

# RCS

Large Capacity PFC Catalytic Abatement



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RE-USE TECHNOLOGY

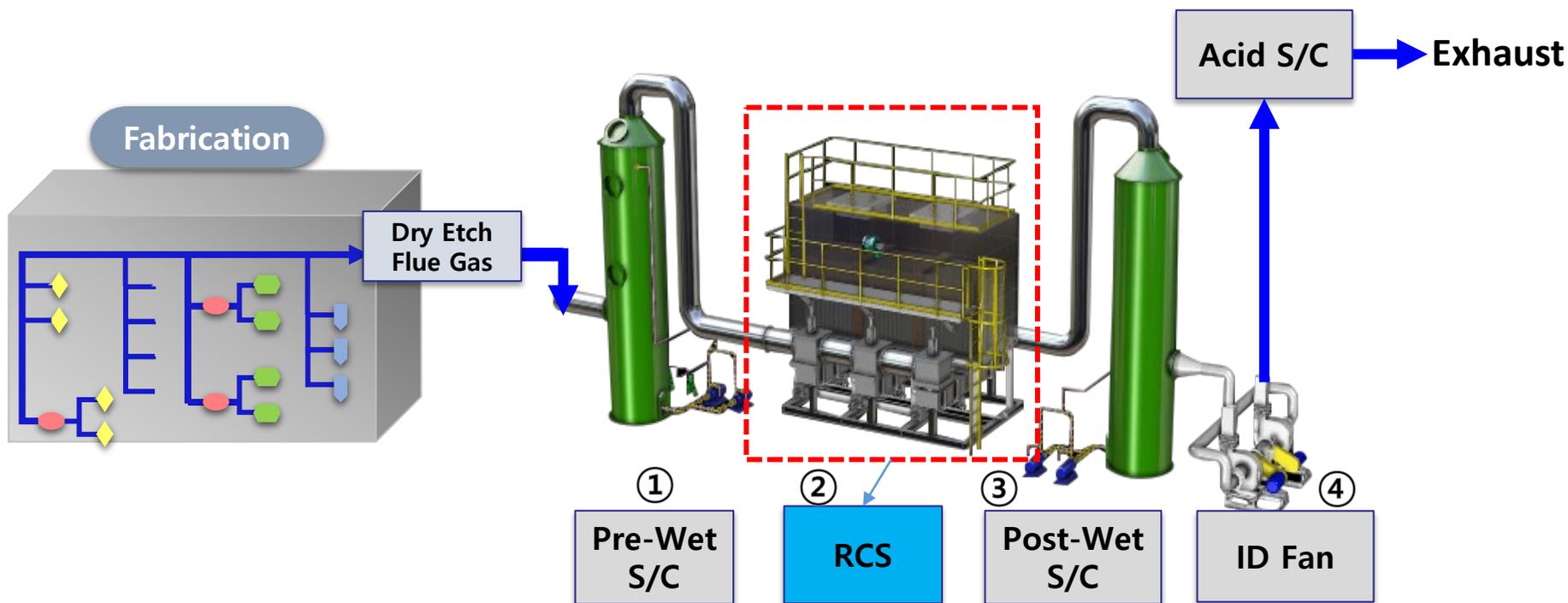
## Green House gases(GHG) & Global Warming Potential(GWP)

6 Major GHG						
	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFCs	PFCs	SF <sub>6</sub>
Sources of Emission	Fuel use	Waste, Agriculture, Landfill	Fertilizer use, Nitric acid, Caprolactam	Refrigerant, Foaming agent	Semiconductor manufacturing	LCD Electrical insulator
GWP	1	21	310	140 ~ 11,700	6,500 ~ 9,200	23,900
Green House Effect(%)	55	15	6		24	

### \* Global Warming Potential

GWP is a measure of how much heat a greenhouse gas traps in the atmosphere up to a specific time horizon, relative to carbon dioxide. It compares the amount of heat trapped by a certain mass of the gas in question to the amount of heat trapped by a similar mass of carbon dioxide and is expressed as a factor of carbon dioxide (whose GWP is standardized to 1).

# 1. Technical Overview



◆ RCS(Regenerative Catalyst Oxidation is a technology jointly developed by Samsung Engineering and EcoProHN

① Pre-Wet SCR	② RCS	③ Post-Wet SCR	④ ID Fan
Catalytic poisoning Removal (HF, Cl <sub>2</sub> Gas, Dust, etc.)	CF <sub>4</sub> , SF <sub>6</sub> etc.. PFCs Gas decomposition <b>Eff. : 95% based on CF<sub>4</sub></b> Operation Temp. : 780°C	Treatment of by-product of PFCs (HF, SO <sub>x</sub> , etc.)	Maintain Process flow and static pressure

### Differences from Existing Technologies

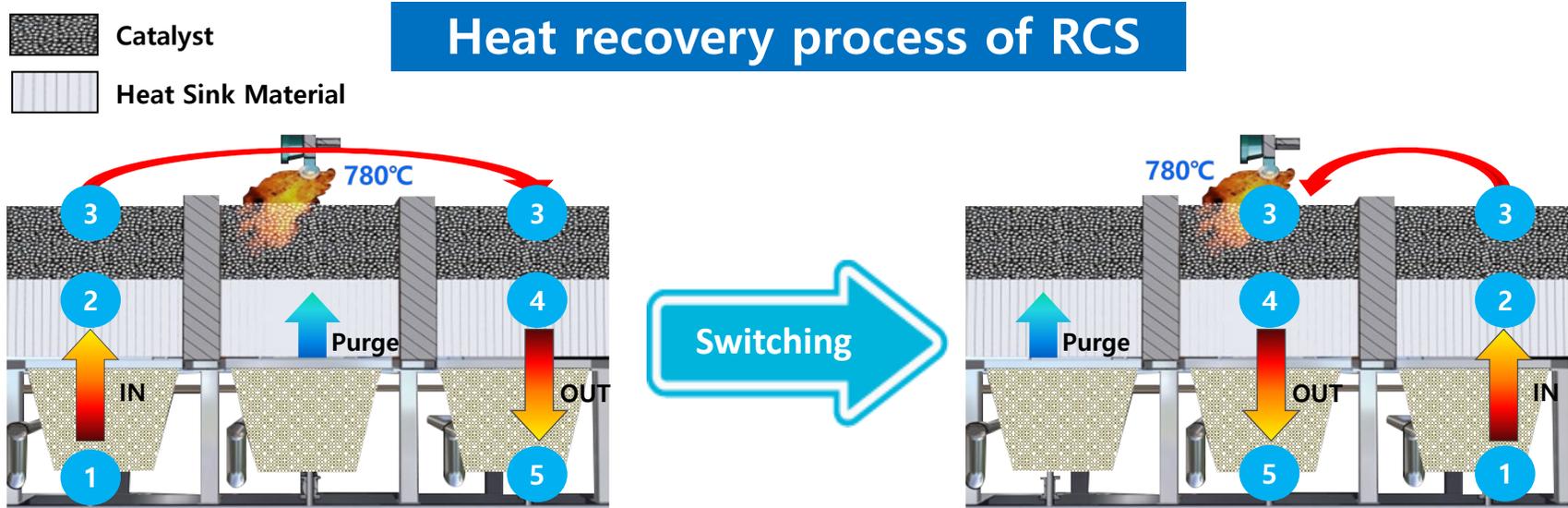
List	Burn / Electric Heat Type	Central RCS
Characteristic	<ul style="list-style-type: none"> <li>· Degradation of greenhouse gases at high temperature above <b>1,300 °C</b></li> </ul>	<ul style="list-style-type: none"> <li>· Degradation of greenhouse gases at high temperature above <b>700 °C</b></li> </ul>
Remark	<ul style="list-style-type: none"> <li>· High operation cost</li> <li>· Excessive energy consumption</li> <li>· Maintenance and fire hazard ↗</li> </ul>	<ul style="list-style-type: none"> <li>· Low operation cost (Amount of energy generated ↘)</li> <li>· Implemented large capacity integrated processing on the <b>roof and ground</b></li> <li>· Eliminating the fluorine compound, environment friendly equipment</li> <li>· NOx Emission minimized</li> <li>· Much less risk on fire hazard</li> <li>· Available for RCS installing at existing FAB running 24 hours</li> </ul>

### Consist of RCS and Function



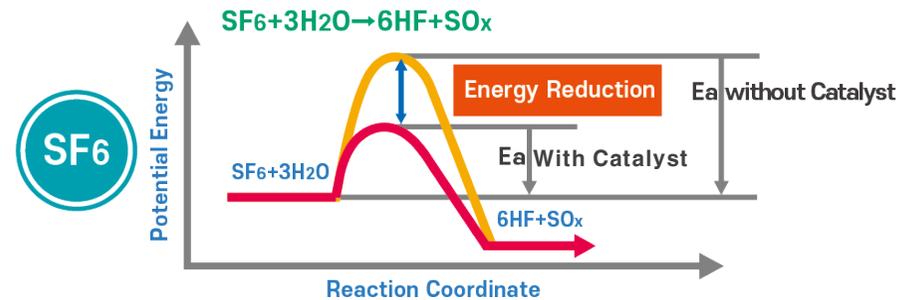
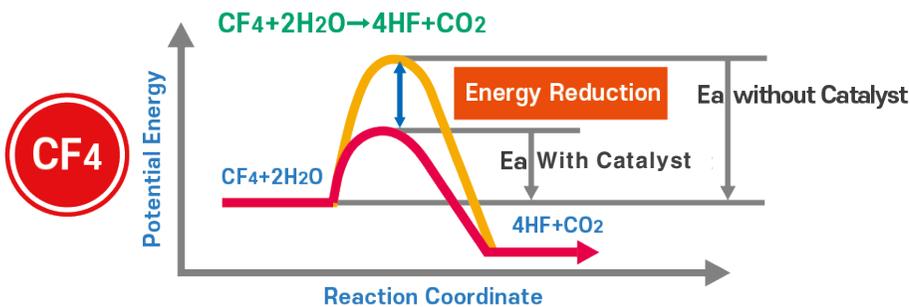
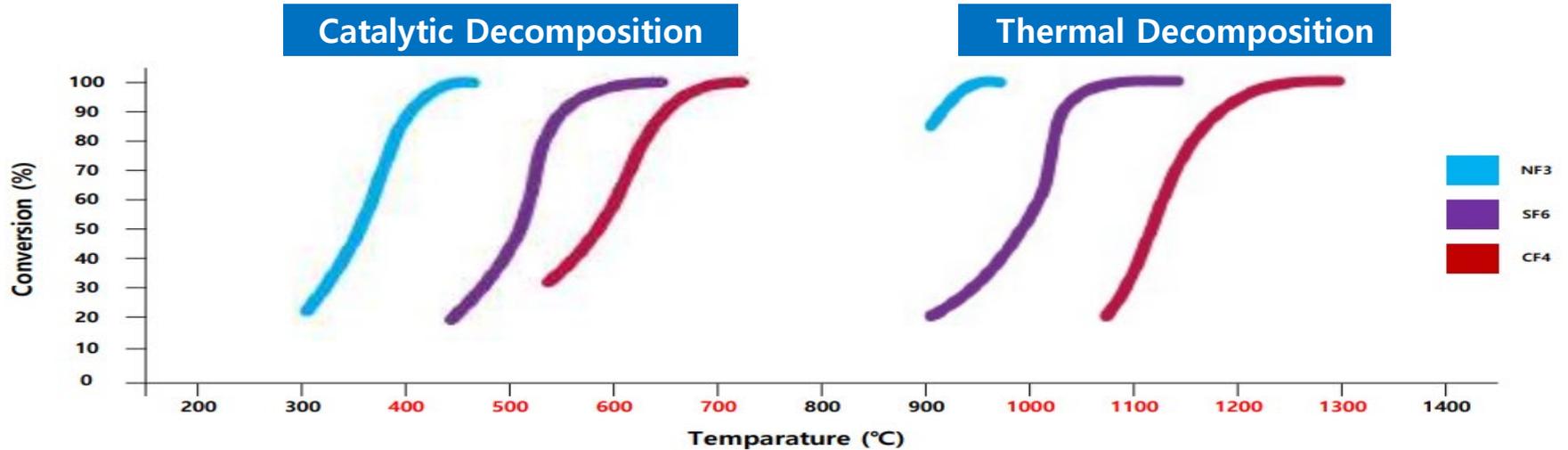
Name	Description
① Catalyst	Catalytic reaction degrades PFCs GAS decomposition temperature Over 1300°C ▶ Over 700°C (Energy Saving) ✓
② Heat Sink Material	PFCs gas recovers high-temperature heat after passing through catalyst ,so that saving operating costs even at high temperatures Heat recovery efficiency 95% ↑ (Energy conservation) ✓
③ Refractory Material	Uses special refractory materials with high corrosion resistance against PFC and HF
④ Casing	Application of strong corrosion resistant material Casing to HF
⑤ In/Out Damper	Poppet type damper with the best durability applied for periodic switching operation

# 3. Heat Recovery Technology



- ① Input process gas (25 °C~30 °C)
- ② It absorbs heat at almost the decomposition temperature level (over 700°C)
- ③ PFC gas is decomposed by passing through catalyst layer
- ④ And then, the PFC gas of high temperature release hot heats to the HSM.  
That is the Heat recovery technology.  
(In other words, Heat regenerator is recovered thereby the HSM absorbs the hot heats.)
- ⑤ Exhaust gas (high temperature : 60 ~ 70 °C) is higher than the input gas.  
**Thus, the heat recovery rate is about 95%.**

# 4. Performance (Lab. Data)

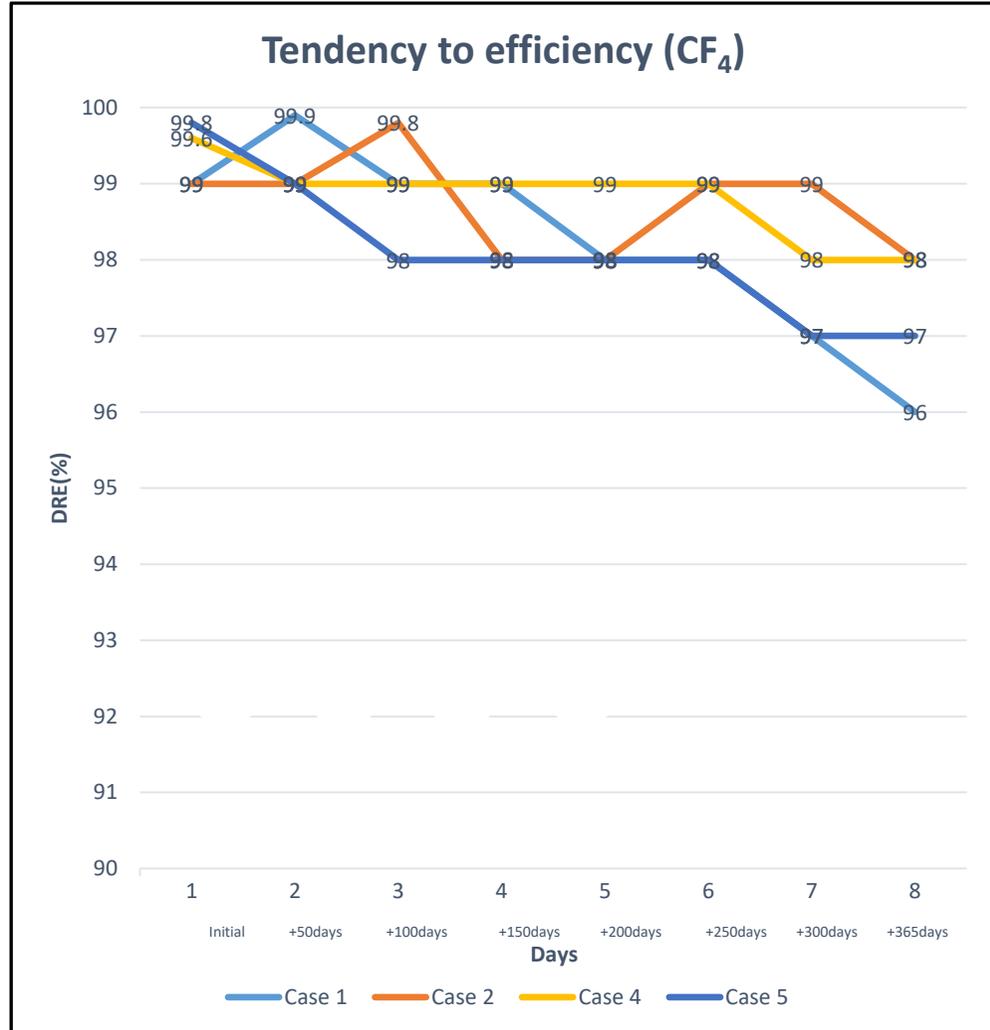


# 5. Field Data for PFCs Gas Removal Efficiency

## 1. Possibility and Effectives on RCS treatment

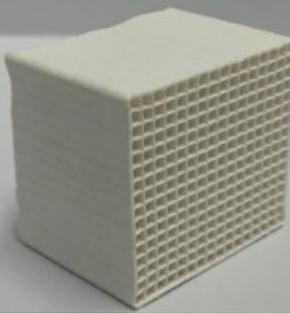
Design Parameter		Possibility of RCS Treatment	Effectives on RCS
HF, BCl <sub>3</sub> , Cl <sub>2</sub> , HBr		X	Catalyst performance degradation
CF <sub>4</sub>		O	
C-F compound	C <sub>4</sub> F <sub>6</sub>	O Proposing to ≥95%	
	C <sub>4</sub> F <sub>8</sub>		
	CH <sub>2</sub> F <sub>2</sub>		
	CH <sub>3</sub> F		
	CHF <sub>3</sub>		
SF <sub>6</sub>		O Proposing to ≥95%	
NF <sub>3</sub>		O Proposing to ≥95%	Occur NOx
CO		O	
Sulfur compounds (COS, SO <sub>2</sub> )		X	No problem RCS itself (Cause catalyst performance decrease)
Silica compounds (SiH <sub>4</sub> , Si <sub>2</sub> H <sub>6</sub> , SiF <sub>4</sub> , (SiH <sub>3</sub> ) <sub>3</sub> N)		X	Masking, (Cause catalyst performance decrease)
O <sub>2</sub>		X	X
Inert Gas (N <sub>2</sub> , He, Ar, etc)		X	X

## 2. Field Data for 1 year

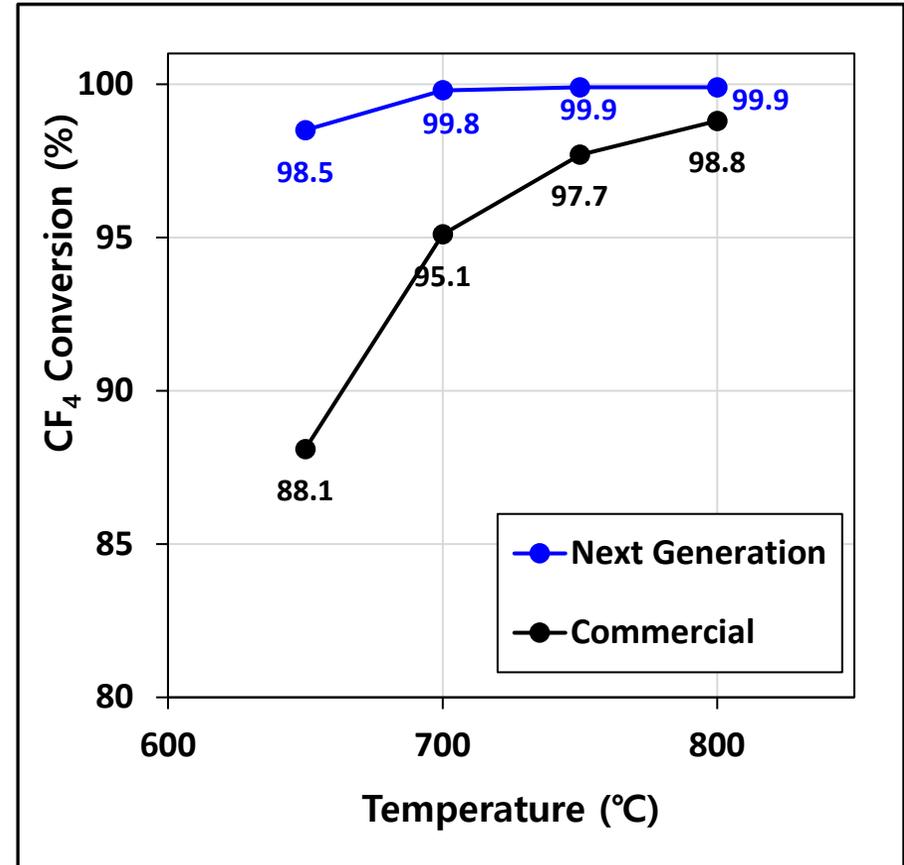


# 6. PFC Catalyst (Next Generation)

## 1. Physical Properties

Categories	Unit	ECOPRO HN	
		Commercial	Next Generation*
Type of catalyst	-		
Standard Size	mm	Φ16 x 18.8(H)	150 x 150 x 100
Surface Area	m <sup>2</sup> /m <sup>3</sup>	400	1,200
Pressure Drop		Normal	Low
DRE (CF <sub>4</sub> ) (at 750°C)	%	95	98 expected

## 2. Efficiency %



Test condition : CF<sub>4</sub> 300ppm / Temp. 650~800°C

**\*\*\* Field Test planned at Customer site in 2<sup>nd</sup> half 2024**

# 7. WASTE <Catalyst / Heat Sink Material> RE-USE TECHNOLOGY

Major Application ECOPROHN is working on



Customer



Additive



Al<sub>2</sub>O<sub>3</sub> Cement



REFRACTORINESS / HIGH EARLY STRENGTH

## Excellent heat resistance and high early strength

Calcium aluminate cement is inorganic binder that is resistant around 1400 ~ 1800°C for refining, smelting as well as fabricating and casting.  
And after construction, it hardens fast and makes available to demold in a day.  
Therefore, it is applied to facilities of not only heavy & chemical industry, but also boiler, incinerator etc. that claim high temperature conditions.

Heavy Chemical Industry,  
Incinerator Etc



**EcoPro** *HN*

*Everyday Everywhere*