明

■ 使用**中空電極電漿火炬**，具有較長的電極使用壽命以及較高的熱效率等優勢。

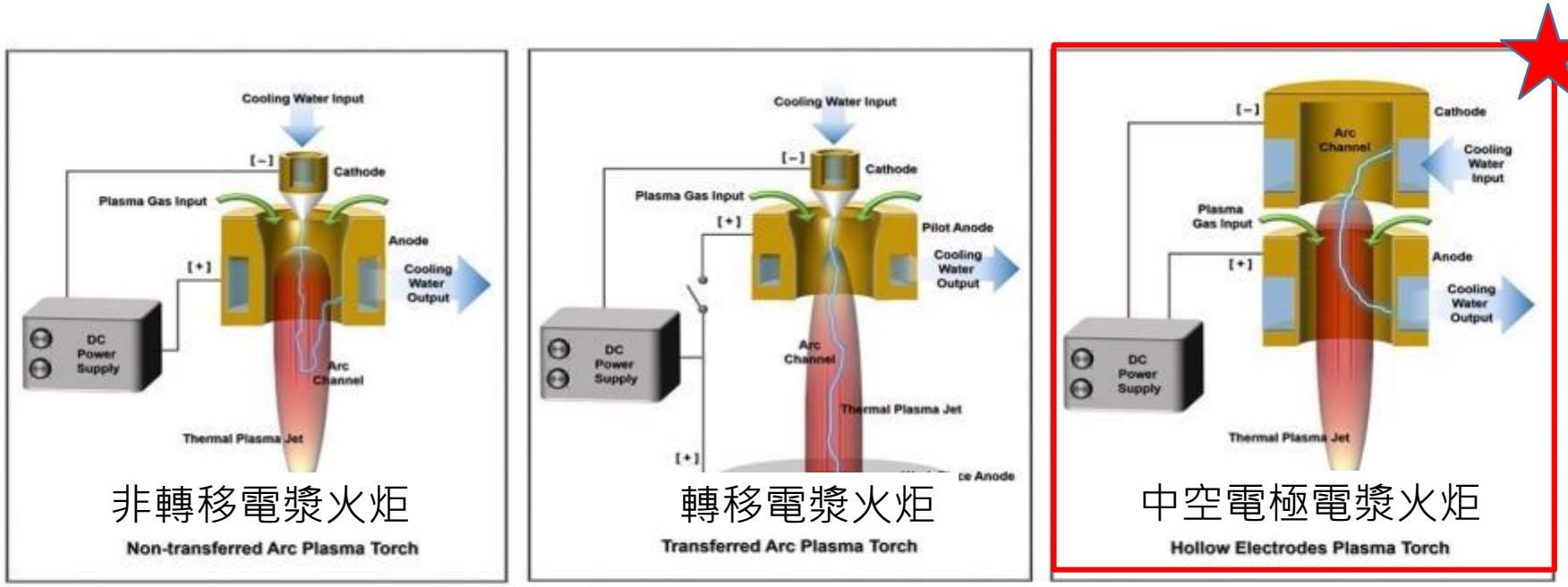


Figure 2. Schematic diagram of the plasma torch geometry: (a) non-transferred plasma torch, (b) transferred plasma torch, and (c) hollow electrodes plasma torch.

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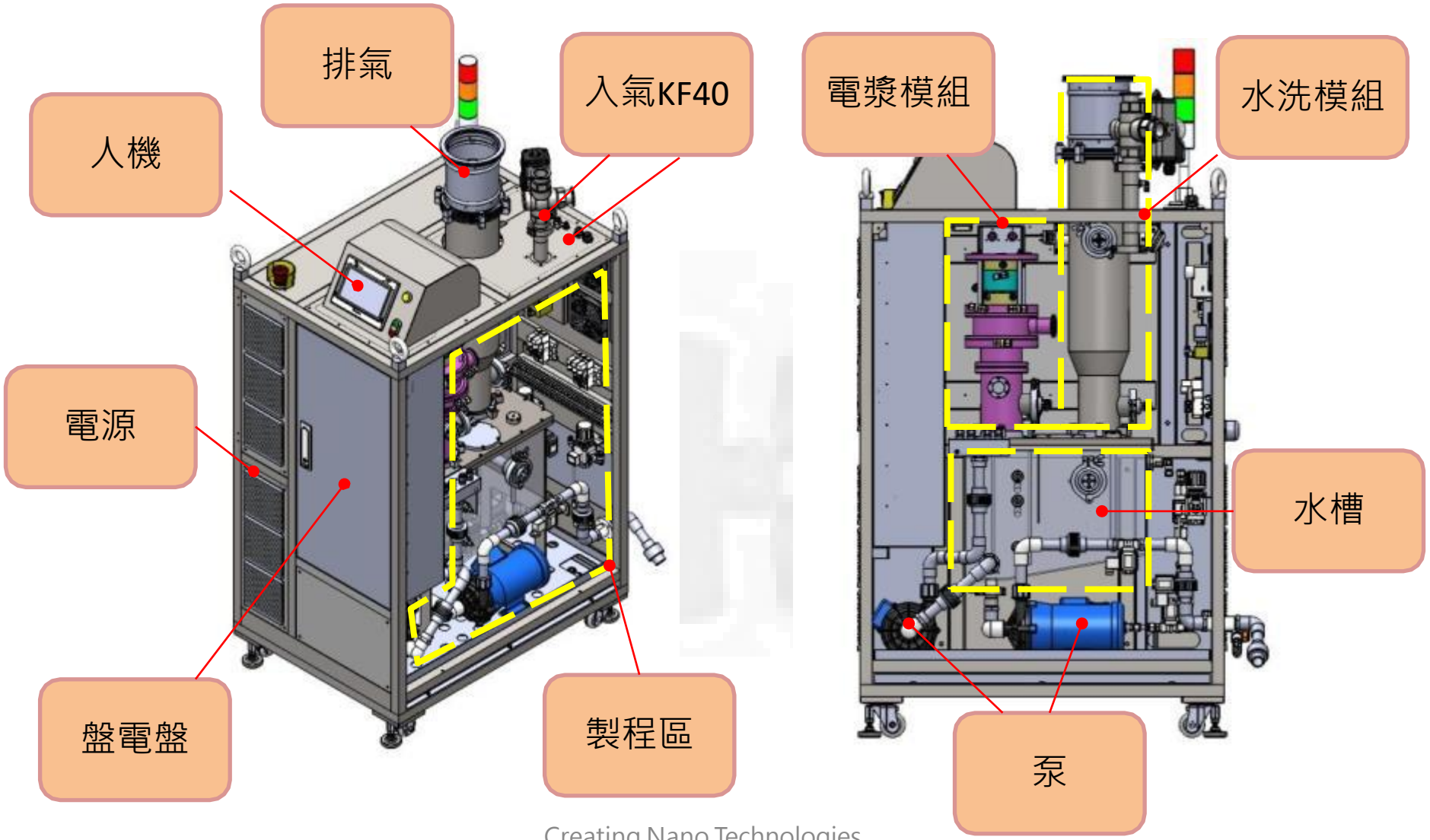
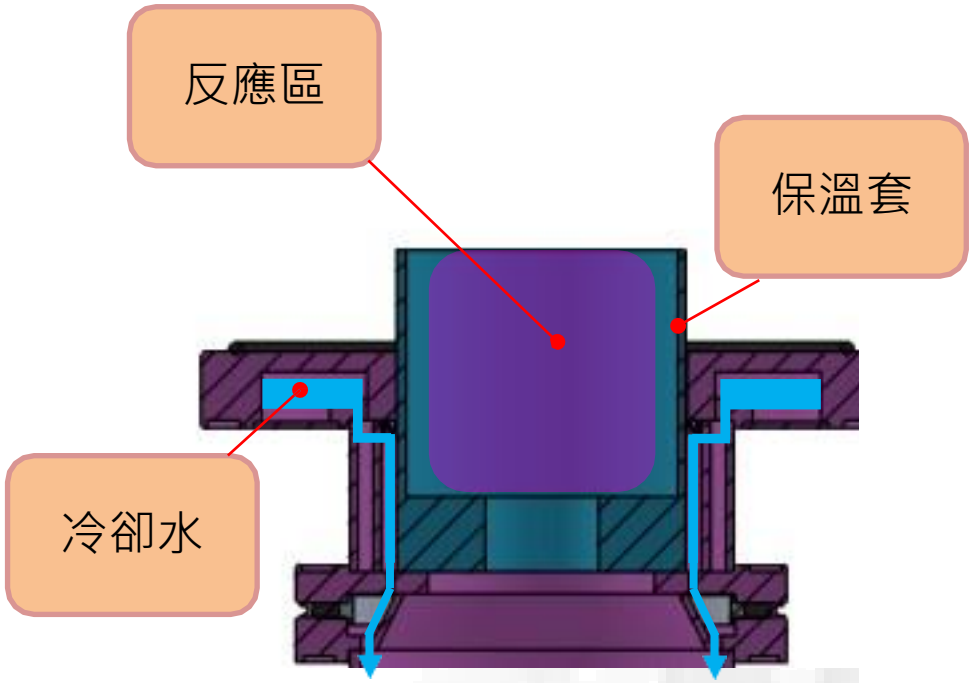
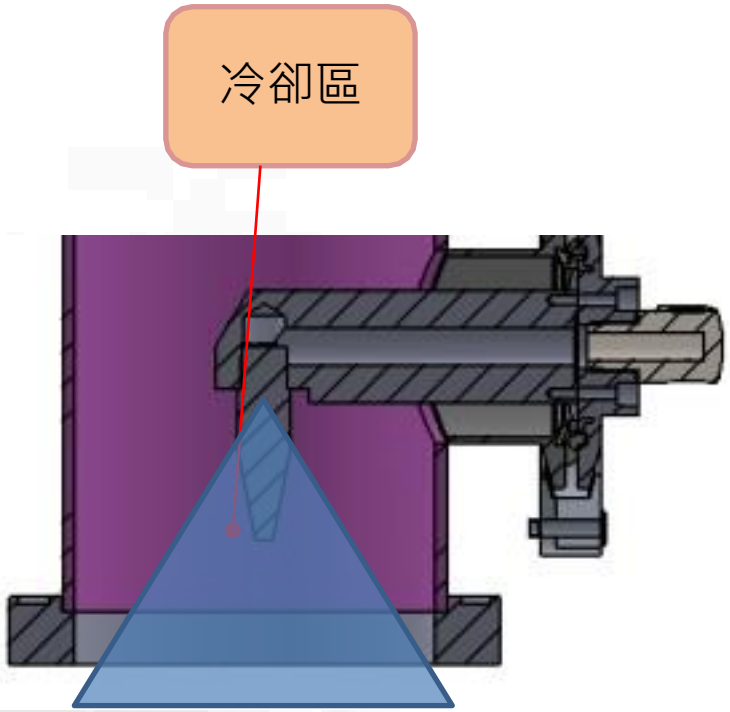
設備內部功能說明



電漿火炬反應區

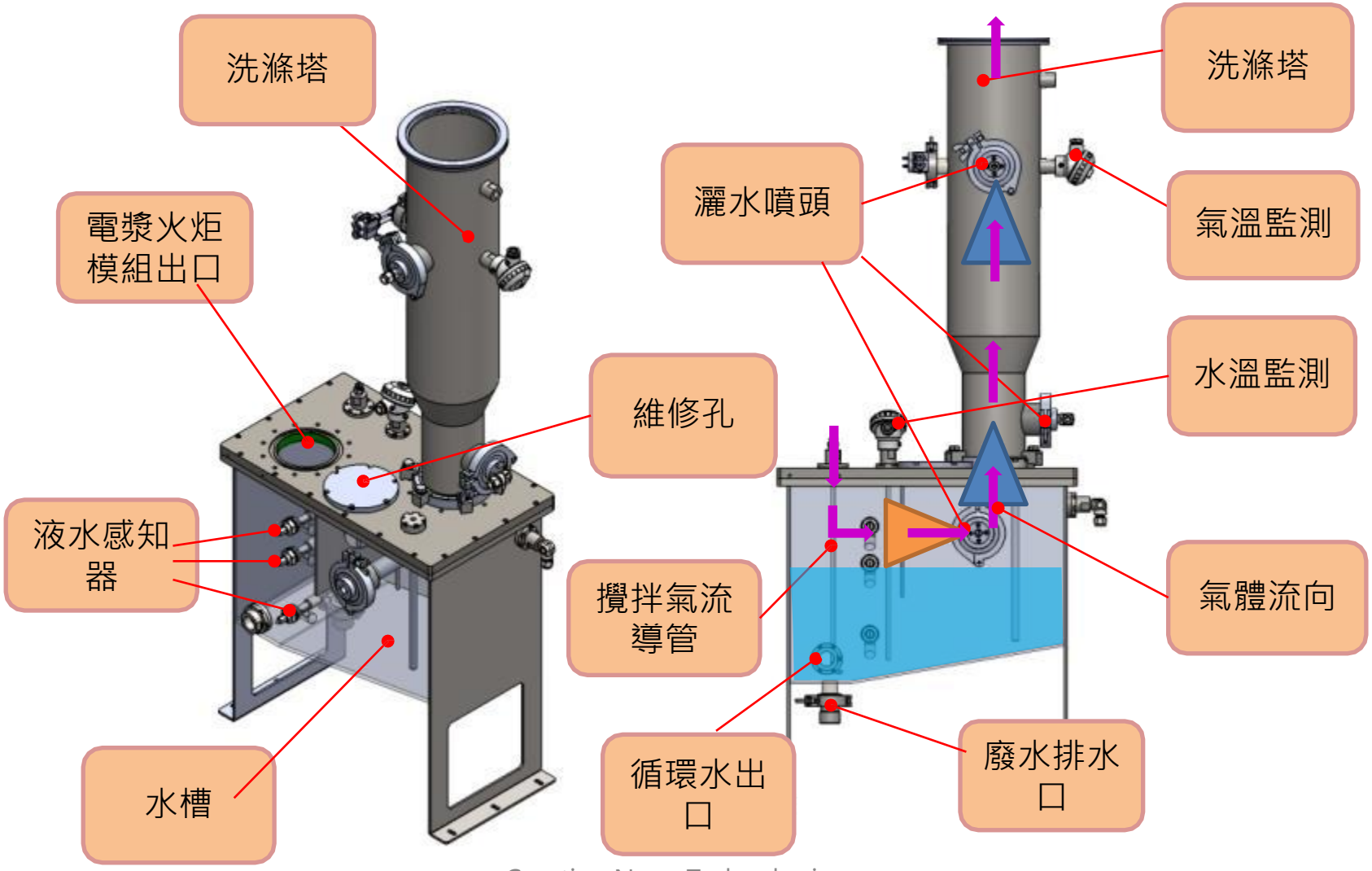


為了確保有很高的效率, 在反應區外設有保溫套, 且冷卻水不會與電漿接觸
冷卻水會在保溫套的背後下方進入, 以保護金屬反應腔室



快速降溫, 並初步將可溶在水裡的污染物帶至水中

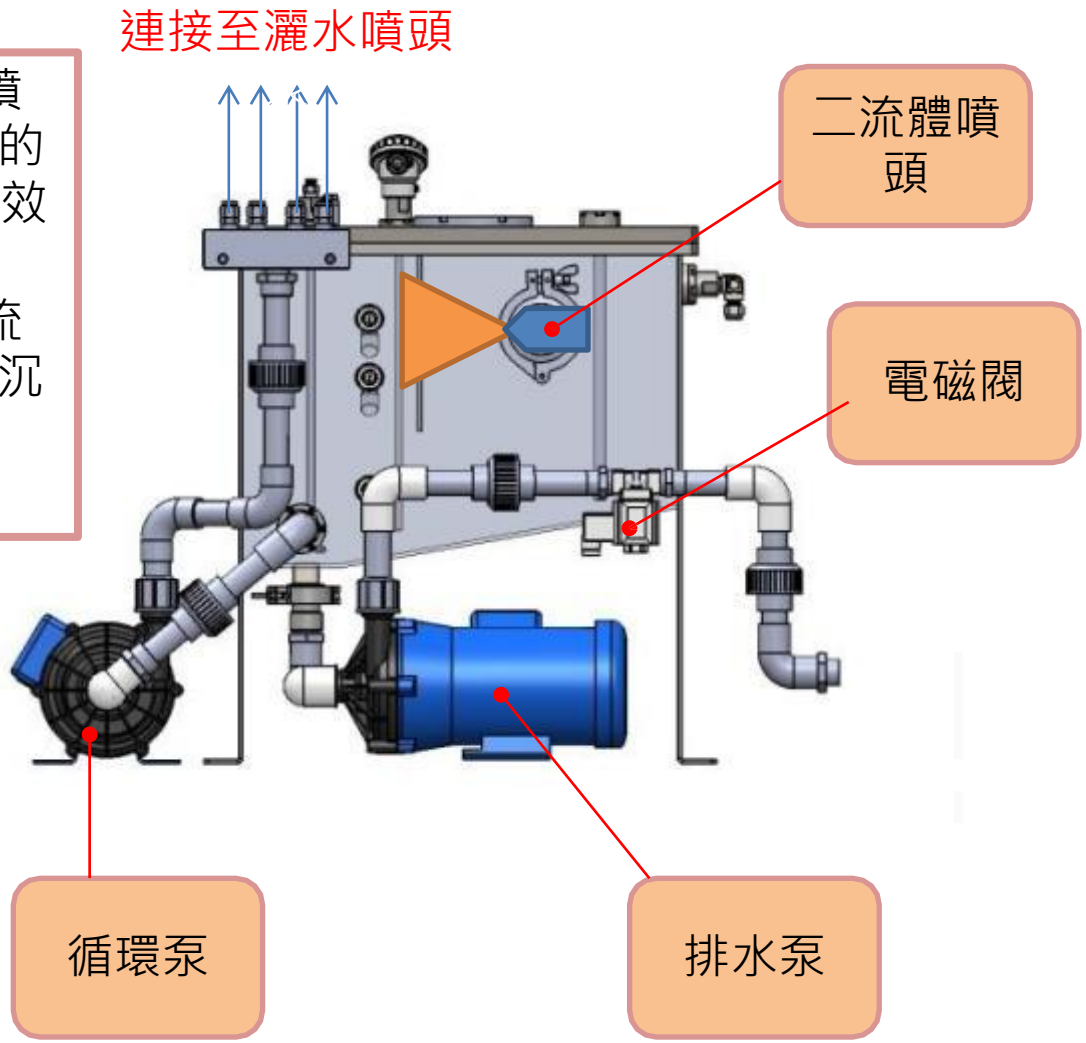
水槽與洗滌塔


洗滌塔
電漿火炬模組出口
維修孔
液水感知器
水槽
洗滌塔
灑水噴頭
氣溫監測
水溫監測
攪拌氣流導管
氣體流向
循環水出口
廢水排水口

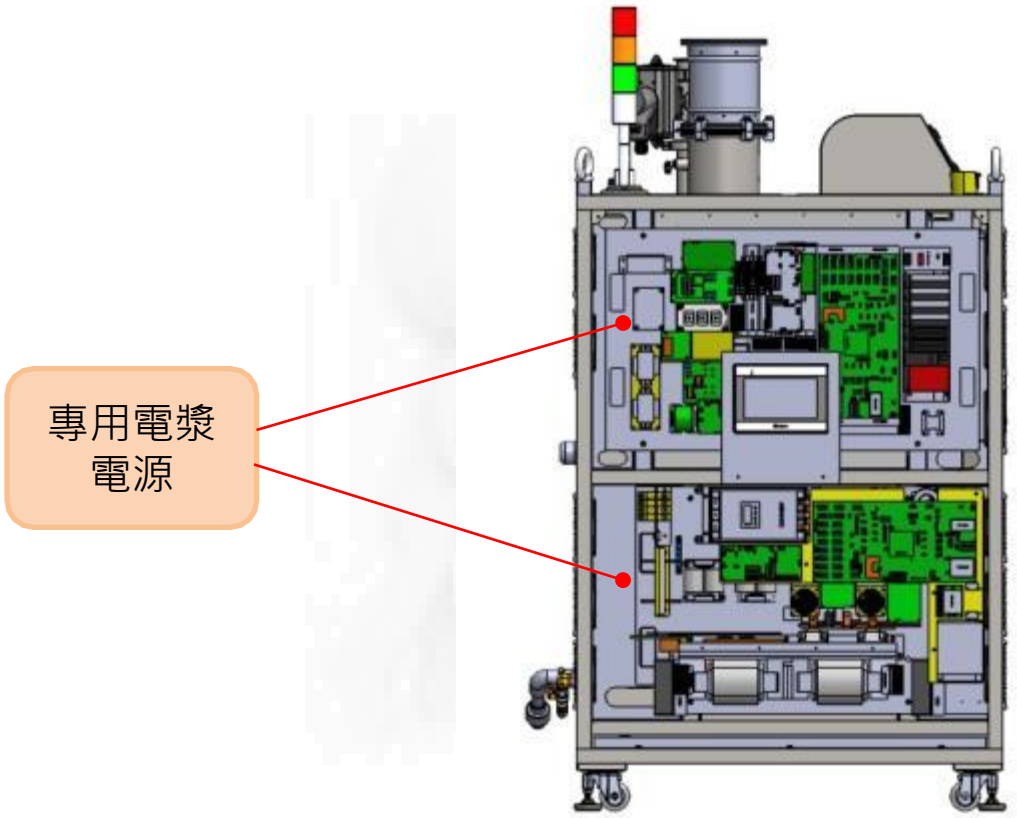
循環管路/排水管路

水槽內設置二流體噴頭, 能夠製造出更細的水滴, 提升HF的抓去效率。

在水槽的底部有氣流攪拌, 能夠防止污泥沉積

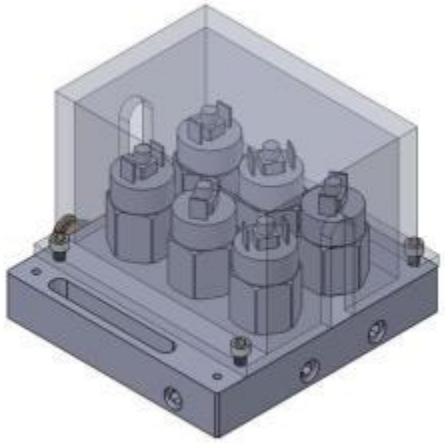


電漿電源供應器Power Supply

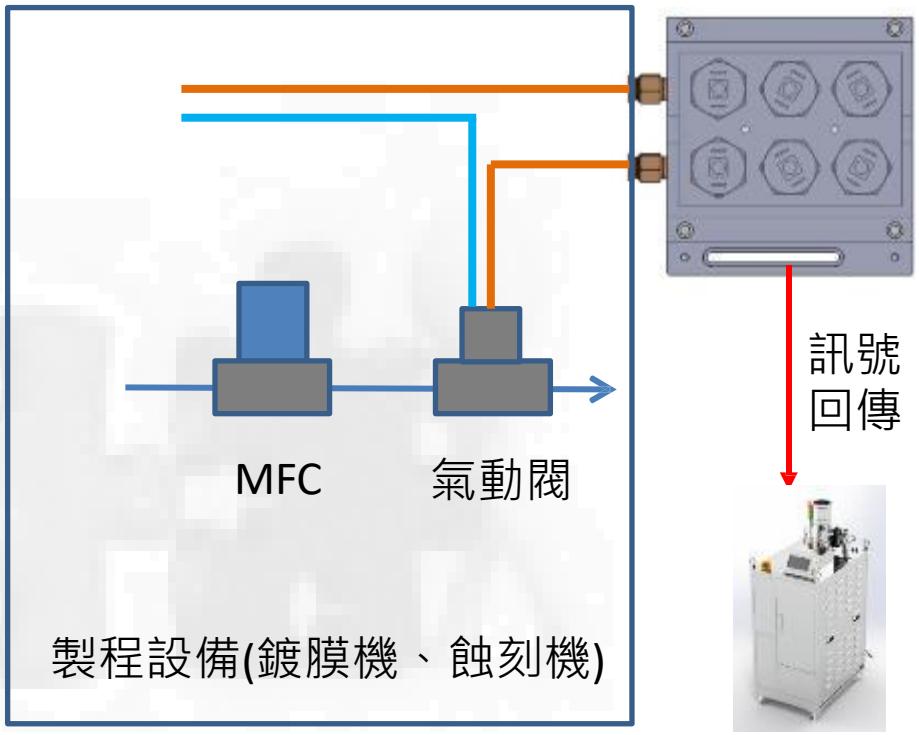


自制電漿電源, 能提供定電流、定電壓等模式選擇, 並能自動偵測電壓、電流。不必額外的電漿感測裝置。能夠自動儲存電源輸出參數供日後進行資料分析。

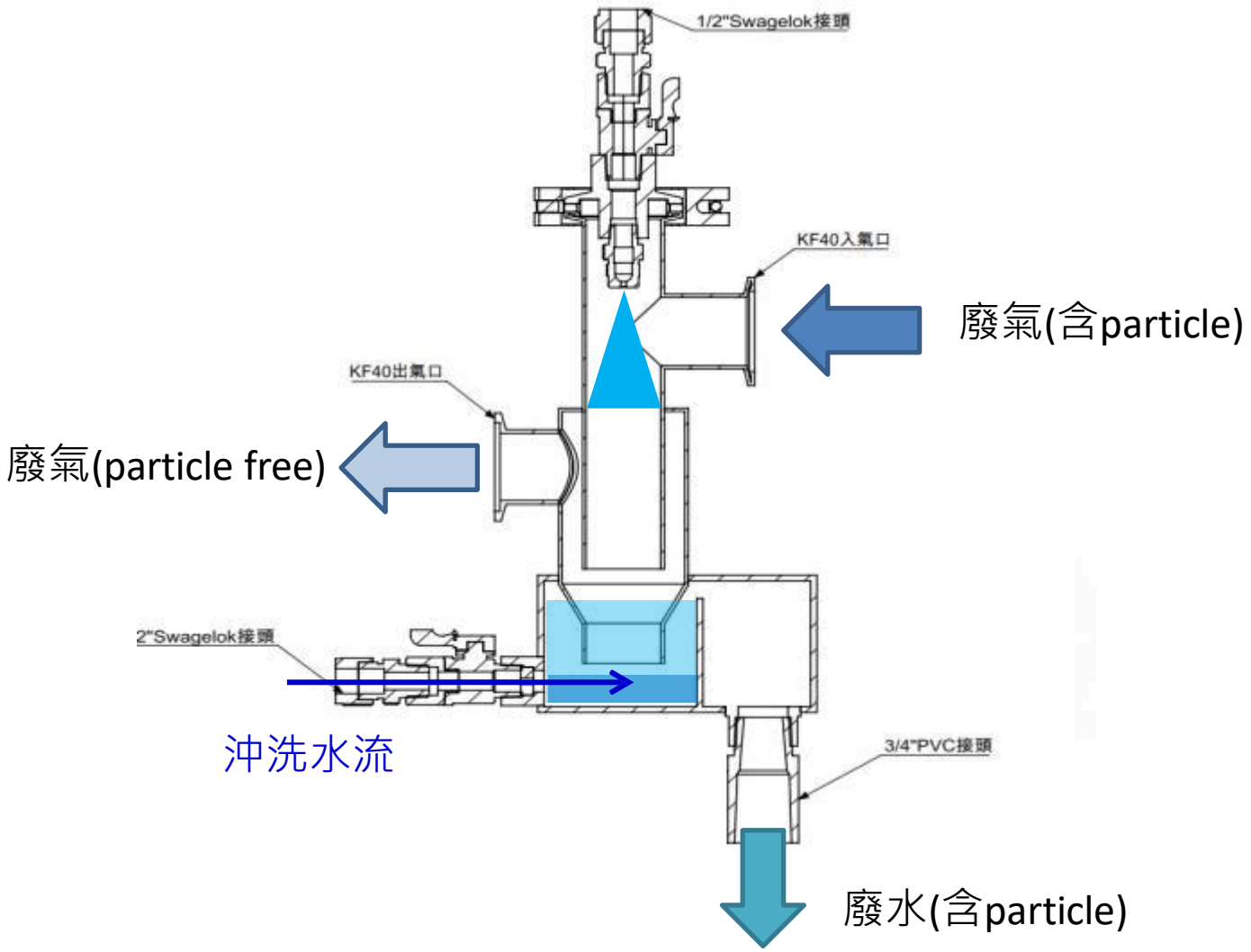
自動啟動機制設計



只需將自動啟動模組按插於製程設備氣動閥氣路上, 即可監控製程設備何時使用含氟氣體、何時停用含氟氣體。並將訊號回傳至plasma scrubber來控制電漿火炬何時啟動, 達到節能效果、且不必複的跟上游設備溝通

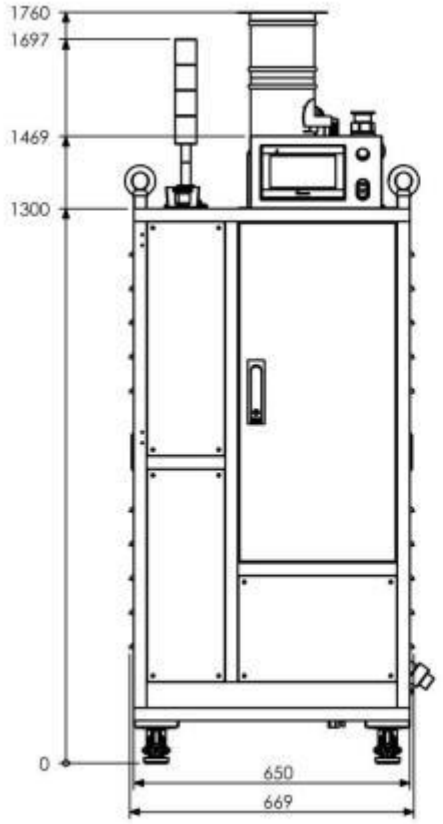


小型初級過濾器

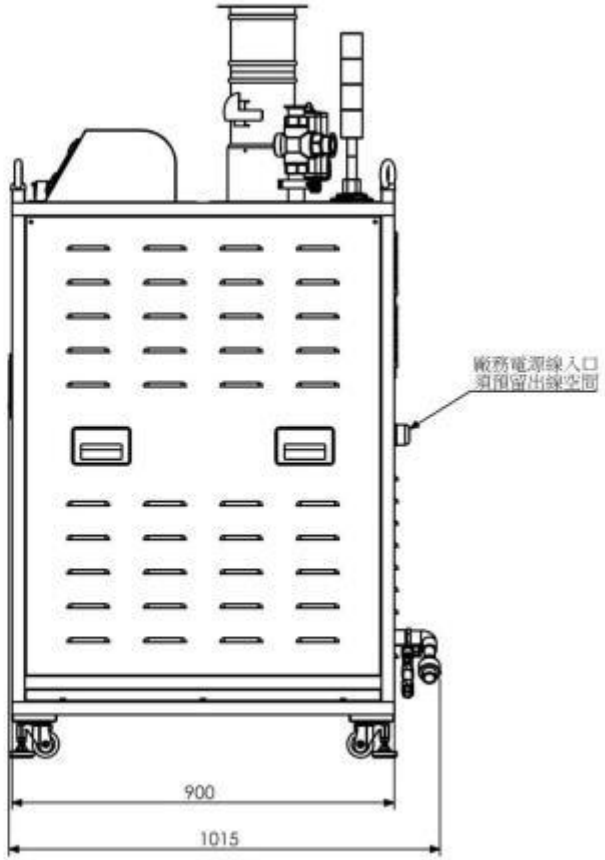

1/2"Swagelok接頭
KF40入氣口
廢氣(含particle)
KF40出氣口
廢氣(particle free)
2"Swagelok接頭
沖洗水流
3/4"PVC接頭
廢水(含particle)

Plasma Scrubber 設備尺寸參考

尺寸(D×W×H)	1015mm×650mm×1760mm	Move in 最小尺寸： 1015mm×650mm×1470mm



50 LPM



100 LPM

Scrubber_APX02 規格表

APX02主機

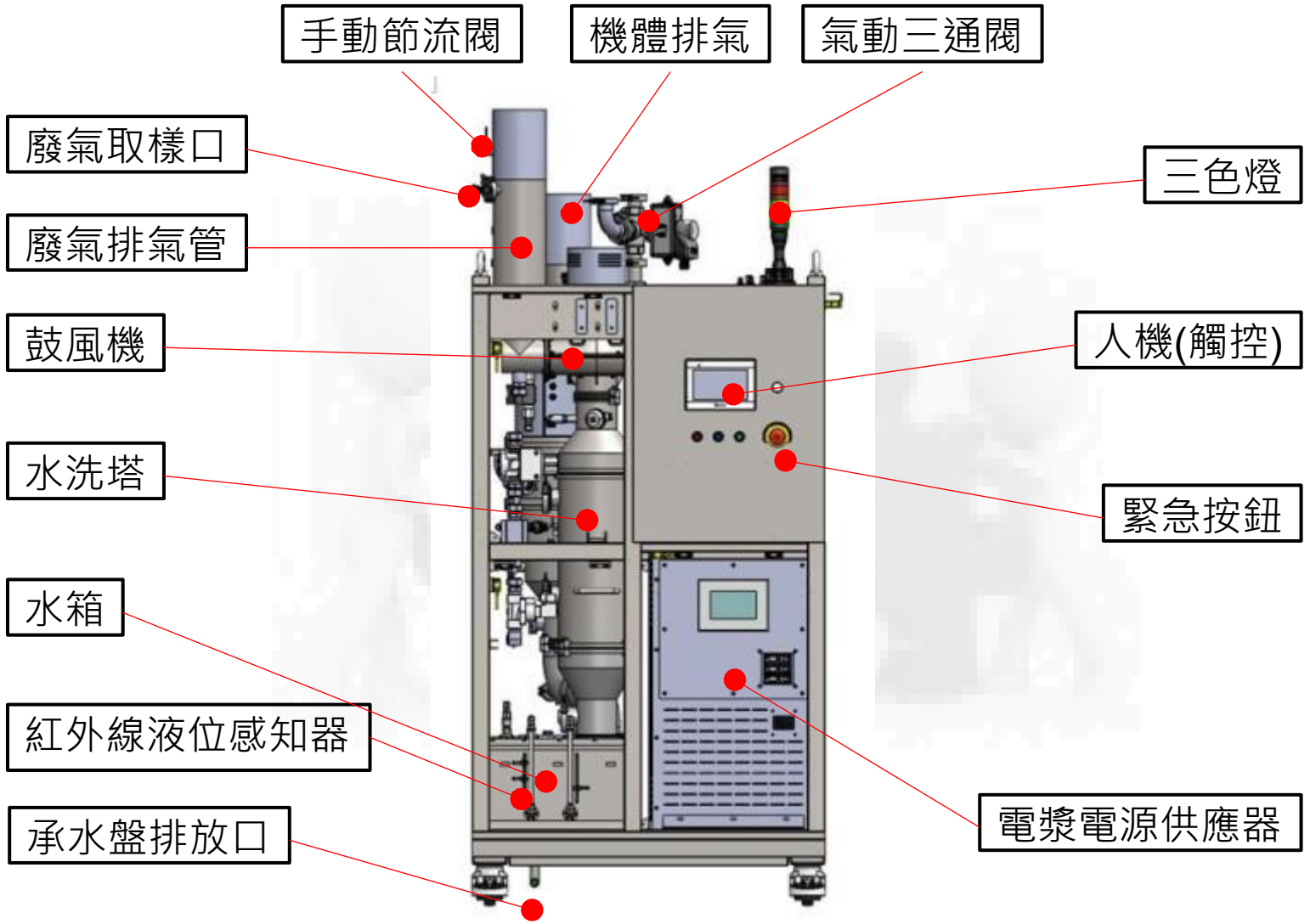
No.	名　　稱	規　　格
1	外觀尺寸	◆ 主機: 900mm*650mm*1400mm(長*寬*高) ◆ 電漿電源: 834mm*482mm*580mm (長*寬*高)
2	機台重量	◆ 主機: 350kg, ◆電漿電源:88kg, ◆加藥模組: 50kg
3	電力需求	◆ 主機: 單相AC220，30A ◆ 電漿電源: AC380V 三相+接地線
4	設備型式	電漿-濕式洗滌
5	設備材質	SUS304/Teflon coating
6	控制介面	PLC Base，7吋人機介面
7	電漿功率	10 KW
8	電漿氣體需求	◆ 使用氣體種類：N2 ◆ 工作氣體壓力：5±0.5 Kg/cm2 ◆ 工作氣體流量：55 L/min ◆ 工作氣體需求：N2純度 > 4N ◆ 工作氣體入口接頭：PM10 ◆ 廢氣入口管徑：KF40*1
9	廠務排氣	◆ 4吋管*1組
10	廢氣流量	100LPM
11	水箱 (內裡鐵氟龍塗層)	◆ 容量：26 L ◆ 用水量: ~100 L/day(每次25 L，一天四次)，依客戶製程調整 ◆ 廠務入(排)水接口：3/8” ◆ 壓力：0.2MPa ◆ 廠務廢水排放量: ~100L/day
12	廠務冷卻水(PCW)	◆ 主機: 冷卻容量10KW ◆ 電漿電源: 7L/min, 25±2℃
13	設備防護	◆ EMO緊急停止 ◆ 水箱溢位口排放 ◆ 水壓偵測 ◆ 水箱漏液檢知
14	選配	◆ 可外接自動加藥機，視實際製程需求進行調整 ◆ 可外接氣冷式水冰機(製冷能力10kW)

相關設備規格

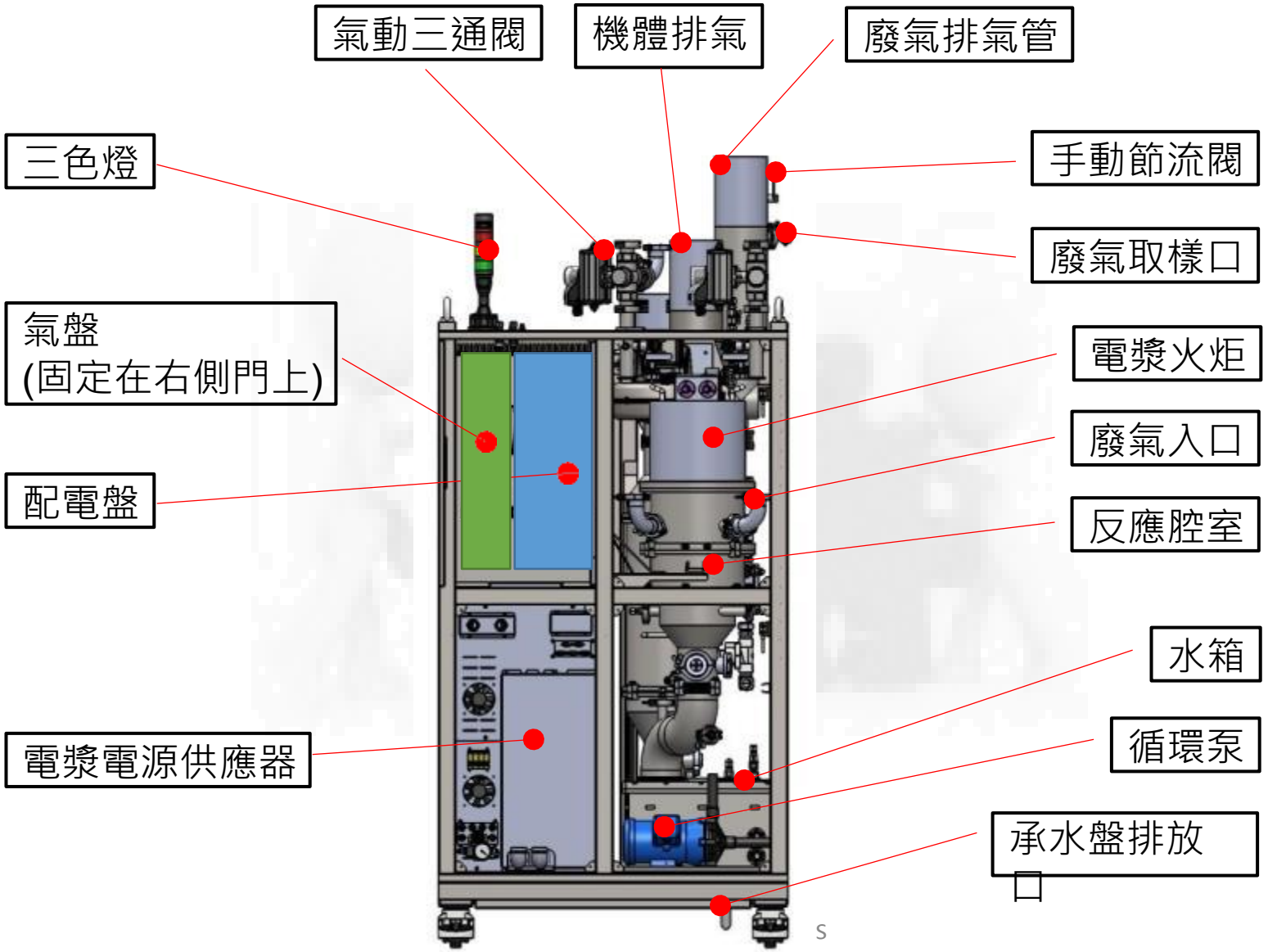
■ 可依據顧客端氣體需求進行客制化

Maker	200LPM	300LPM	600LPM
Technology type	Plasma wet	Plasma wet	Plasma wet
Model name	APX02	APSC01	APSC02
Process application	Etch & CVD	Etch & CVD	Etch & CVD
Guarantee CF4 &C2F6 DRE	C2F6>95% CF4 >90%	C2F6>95% CF4 >90%	C2F6>95% CF4 >90%
Total Max capacity	Max 200LPM	Max 300LPM	Max 600LPM
Footprint(maintenance space)mm	W1000 x D900 x H 1850	W1000 x D900 x H 1850	W1600 x D885 x H 2465
Foot print (m2)	0.9m2	1.17m2	1.41m2
M2 vs CF4 treatment capacity	0.0045	0.0039	0.00235
Number of inlets	3-4 inlets	4 inlet	6 inlet
Warranty period	1 year	1 year	1 year
Alkaline dosing system (option)	Dual tank auto switch PH monitor	Dual tank auto switch PH monitor	Dual tank auto switch PH monitor
Power	AC 220V. 50/60Hz, 3ϕ	AC 220V. 50/60Hz, 3ϕ	AC 220V. 50/60Hz, 3ϕ
Power consumption	Ave 15KW	Ave 20KW	Ave 30KW
N2	Ave 70LPM	Ave 80LPM	Ave 150LPM
PCW	Ave 30LPM	Ave 45LPM	Ave 60LPM
Water	Ave 10LPM	Ave 15LPM	Ave 20LPM
CDA	Ave 10LPM	Ave 10LPM	Ave 20LPM
Hot N2	N/A	N/A	N/A
Delivery Lead Time	20 weeks	20 weeks	20 weeks
Manufacturing location	Taiwan	Taiwan	Taiwan

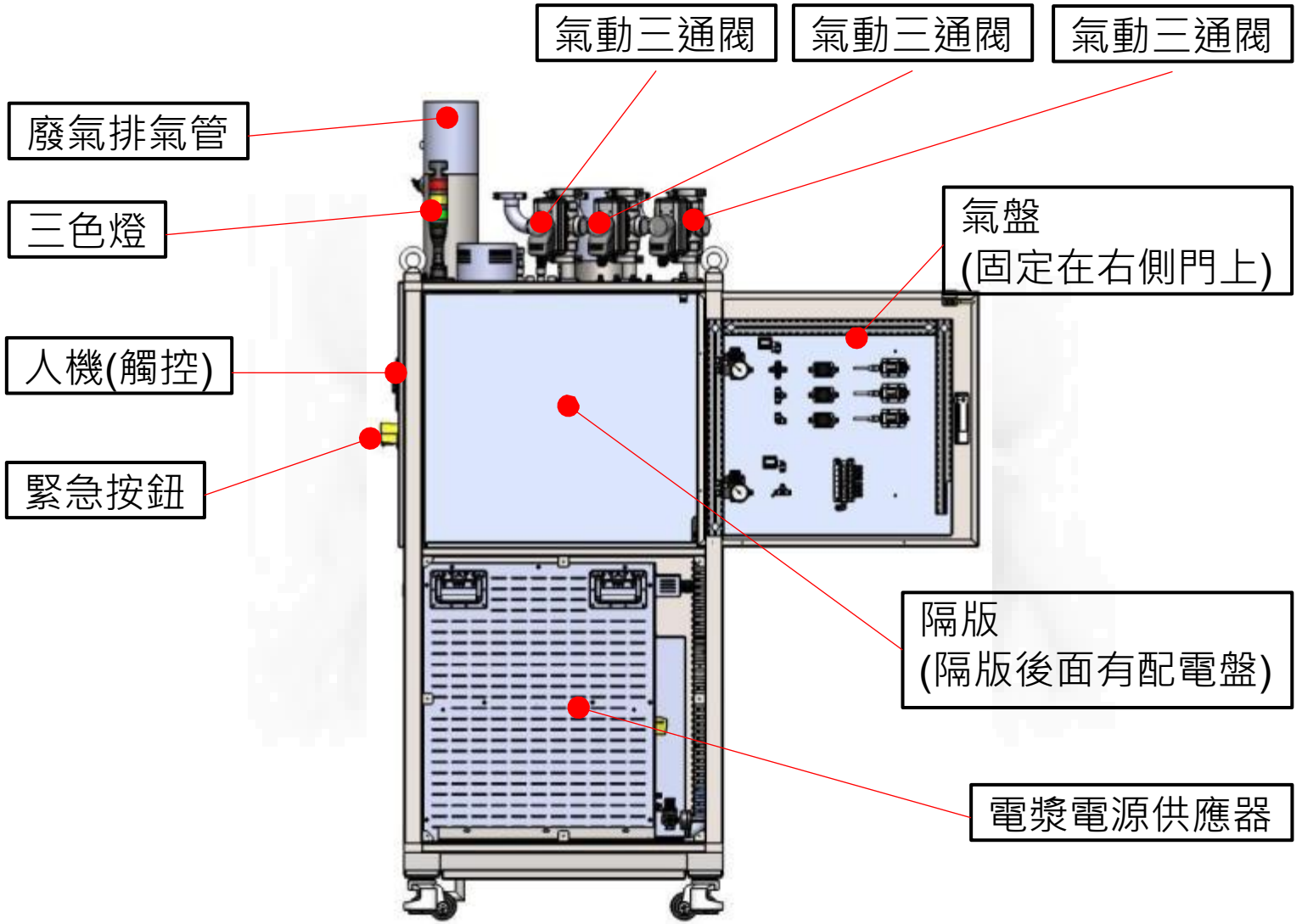
電漿洗滌器反應器(正面)


手動節流閥
機體排氣
氣動三通閥
廢氣取樣口
廢氣排氣管
鼓風機
水洗塔
水箱
紅外線液位感知器
承水盤排放口
三色燈
人機(觸控)
緊急按鈕
電漿電源供應器

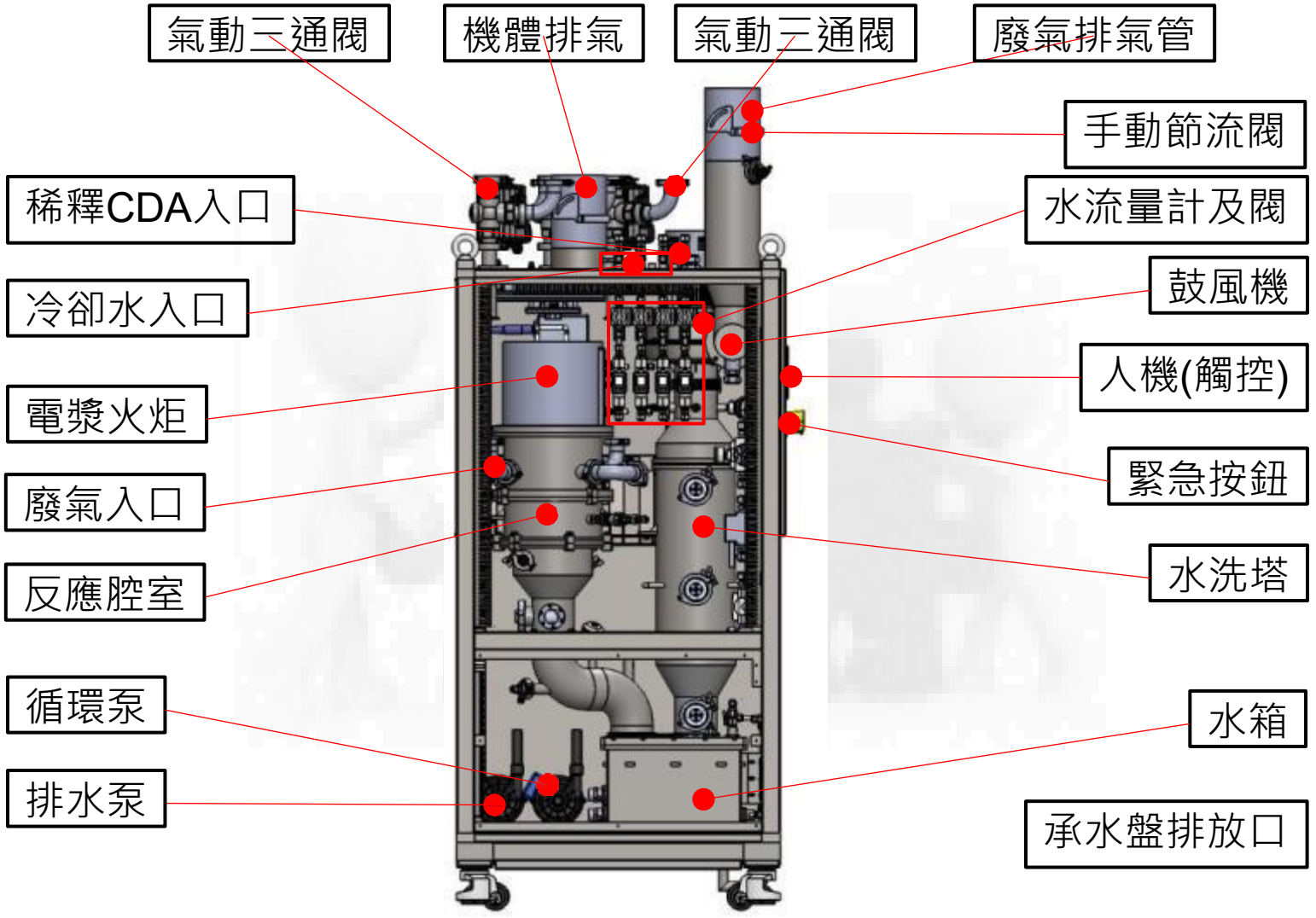
電漿洗滌器反應器 (背面)


氣動三通閥
機體排氣
廢氣排氣管
三色燈
手動節流閥
廢氣取樣口
氣盤
(固定在右側門上)
電漿火炬
廢氣入口
配電盤
反應腔室
水箱
電漿電源供應器
循環泵
承水盤排放口

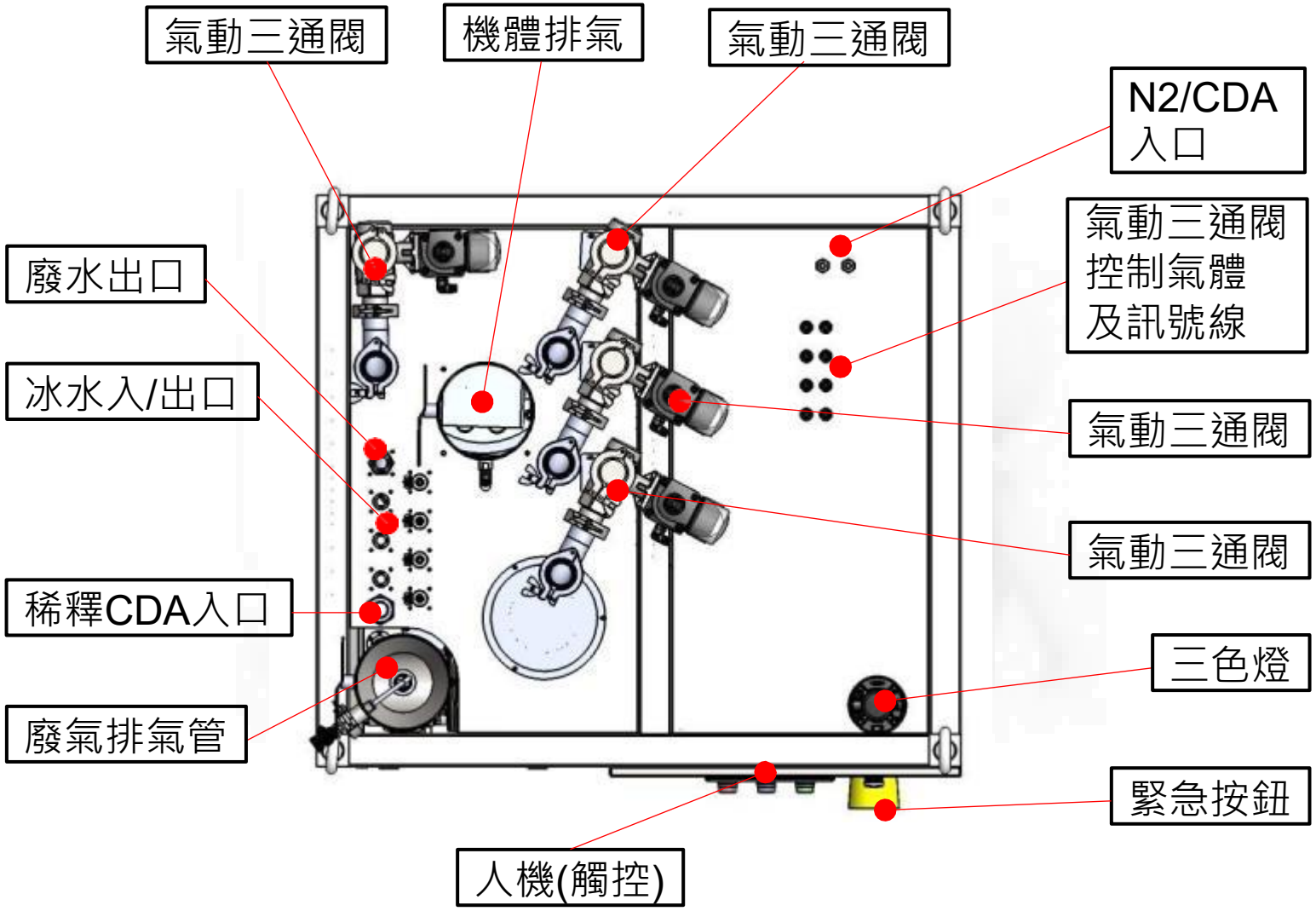
電漿洗滌器反應器 (右側)


氣動三通閥
氣動三通閥
氣動三通閥
廢氣排氣管
三色燈
人機(觸控)
緊急按鈕
氣盤
(固定在右側門上)
隔版
(隔版後面有配電盤)
電漿電源供應器

電漿洗滌器反應器 (左側)


氣動三通閥
機體排氣
氣動三通閥
廢氣排氣管
手動節流閥
稀釋CDA入口
水流量計及閥
冷卻水入口
鼓風機
電漿火炬
人機(觸控)
廢氣入口
緊急按鈕
反應腔室
水洗塔
循環泵
水箱
排水泵
承水盤排放口

電漿洗滌器反應器 (上視)


氣動三通閥
機體排氣
氣動三通閥
N2/CDA
入口
廢水出口
氣動三通閥
控制氣體
及訊號線
冰水入/出口
氣動三通閥
氣動三通閥
稀釋CDA入口
三色燈
廢氣排氣管
緊急按鈕
人機(觸控)

Cost Saving for Plasma Scrubber

For 6 processes system,
1 plasma/wet (APSC02) could match 1 tool (6 chamber)
Utility cost Comparison Chart (Assuming other utility items cost almost the same)

		DXX Dual Burn/wet			CNT Plasma/wet (APSC02)		
item		Cons.	unit	Yearly cost	Cons.	unit	Yearly cost
Power(kwh)	$2.4	1.5	kW	$31,536	30	KW	$630,720
LNG(m^3)	$19.8	1.56	m^3/h	$270,579	0	m^3/h	$0
Oxygen(m^3)	$6.0	3.12	m^3/h	$163,987	0	m^3/h	$0
Water(m^3)	$12.0	3.12	m^3/h	$327,924	4.13	m^3/h	$434,146
N_2(m^3)	$0.8	525[1]	m^3/h	$3,679,200	9.6	m^3/h	$41,522
			Total	**$4,473,226**		**Total**	**$1,106,388**

[1] $N_2 Consumption = 600 \frac{kg}{h} = 600 \left(\frac{kg}{h}\right) \times \frac{1000g}{kg} \times \frac{mol}{28g} \times \frac{24.5L}{mol} \times \frac{1M^3}{1000L} = 525 \frac{M^3}{h}$

Further cost savings through power modulation and operating mode changes.

Total Cost of Ownership, TCO

A. Utility cost		DXX Dual Burn/wet 600LPM			CNT Plasma/wet (APSC02) 600LPM		
item		Cons.	unit	Yearly cost	Cons.	unit	Yearly cost
Power(kwh)	$2.4	1.5	KW	$31,536	30	KW	$630,720
N2(m3)	$0.8	1050	m^3/h	$7,358,400	160	LPM	132,871
PCW(kg)	$0.12	3000	Kg/h	$3,153,600	60	LPM	$3,784,320
Water (kg)	$0.12	120	Kg/h	$126,144	20	LPM	$1,261,440
CDA(m3)	$7.5	0	LPM	0	30	LPM	$118,260
LNG(m^3)	$19.8	1.56	m^3/h	$270,579			
Oxygen(m^3)	$6.0	3.12	m^3/h	$163,987			
B. Maintenance costs			**Total**	**$11,104,246**		**Total**	**$5,927,611**
		Qty	Unit	Yearly cost	Qty	Unit	Yearly cost
PM service	$14,400	NA	time	0	4	time	$57,600
Consumable Parts (Electrodes kit)	$30,000	NA	set	$360,000	8	set	$240,000
			Total	**$360,000**		**Total**	**$297,600**
TCO (7*(A+B))				**$80,249,722**			**$39,792,157**

Comparison Chart of CO_2 emissions

Comparison of CO_2 emissions from different types of scrubbers

1. Power/LNG/water/N_2 之 CO_2 emissions 為網路上公布之換算參數
2. Not removed CF_4 CO_2 emissions 以通入 500 LPM (設備可處理廢氣量) 之 4%CF_4 及利用 scrubber 之 CF_4 去除率來計算 (去除率約 95%)
3. CF_4 GWP 為 6630 *[溫室氣體排放係數管理表6.0.4版本]*
4. 溫室氣體排放量 (CO_2e) = 活動強度*全球暖化潛勢

		DXX Dual Burn/wet			Plasma/wet (APSC02)		
item		Cons.	unit	Yearly CO_2 emissions (ton)	Cons.	unit	Yearly CO_2 emissions (ton)
Power(kwh)	0.554 kg CO_2/kwh	1.5	kW	7.279	75	kW	363.978
LNG(m^3)	2.09 kg CO_2/m^3	1.56	m^3/h	28.56	0	m^3/h	-
Water(m^3)	0.156 kg CO_2/m^3	3.12	m^3/h	4.264	4.8	m^3/h	6.56
N_2(kg)	0.123 kg CO_2/kg	1,200	kg/h	1293	3.75	kg/h	4.04
Not removed CF_4	-	223.2	g/h	12962	223.2	g/h	12962
			Total	**14295**		**Total**	**13337**

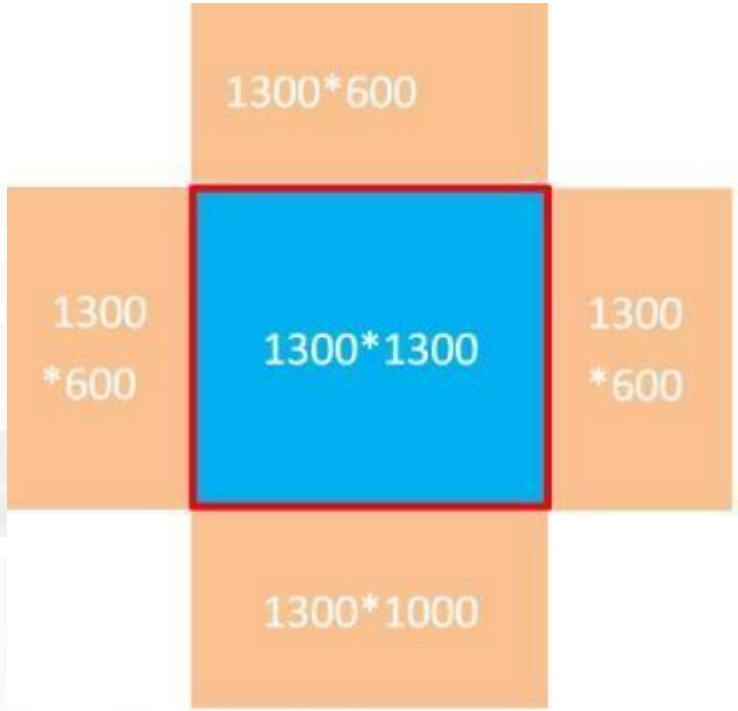
Plasma/wet對比於DXX Dual Burn/wet，每年減少959噸CO2排放

Foot print Compassion

DXX /500LPM

APSC02

/500LPM/600LPM



APSC02/ 500LPM/ 600LPM
Foot print=1300*1300=1.69m^2
維修面積=1300*1000+1300*600*3=3.64m^2
Total foot print=1.69+3.64=5.33m^2

Destruction Removal Efficiency

Green gas	Flow rate	Cin (PPM)	Cout (PPM)	DRE*
CF_4	CF4: 2slm Pump N2 : 30 slm Scrubber plasma 40 slm	32,258	1610	**>95%**
C_2F_6	C2F6: 2slm Pump N2 : 30 slm Scrubber plasma 40 slm	32,258	322	**>99%**

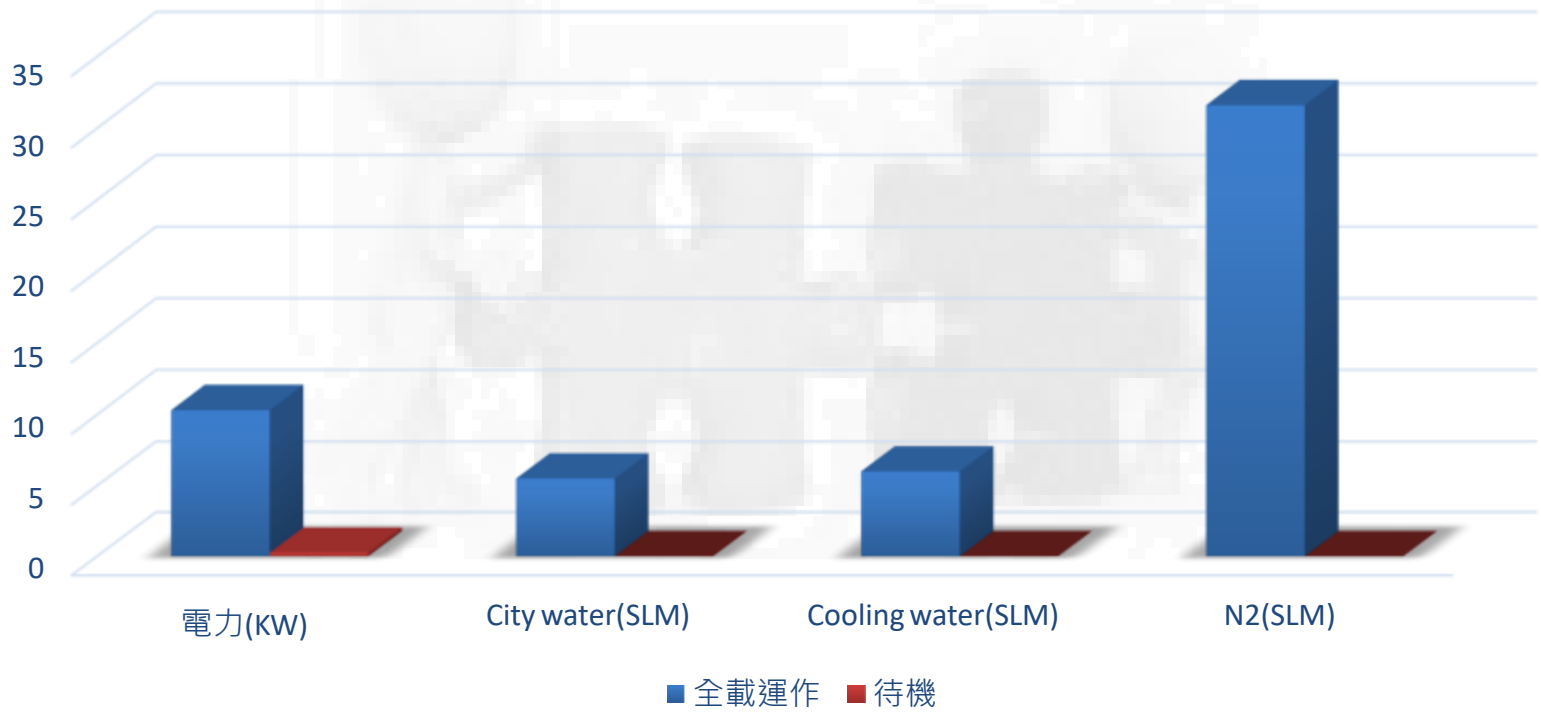
*DRE=$(C_{in}-C_{out}/C_{in})*100\%$
Plasma conditions: 10KW

安全機制

溫度、壓差、功率、製程氮氣流量、冷卻水流量異常保護

節能數據

APX01運作數據				
	電力(KW)	City water(SLM)	Cooling water(SLM)	N2(SLM)
全載運作	10.3	5.5	6	31.6
待機運作	0.25	0	0	0
節能比例(%)	97.5%	100%	100%	100%



Thank you!

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