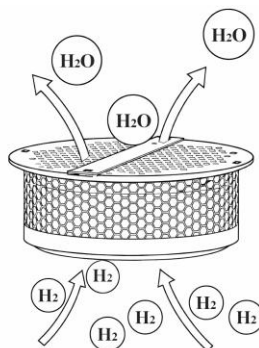


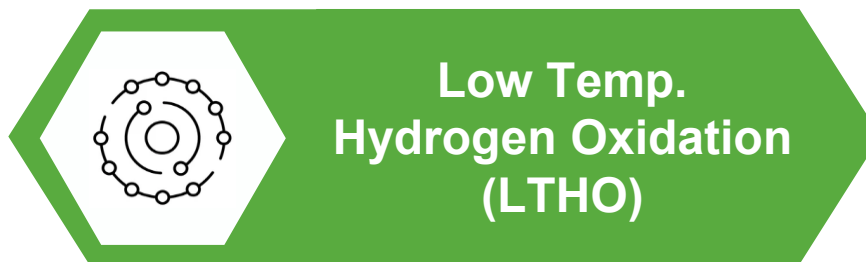
# LTHO Solution – Hydrogen Elimination

Eliminating H<sub>2</sub> leaks

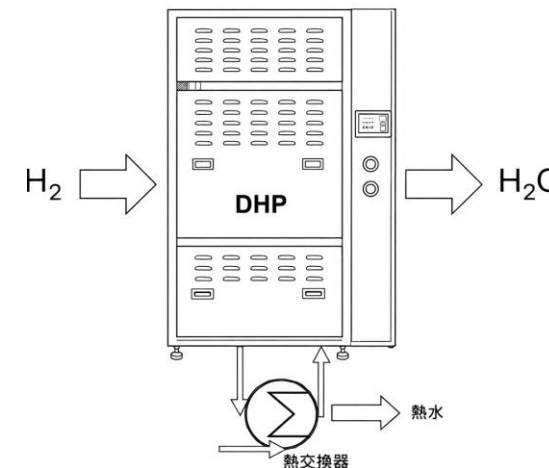


## DHC series convection type dehydrogenizer

- Eliminate indoor leaked hydrogen
- Fuelless, no power required
- Zero emissions



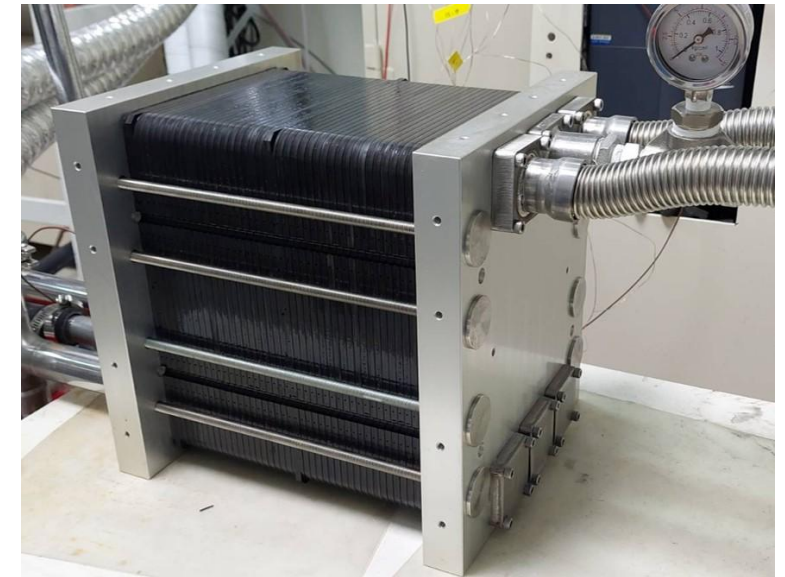
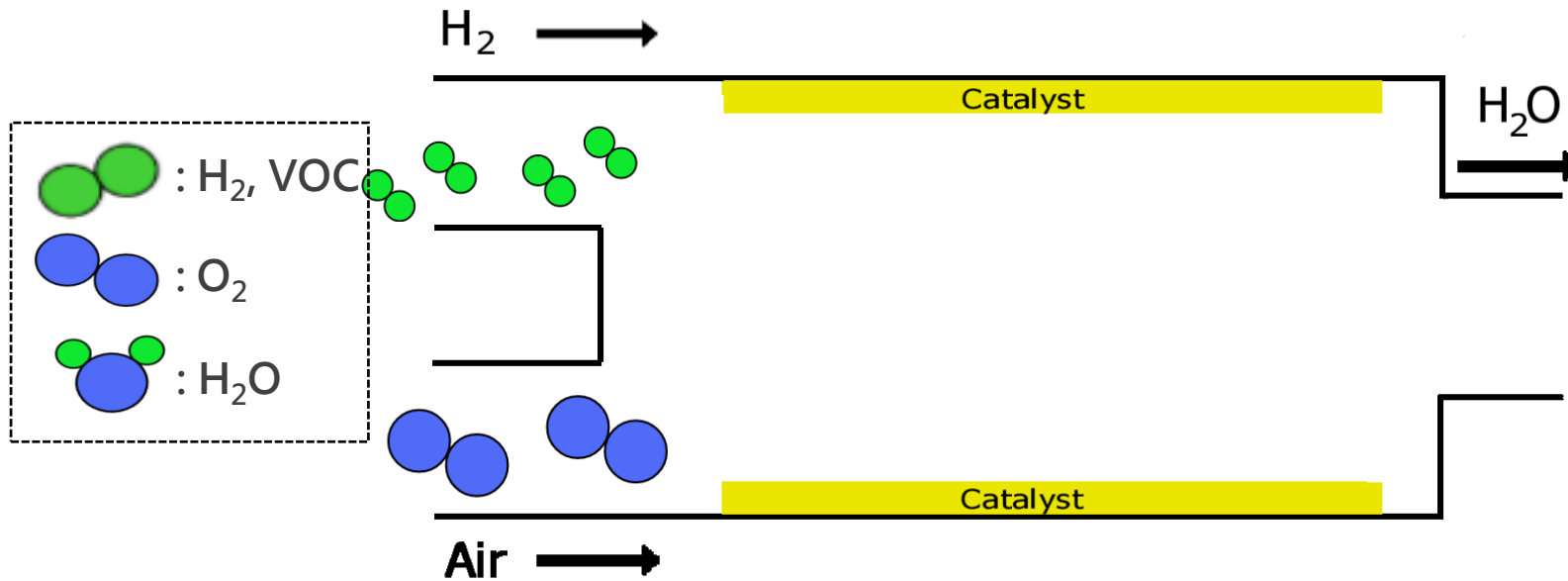
Eliminating pipeline-based H<sub>2</sub> emissions



## DHP series pumping type dehydrogenizer

- Eliminate hydrogen exhaust without flame
- Residual H<sub>2</sub> < 4000ppm, DRE > 98%
- Zero emissions; capable of heat recycling

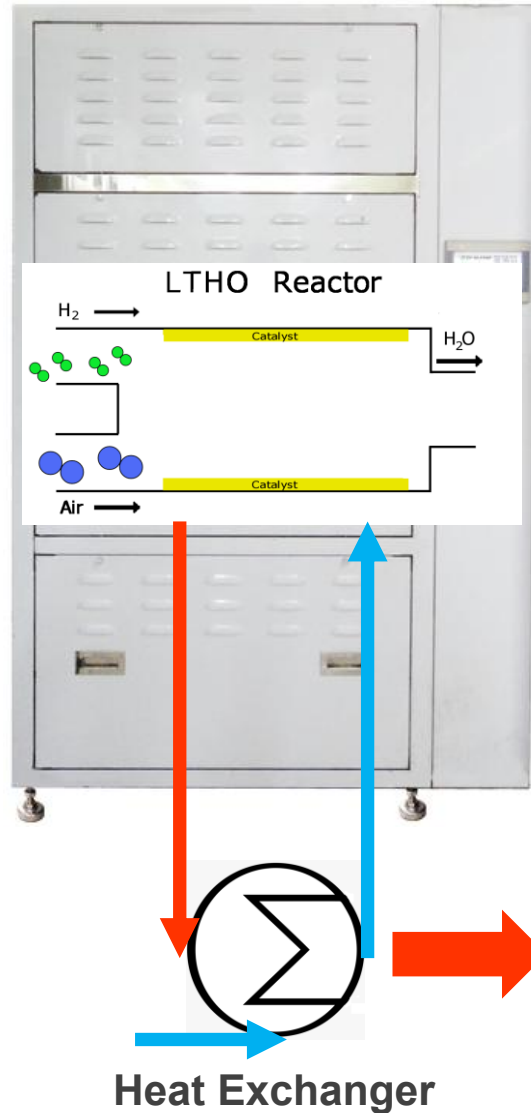
# Introduction of DHP



## Advantage

- ✓ Low operation temperature (<math><100^\circ\text{C}</math>)
  - ✓ Zero  $\text{CO}_2/\text{NO}_x$  emission,  $\text{H}_2\text{O}$  is the only byproduct
  - ✓ DRE > 98%, Residual  $\text{H}_2$  < 4000 ppm\* (10% LEL)
- (\* Depending on customer's exhaust gas and requirement, residual  $\text{H}_2$  conc. could be different)

# DHP Heat Recycling



H<sub>2</sub> oxidation reaction generates heat which can be recycled.

Est. Benefit:

H <sub>2</sub> flow (M <sup>3</sup> /hr)	Heat (KW/year)	Saving \$		CO <sub>2</sub> reduction
		Electricity bill (USD/year)	CO <sub>2</sub> -electricity (Ton/year)	Hot water flow (Ton/hr, 20°C rise)
45	745,038	\$96,855	373	4.6

[Est. conditions] running time: 7884 hr/year; heat exchange efficiency: 70%; electricity price: US\$0.13/kWh  
 \* Depending on the recycling temperature and system, there will be different energy-saving and CO<sub>2</sub> reduction effects; CO<sub>2</sub> reduction is based on 0.5Kg CO<sub>2</sub>/kWh in Taiwan.

# ITRI DRE Test Report for DHP

Reactor information			Process information		
Model NO.	DHM07A		Process	De-hydrogen	
Module S/N	TPRD202108EXH03ST		Process Gas	H <sub>2</sub>	
操作條件	校正後入口氣體組成(LPM)			Process condition	60 ~ 65 °C
	H <sub>2</sub> (設定值)	N <sub>2</sub> (設定值)	Air (設定值)		
	99.0 (100)	0 (0)	370.1 (370)		
	89.1 (90)	57.9 (40)	360.1 (360)		
	28.7 (29)	24.7 (11)	99.9 (100)		
	28.7 (29)	0 (0)	99.9 (100)	Assessing instrument	Dräger Polytron® 8200 CAT
時間地點					
測試日期	05/19/2022				
測試地點	Toplus Energy Corporation				
委託單位	Toplus Energy Corporation				
執行單位	工業技術研究院 材化所				

Test result from ITRI:

1. DRE > 98%
2. Residual H<sub>2</sub> concentration < 4000ppm

校正後入口氣體組成(LPM)			H <sub>2</sub> 濃度(入口) (H <sub>2</sub> +N <sub>2</sub> +Air) ppm	入口流量 (Q <sub>in</sub> : H <sub>2</sub> +N <sub>2</sub> ) LPM	H <sub>2</sub> 濃度(入口) (C <sub>in</sub> : H <sub>2</sub> +N <sub>2</sub> ) ppm	出口流量 (Q <sub>out</sub> ) LPM	H <sub>2</sub> 濃度(出口) (C <sub>out</sub> ) ppm	DRE %
H <sub>2</sub> (設定值)	N <sub>2</sub> (設定值)	Air (設定值)						
99.0 (100)	0 (0)	370.1 (370)	211059	99	1000000	387.3	2800	98.9%
89.1 (90)	57.9 (40)	360.1 (360)	175721	147	606123	434.3	3600	98.2%
28.7 (29)	24.7 (11)	99.9 (100)	187214	53.4	537453	124.3	800	99.7%
28.7 (29)	0 (0)	99.9 (100)	223173	28.7	1000000	110.7	1200	99.5%

$$DRE = 1 - \frac{C_{out} \times Q_{out}}{C_{in} \times Q_{in}}$$