

DIABON[®] HCl Synthesis Units – a perfect match between energy efficiency and highest HCl concentration up to 38%

SGL CARBON GmbH May 13, 2025

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12th International Chlor-Alkali Technology Conference & Exhibition

> 13-15 May 2025 Barcelona - Spain





 High concentrated HCl acid production up to 38%

• SGL's 170 TPD Synthesis Unit

 Heat Recovery by SGL's Synthesis Units

Systems by SGL CARBON



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High concentrated HCl acid production up to 38%



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SGL's DIABON HCl Synthesis

Parameter	Unit	
Capacity (100% HCl)	TPD	0 - 170
HCl acid concentration	wt.%	38
HCl gas concentration	vol%	95
HCl gas pressure	barg	3.2
Cl2 content in acid	ppm wt.	< 1
HCl content in vent gas	mg/Nm ³	< 30
Cl2 content in vent gas	mg/Nm ³	< 3



CWS: Cooling water supply; CWR: Cooling water return



HCI Acid Production

HCl acid production up to 34%

HCl synthesis unit standard design

High concentrated acid production up to 38%

- By reduction of absorption water flowrate concentration will increase
- Boiling point of acid decreases
- Absorption efficiency decreases
- HCl take over to scrubber increases
- Buffer/storage tank fuming increases







High concentrated acid production up to 38%

Boiling point reduces with increasing concentration

- To be avoided:
- High HCl take over to scrubber causing scrubber overheating and emissions
- HCl losses via tank venting
- → Product acid to be cooled well below boiling point









High concentrated acid production up to 38%

Scrubber design considerations

- Absorption efficiency
- H2 excess and inert gas content
- Turn down operation
- Packed section design
- Distribution and redistribution
- Cooling requirement
- Caustic scrubber requirement

HCl Emissions of a Standard Scrubber - simulated







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High concentrated acid production up to 38%

Phase the challenges by

- SGL's advanced process design capabilities (ASPEN+, HTRI, ANSYS) in combination with SGL's graphite equipment
- SGL's diverse solutions:
 - Product acid cooler
 - Cooled scrubber
 - External falling film absorber
 - Counter current absorption
 - **Integrated HCl synthesis**









Product acid cooling options

- Product acid outlet cooling device
- External product acid cooler
- Additional acid cooling blocks
- Cooling serviced partly by chilled water
- Cooling jacket sections
- Low absorption water temperature is beneficial











Cooled Scrubber

- Highly efficient plate type scrubber cooler
- Adjustable recycle flow
- Standby operation without use of fresh absorption water
- No additional control loop required due to overflow design
- Unsensitive against high inert gas loads
- \rightarrow Robust operation ensured







External falling film absorber

- Handles highest HCl take overs e.g. caused by high inert gas loads in combination with high concentrated acid production
- Serviced with cooling water or chilled water to boost performance
- Counter current absorption concept proofs high efficiency





chlor



sal carbon



Integrated HCI Synthesis Unit

- Invented and designed for high concentrated acid production
- For most efficient absorption gas to absorption media in counter current flow
- Integrated tray type scrubber section is cooled by cooling jacket
- Dedicated product acid cooling blocks at the bottom



Tunnel trays

Absorption blocks

Acid cooling blocks

Combustion chamber







SGL's 170 TPD Synthesis Unit



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SGL's 170 TPD DIABON HCl Synthesis

Type S-1440e

Capacity: 170 TPD HCl 100%

Dimension: OD ~ 2000 mm Height ~ 22m Weight ~ 35t



pre-assembled combustion chamber



with spin burner made from graphite





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Heat Recovery by SGL's Synthesis Units



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Heat recovery in HCl synthesis units

	Standard	Hot water loop	Membrane wall	ECOSYN
Steam production	-	-	0,6 t/t HCl	0,9 t/t HCl
Hot water production	-	400 kWh/t HCl	-	-
Cooling water duty ⁽¹⁾	1200 kWh/t HCl	800 kWh/t HCl	800 kWh/t HCl	550 kWh/t HCl
Units sold since last Eurochlo	or 32x	4x	6x	1x
Setup				Patented technology

(1) Cooling water duty can be further reduced by using the heat of absorption (e.g., boiler feed water pre-heating)



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Membrane Wall Technology

Key performance data	Unit	
Capacity (100% HCl)	TPD	0 - 160
Steam production	t/t HCl	0,6
Steam pressure	Barg	up to 10
Fe content	ppm wt.	< 3

Requirements

- Feed must be free of salt
- Steel combustion chamber must not cool down below the dew point for corrosion protection
- Boiler feed water according to specification EN12952-12





Membrane Wall Technology

Customer Benefits

- No pumps
 - $\circ~$ Thermosiphon principle for boiler water circulation
 - Elevated acid outlet
- High reliability
 - $\circ~$ Design is based on proven membrane wall technology
- Highest safety level
 - Same safety system as per standard concept
- Good accessibility
 - $\circ~$ Designed as per standard bottom burner concept
- References
 - o China, Canada, France, Italy, Korea, Malaysia, India









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ECOSYN Technology

Key performance data	Unit	
Capacity (100% HCl)	TPD	90
Steam production	t/t HCl	0,9
Steam pressure	barg	up to 14
Fe content	ppm wt.	< 1,5

Requirements

- Feed must be free of salt
- Steel combustion chamber must not cool down below the dew point for corrosion protection
- Boiler feed water according to specification EN12953-10





ECOSYN Technology

- **Customer Benefits**
- Highest efficiency
 - o 0.9 t steam/t HCl
- High steam pressure
 O Up to 14 barg
- High reliability
 - Design is based on shell boiler technology
 - $\circ~$ Standard SGL burner used
- Good accessibility
 - $\circ~$ Designed as per standard bottom burner concept
- References
 - o Austria, Italy, Slovenia









Systems by SGL CARBON



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Systems by SGL Carbon

Corrosive fluid handling

- HCl gas synthesis units
- HCl synthesis & desorption units
- HCl desorption units
- Azeotrope breaker systems
- Absorption systems
- Quench systems
- H2SO4 dilution units
- P2O5 concentration, extraction and defluorination









Summary



DIABON HCl synthesis units are designed as tailor-made solutions, providing unique selling points like highest HCl concentrations up to 38%, heat recovery and safety.

Whenever you have a challenge in the area of corrosive fluid handling – contact SGL









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Chlor-alkali: achieving climate neutrality

THANK YOU

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