

The Dow Chemical Company



羅門哈斯竹南廠鑽石級綠建築案例解說 (陶氏化學成員企業)

廠務: 范聖豐
Nov. 22 2011



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內容

- 公司簡介
- Sustainability 願景及目標
- 綠建築各項指標評估說明
- Q & A



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Who We Are

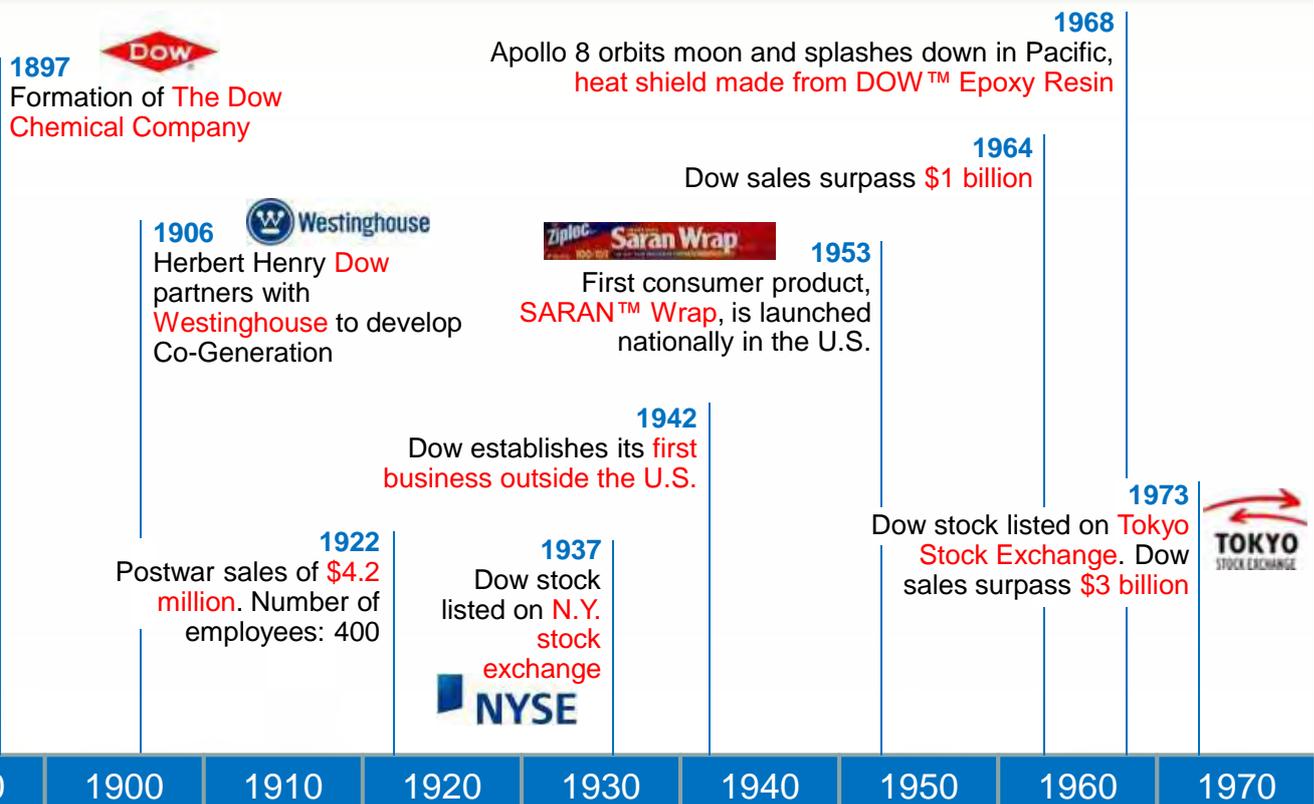
- Founded in 1897 by Herbert H. Dow in Midland, Michigan
- Supplies a broad range of products and services to customers in approximately 160 countries
- More than 5,000 products manufactured at 188 sites in 35 countries
- Employs 50,000 employees worldwide



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Our History and Milestones



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Our History and Milestones (CONTINUED)

2010

Approximately 50,000 employees worldwide; \$53.7 billion in sales

1995

Dow sales surpass \$20 billion



Dow becomes a Worldwide Partner and the "Official Chemistry Company" of the Olympic Games



Dow wins Robert W. Campbell Award for commitment to EH&S excellence

1997

Dow's 100th Anniversary



2009
Acquisition of Rohm and Haas makes Dow the leading specialties chemicals and advanced materials company

2001

Acquisition of Union Carbide Corporation



2008

Dow named 2007 Chemical Company of The Year by 'Chemical & Engineering News'

2007

Dow named one of the top 100 companies in the 'Fortune 500'



1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010



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Our Vision

To be the most profitable and respected science-driven chemical company in the world

Our Mission

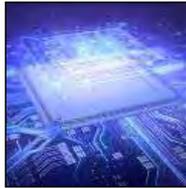
To passionately innovate what is essential to human progress by providing sustainable solutions to our customers



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Dow's Operating Segments



Advanced Materials



Electronic & Specialty Materials



Coatings & Infrastructure



Health & Agricultural Sciences



Health & Agricultural Sciences



Performance Products & Systems



Performance Systems



Performance Products



Basics



Plastics



Chemicals & Energy



Hydrocarbons



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Rt
RIGHT



Financial Performance & Strategy



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2010 Full-Year Financial Performance

	2009	2010
Sales (billions)	\$44.9	\$53.7
Equity Earnings (millions)	\$630	\$1,112
Earnings Per Share (GAAP)	\$0.32	\$1.72
Earnings Per Share*	\$0.63	\$1.97

*Non-GAAP data; excludes certain items. See www.dow.com for more information.



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Olympic Partnership

It's official ...

Dow is a Worldwide Olympic Partner and the "Official Chemistry Company" of the Olympic Movement through 2020.

What is the goal of the Olympic Movement?



To contribute to building a peaceful and better world by educating youth through sport practiced without discrimination of any kind, in a spirit of friendship, solidarity and fair play.

Why is Dow involved?



Our worldwide partnership allows us to highlight the depth and breadth of our specialty products and the important role chemistry plays in sports and everyday life, while pursuing significant new revenue opportunities.

How is Dow involved?

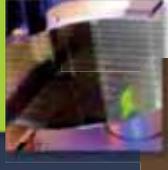


We are leveraging our global network to deliver chemistry- and technology-enabled solutions to help achieve a more sustainable footprint for the Olympic Games and for communities in the host territories.



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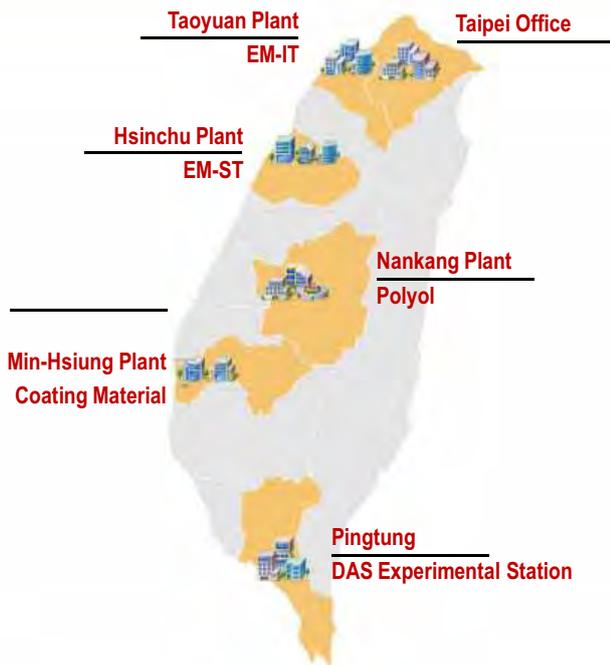


The Dow in Taiwan

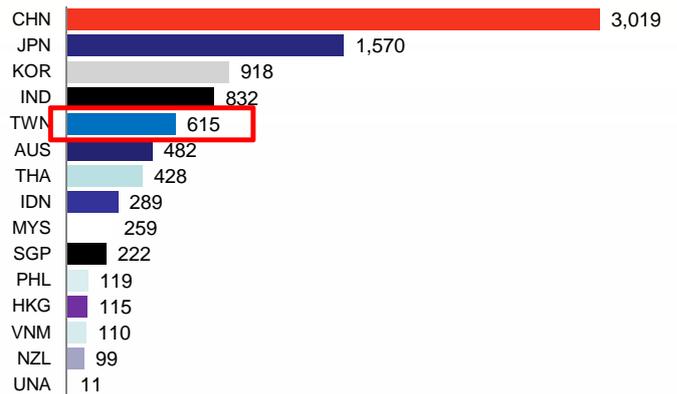


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Dow's Current Participation in Taiwan



2010 PAC sales by Region (\$ MM)



- Established in 1968
- 1 business center/office, 4 manufacturing sites
- 2010 sales: \$ 615 MM, Dow 5th market in APAC
- 3Q11YTD: \$ 599 MM, 32% Growth
- 600 Employee, 16% of G. China

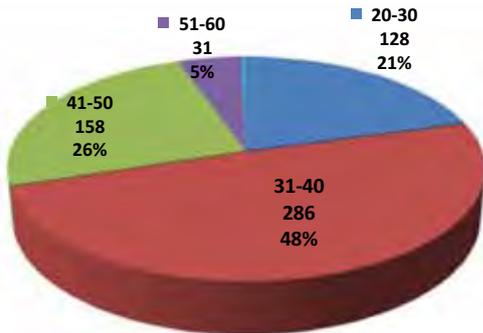


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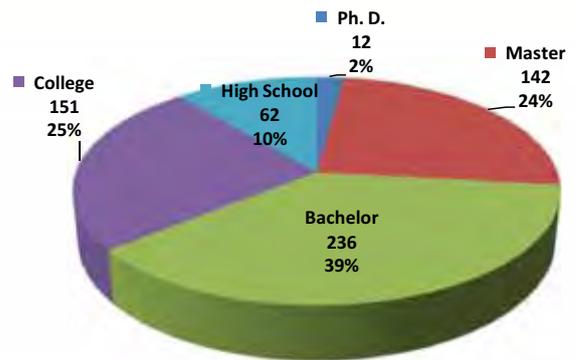
Dow Taiwan Talent Pool

Headcount by Age

Ave: 37.8



Headcount by Education



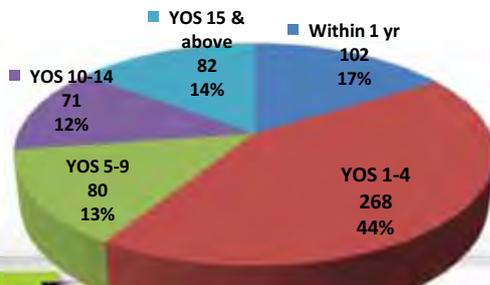
Total Headcount: 603

Female: 27%

Male: 73%

Headcount by Seniority

Ave: 6.4



Headcount by Division

Bus Div	Total
COATING	62
AGRICULTURAL SCIENCES DIVISION	14
CORPORATE DIVISION	35
LICENSING / VENTURES / NBD DIVISION	3
PERFORMANCE PLASTICS DIVISION	10
PERFORMANCE MATERIALS DIVISION	39
ELECTRONIC MATERIALS	428
Other	12
Grand Total	603

- Do Not Share



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As of Oct.31, 2011

Recognized as The Best Employer in Dow Taiwan

Dow Taiwan received the "Ideal Workplace Award," which recognizes Taiwan's best employers for their successful management systems and high level of employee satisfaction.



Commissioner (Department of Labor) led his crew to visit Hsinchu CMP Site for learning journey.



News in Dow intranet

<http://dowtoday.intranet.dow.com/absolutenm/templates/?a=7731>



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Dow's 2015 Sustainability Goals

Reduce our GHG intensity 2.5% per year

Reduce our energy intensity 25%

Achieve at least three breakthroughs that will significantly help solve world challenges



Publish product safety assessments for all products

Achieve on average a 75% improvement of key indicators for EH&S operating excellence from 2005 baseline

Achieve individual community acceptance ratings for 100% of Dow sites where we have a major presence



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Recognitions for Sustainability

7 Presidential Green Chemistry Awards

- more than any other company



Named Ten Times



Dow Jones Sustainability Indexes

China's "Most Innovative Corporation" Award



for sustainable innovation of corporate ecosystem, CEO CIO Magazine and the Research Center for Technological Innovation

2010 Robert W. Campbell Award



100 Most Technologically Significant New Products of the Year

for IMPAXX™



"50 Best Inventions of 2009"

Dow POWERHOUSE™ Solar Shingle
TIME Magazine's



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About Dow CMP Technologies

- Market Leader:
 - #1 in CMP consumables
 - #1 in Pads
 - #2 in Slurry
- Largest materials company dedicated to CMP: pads, slurries, conditioners
- Leading edge technology to support our customers in development and manufacturing since 1969.
- High-volume manufacturing for pads and slurries
- MRP II A World Class Supply Chain
- Six Sigma And Lean In Placed



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Asia-Pacific Manufacturing and Technical Center



- **Location:** Hsinchu Science Park, Chunan expansion base
- **Ground Breaking:** December 2005
- **Grand Opening Ceremony:** December 2006
- **Commercial Operation:** March 2007
- **Technical Center Operations:** July 2007



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Awards

CSR, TFCF
Nov. 2008

Green Building Award, MOI
Dec. 2006



Best Landscape, HSIP
Mar 2007



Carbon Reduction Award, HSIP
Dec. 2008



Safety & Health Award, MOEA
Nov. 2009



Green Building Award, MOI
Jan. 2010



2007 **2008** **2009** **2010**

ISO 9000:2000
June, 2007



ISO 14000
Dec. 2007



OHSAS 18000
June, 2008



RC 14000
Jan., 2009












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竹南工廠 Green Building Award 2007/2008/2009



2007新竹科學園區第一家取得綠建築合格級
 2009取得綠建築鑽石級





綠建築標章
GREEN BUILDING

綠建築標章證書審查報告書

建築物名稱：羅門哈斯亞太廠房辦公棟及廠房棟

建築物概要：地下0層，地上二層

鋼筋混凝土／鋼骨構造

辦公廳類及大型空間類建築

綠建築等級：**2007 年版 鑽石級**

申請指標項目：1.綠化指標

2.日常節能指標

3.二氧化碳減量指標

4.廢棄物減量指標

5.室內環境指標

6.水資源指標

7.污水垃圾改善指標

中華民國九十八年八月廿日



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綠建築分級評估計分表 A

九大指標	有無	設計值	基準值	變距 Rn(註)	分級評估得分 RSi	得分上限		
一. 生物多樣性指標	--	BD=---	BDc=60	R1=---	RS1=9.51×R1+2.0=---	RS1≤9.0		
二. 綠化量指標	有	TCO ₂ = 6622620	TCO _{2c} = 3456045	R2=0.92	RS2=4.29×R2+2.0=5.95	RS2≤9.0		
三. 基地保水指標	---	λ=---	λc=---	R3=---	RS3=1.41×R3+2.0=---	RS3≤9.0		
四. 日常節能指標	外殼節能	辦公類	有	EEV=0.67	0.80	R41=0.16	RS4 ₁ =29.76×R4 ₁ +2.0=6.76	加權計算得分 =10.02
		百貨類	--	EEV=---	0.80	R41=---	RS4 ₁ =29.76×R4 ₁ +2.0=---	
		醫院類	--	EEV=---	0.80	R41=---	RS4 ₁ =11.11×R4 ₁ +2.0=---	
		旅館類	--	EEV=---	0.80	R41=---	RS4 ₁ =11.11×R4 ₁ +2.0=---	
		住宿類	--	EEV=---	0.80	R41=---	RS4 ₁ =8.93×R4 ₁ +2.0=---	
		學校及大型空間類	有	EEV=0.35	0.80	R41=0.56	RS4 ₁ =18.94×R4 ₁ +2.0=12.00	
	空調節能	有	EAC=0.7	0.80	R42=0.13	RS4 ₂ =13.99×R4 ₂ +2.0=3.82	RS4 ₂ ≤10.0	
照明節能	有	EL=0.59	0.70	R43=0.16	RS4 ₃ =8.77×R4 ₃ +2.0=3.40	RS4 ₃ ≤6.0		
五. CO ₂ 減量指標	有	CCO ₂ =0.70	0.82	R5=0.15	RS5=20.11×R5+2.0=5.02	RS5≤9.0		
六. 廢棄物減量指標	有	PI=2.52	3.30	R6=0.24	RS6=15.77×R6+2.0=5.78	RS6≤9.0		
七. 室內環境指標	有	IE=73	60.0	R7=0.24	RS7=20.66×R7+2.0=6.55	RS7≤12.0		
八. 水資源指標	有	WI=8.8	2.0	---	RS8=WI=8.8	RS8≤9.0		
九. 污水垃圾指標	有	GI=18	10.0	R9=0.80	RS9=4.29×R9+2.0=5.43	RS9≤6.0		

合計總分 RS = ΣRSi = 54.77

註：變距 R1~R9 為該指標的設計值與基準值的絕對值差與基準值之比，依「(設計值-基準值)÷基準值」之公式計算。



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綠建築分級評估最終等級評量表 B (單位：分)

綠建築評量等級 (得分概率分佈)		合格級 0~30%	銅級 30~60%	銀級 60~80%	黃金級 80~95%	鑽石級 95%以上
九大指標全評估時總得分 RS 範圍		12 ≤ RS < 26	26 ≤ RS < 34	34 ≤ RS < 42	42 ≤ RS < 53	53 ≤ RS
基準 減分	<input type="checkbox"/> 有、 <input type="checkbox"/> 無 <input type="checkbox"/> 免評估生物多樣性指標者基準減分	-0.0	-1.0	-1.5	-1.8	-2.2
	<input type="checkbox"/> 免評估空調節能者基準減分	-2.0	-2.3	-2.7	-3.2	-3.9
	<input type="checkbox"/> 免評估照明節能者基準減分	-2.0	-1.6	-2.1	-2.4	-2.9
	<input type="checkbox"/> 免評估室內環境指標者基準減分	-0.0	-3.5	-4.3	-5.4	-6.6
	<input type="checkbox"/> 免評估省水器具者基準減分	-2.0	-2.0	-2.0	-2.0	-2.0
有免評估項目時，新調整總得分 RS 範圍		__ ≤ RS < __	53 ≤ RS			
評價總分 RS = 54.77 分級評估歸屬級別 (請勾選)						✓



綠化指標評估說明

第一章、綠化指標評估說明

一、建築基本資料

1. 建築名稱：羅門哈斯亞太廠房辦公棟及廠房棟
2. 建築地點：苗栗縣竹南鎮新竹科學園區科西二路6號
3. 建築類別：大型空間類建築
4. 基地面積A0：23040.30 m²
5. 建築面積：8406.47 m²
6. 綠地面積：5675.41 m²
7. 不可綠化面積Ap：0 m²
8. 法定建蔽率r：50.00 %
9. 實際建蔽率：36.49%
10. 單位綠地CO2 固定量基準β=400

佔25%

二、設計概要

1. 建築四周綠地種植大小喬木與各式灌木，分別檢討。
2. 綠化範圍內無地下結構物，喬木覆土深度1m 以上，灌木覆土深度0.5m 以上。
3. 採用之喬灌木以各式原生或誘鳥蝶植物為主，採用比例ra=0.97



綠化指標評估說明

三、生態綠化優待係數 α

本基地綠化設計採用各種原生及誘鳥誘蝶植物，可計算生態綠化優待係數 α ，
原生或誘鳥誘蝶植物採用比例 $ra=0.97$
 $\alpha=0.8+0.5 \times ra=0.8+0.5 \times 0.97=1.29$

四、綠化設計值 **TCO2** 計算

1) 大喬木

間距6m 以上=30 株 $\times 36 \text{ m}^2=1080 \text{ m}^2$

間距6m 以下=59 株=1762.98 m^2

總裁種面積=2842.98 m^2

二氧化碳固定量=2842.98 $\text{m}^2 \times 900=2558682 \text{ kg}$

2) 小喬木

間距 6m 以上=8 株 $\times 36 \text{ m}^2=288 \text{ m}^2$

間距6m 以下=147 株=2906 m^2

總裁種面積=3194 m^2

二氧化碳固定=3194 $\text{m}^2 \times 600=1916400 \text{ kg}$

3) 灌木面積1884 m^2

二氧化碳固定=1884 $\text{m}^2 \times 300=565200 \text{ kg}$



綠化指標評估說明

4) 草坪面積5675.41 m^2

二氧化碳固定=5675.41 $\text{m}^2 \times 20=113508 \text{ kg}$

5) 以上累加 $\Sigma (Gi \times Ai)=5153790 \text{ kg}$

6) $\text{TCO2}=\Sigma (Gi \times Ai) \times \alpha=5153790 \text{ kg} \times 1.29=6622620 \text{ kg}$

五、綠化基準值 **TCO2C** 計算

$A'=(A0-Ap) \times (1-r)=(23040.30-0) \times (1-0.50)=11520.15$

$\text{TCO2C}=1.5 \times (0.5 \times A' \times \beta)=1.5 \times (0.5 \times 11520.15 \times 400)=3456045 \text{ kg}$

六、綠化量指標及格標準檢討

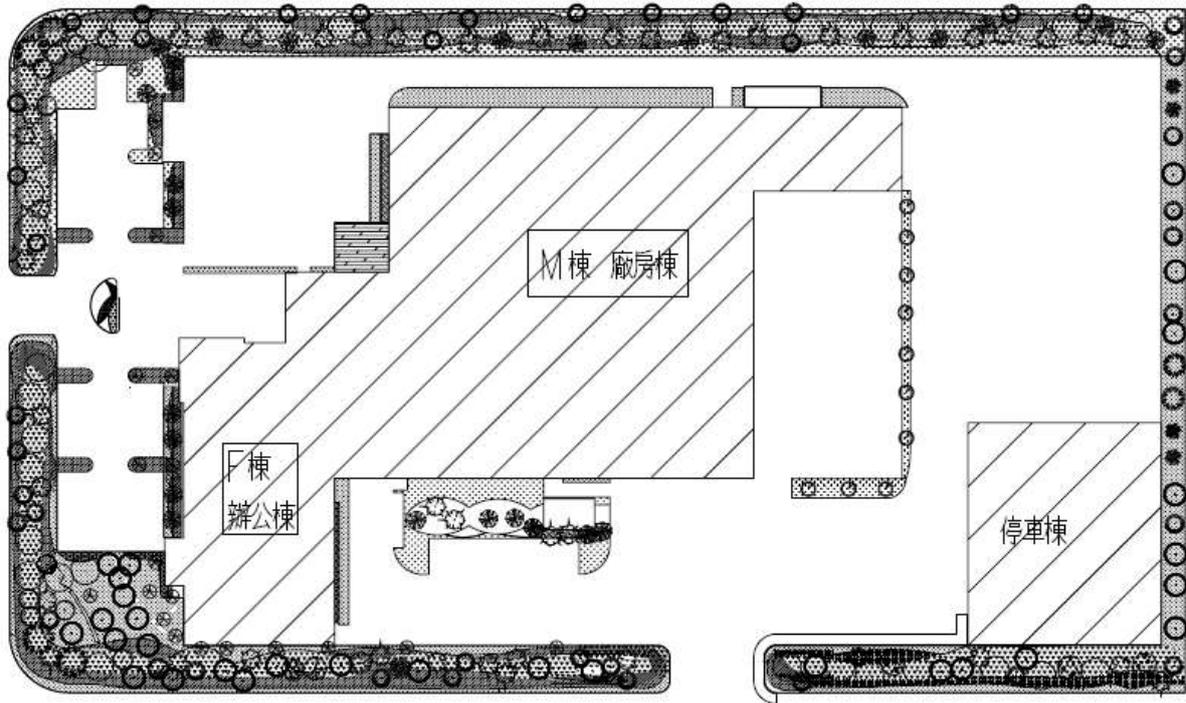
1.設計值：TCO2=6622620 kg

2.標準值：TCO2C=3456045 kg

3.判斷式：TCO2 > TCO2C，本指標及格



綠化指標評估說明



全區景觀配置圖

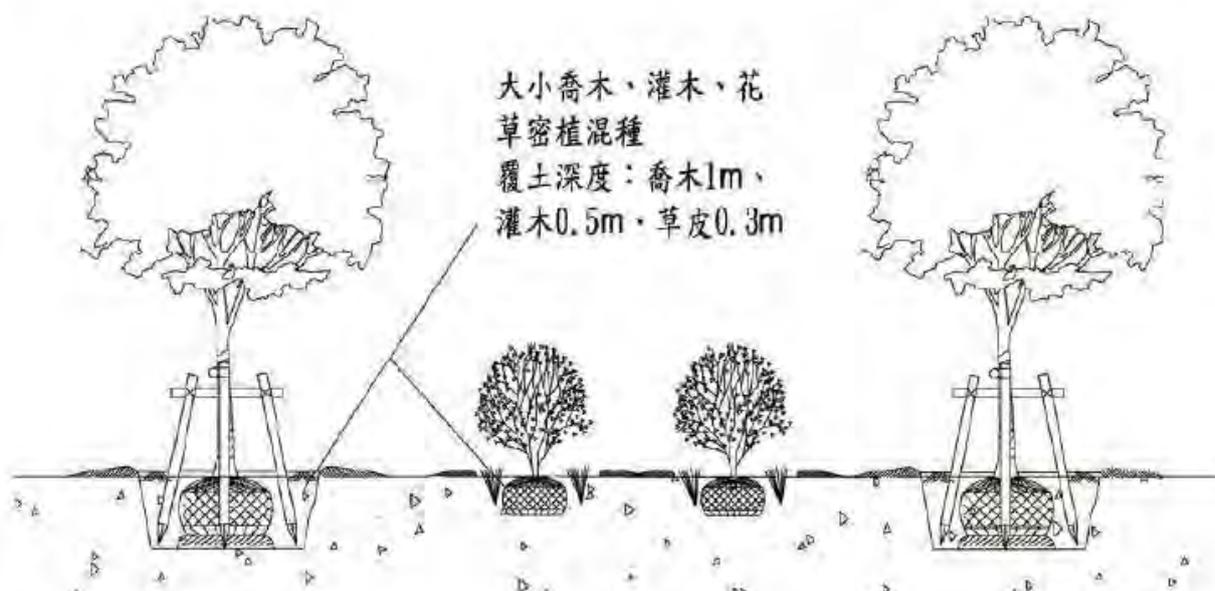


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綠化指標評估說明

◎植栽與覆土設計深度剖面圖

◆生態複層



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綠化指標評估說明

廠區四周
綠地皆以
喬木及複
層綠化的
方式植栽



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綠化指標評估說明

基地原有樹種



檸檬樹



蓮霧樹



荔枝樹



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廠區西側入口景觀



東側景觀



北側景觀



廠區南側入口景觀



日常節能指標說明

三、日常節能指標及格標準檢討

(1) 辦公類 $EEV = \underline{0.67} \leq 0.80$ 是 **建築外殼節能評估**

大型空間類 $EEV = \underline{0.35} \leq 0.80$ 是

(2) EAC: $HSC = \underline{\quad\quad\quad} \leq HSC_c = \underline{\quad\quad\quad}$

$EAC = \underline{0.7} \leq 0.80$ 是 **空調系統節能評估**

(3) $EL = \underline{0.59} \leq 0.70$ 是 **照明系統節能評估**

(4) 以上三條判斷式必須全部通過才屬合格

合格	是
不合格	



二、EEV 外殼耗能效率計算

1. F棟辦公棟屬辦公類建築，以計算建築外殼耗能量ENVLOAD檢討之。

辦公類 建築外殼耗能量ENVLOAD	北區基準值	EEV	判斷
53.23	80	0.67	≤ 0.80 通過

2.M棟廠房棟屬大型空間類，以計算窗面平均日射取得率AWSG檢討之。

大型空間類 建築外殼耗能量ENVLOAD	北區基準值	EEV	判斷
97.27	276	0.35	≤ 0.80 通過



辦公室開窗率小於**25%**
並採用**Low-E玻璃**





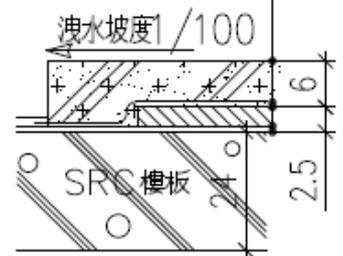
外牆採用Low-E 玻璃



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60mm厚2500psi 混凝土
0.2mm厚PE布
厚度25mm隔熱PS板
厚度0.3mm 熱熔式防水毯



空氣層
礦纖天花板10mm

M棟屋頂大樣

屋頂平均熱傳透率 **0.72 (W/m2.k)**
< 1.0 (W/m2.k) OK !



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三、EAC空調系統節能計算

1. 本案採空調節能計畫書評估之。
2. 採最大熱負荷計算，**EAC=0.7 ≤ 0.80**，合格。

採用高效率冰水主機

冷卻水塔風車以變頻器控制
冰水泵浦採用變頻控制依負載加減載



廠房排氣風扇運轉調整

- 一樓排風扇兩台自動啟動改為手動控制單台運轉
- 二樓排氣風扇全載運轉改為以變頻器調整負壓控制

冰機出水溫度從5.61℃上調至7℃

在夏季可節省 9446.4KWH / 月
在冬季可節省 5904 KWH / 月

辦公室空調溫度

設定至26℃ 至28℃

