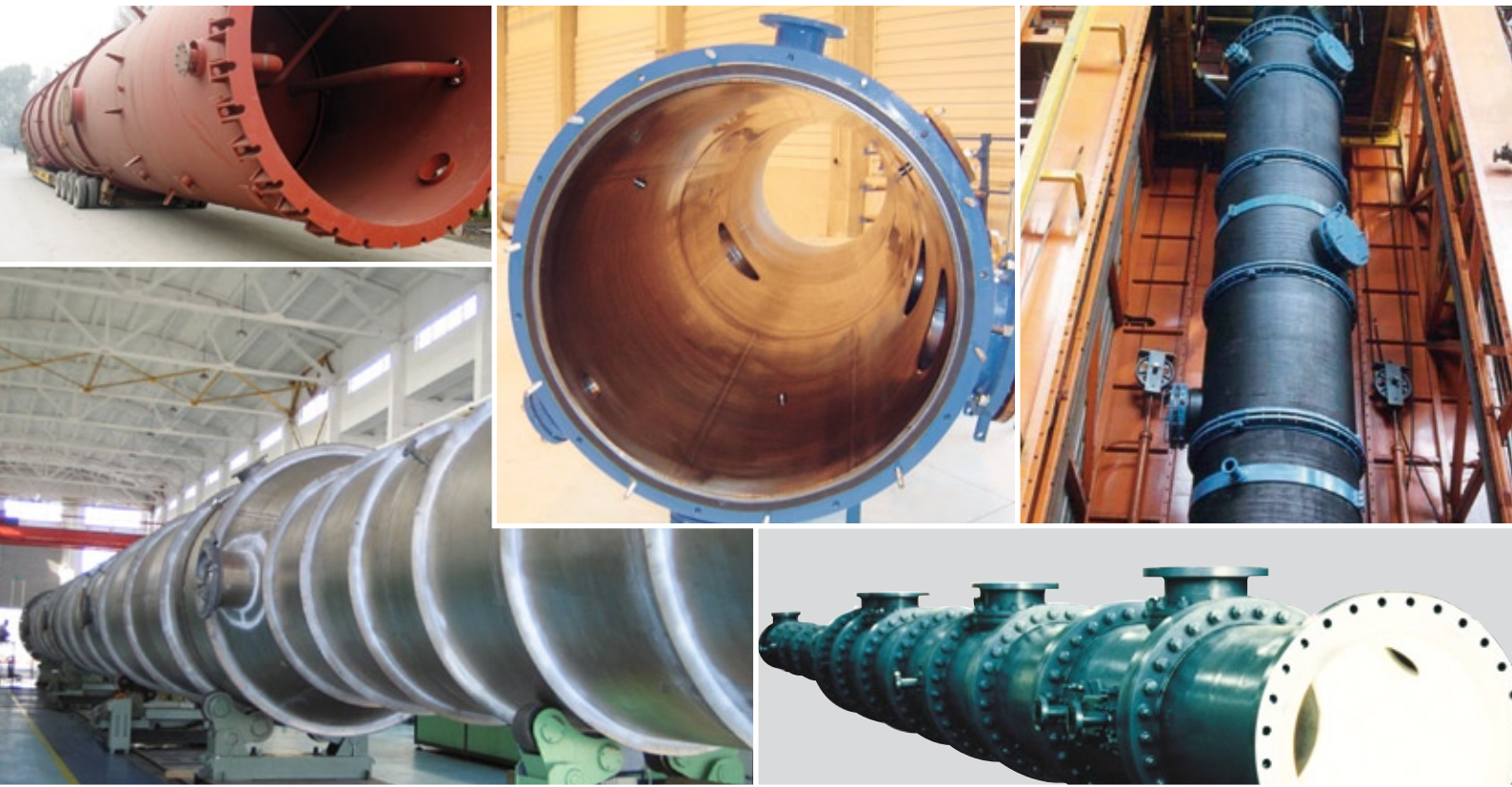




# CARBONE LORRAINE CHEMICAL EQUIPMENT DIVISION Columns



CARBONE LORRAINE IS NOW

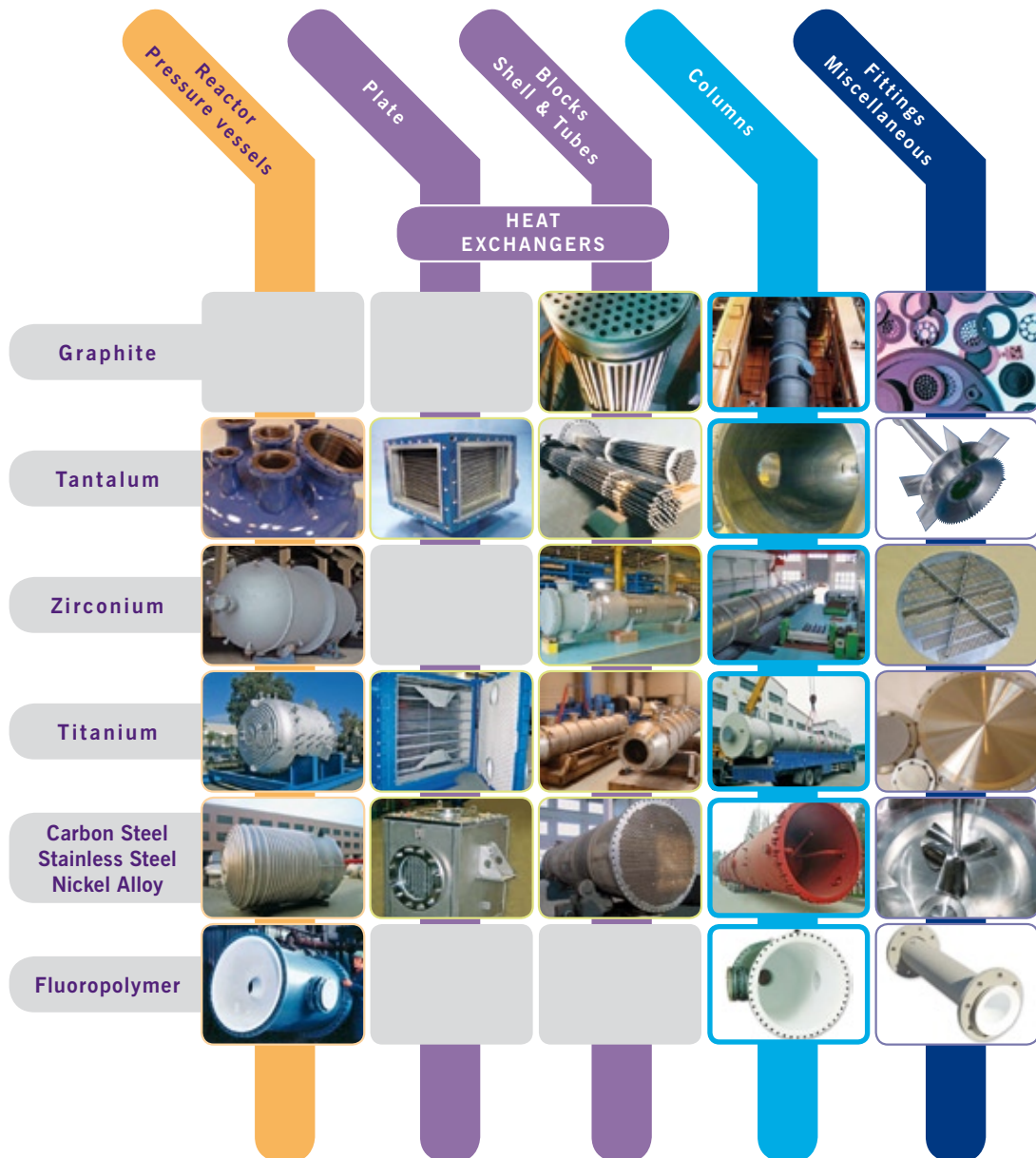
**MERSEN**

# Carbone Lorraine Chemical Equipment Division

Carbone Lorraine Chemical Equipment Division is a global leader in supplying equipment with innovative materials dedicated to severe process industries.

Expert in materials, the Division excels in the development of technological solutions in **highly demanding chemical environments**. These media employ very corrosive products requiring appropriate equipment.

Carbone Lorraine, the number one supplier of corrosion-resistant equipment, is recognized as an international leader whose leading position is explained by its policy of permanent innovation.



# Columns

Carbone Lorraine designs and manufactures columns in graphite, PTFE lined, reactive metals (tantalum, titanium, zirconium) and metals (nickel alloys, stainless steel, carbon steel). The columns can be completed according to your specifications.

Our columns are fully compliant with international construction codes and certifications, such as

- PED 97/23/EC European Pressure, Equipment Directive, ASME Stamp U/U2 American certification, SELO Chinese certification, AD-Merkblatt 2000-WO, AD-Merkblatt 2000-HPO...
- ASME VIII Div 1, CODAP, AD-Merckblatt

Whatever the constraints of your process, we have the solution within our large range of materials.

## MATRIX SELECTION: MATERIALS - PRESSURE - TEMPERATURE

	Graphite	PTFE Lined Steel	Metals
Design Pressure	Max 3barG	8barG	30barG
Vacuum resistance	OK	Optional	For clad or solid For loose lined
Design Temperature	Up to 430°C	230°C	250°C
Sealing	Gasket between sections Max 2.5m	No gasket required Max 1.5m	Welding or gasket when required
Maximum diameter	80" in Graphilor® ML	64" in seamless PTFE Alternative material for higher diameter	No limit
Permeability	Impregnated graphite	PTFE natural permeability	None
Thermal shock resistance	Ceramic material	No influence	No influence
Main application	<ul style="list-style-type: none"> <li>• HCl stripping</li> <li>• HCl absorption</li> <li>• Gas cleaning</li> </ul>	<ul style="list-style-type: none"> <li>• HCl stripping</li> <li>• HF and H<sub>2</sub>SO<sub>4</sub> processing</li> </ul>	<ul style="list-style-type: none"> <li>• Ta: All chemicals except HF</li> <li>• Zr: Acetic acid, formic acid, sulfuric, nitric</li> <li>• Ti: chlorine chemicals, sea water, nitric acid</li> </ul>
Final product tests	<ul style="list-style-type: none"> <li>• Visual</li> <li>• Dimensional</li> <li>• Tightness (Hydro test, pneumatic test)</li> </ul>	<ul style="list-style-type: none"> <li>• Visual</li> <li>• Dimensional</li> <li>• Tightness (Dielectric test, hydro test, pneumatic test)</li> </ul>	<ul style="list-style-type: none"> <li>• Visual</li> <li>• Dimensional</li> <li>• Dye penetrant test</li> <li>• X Rays, ultrasonic</li> <li>• Helium test</li> <li>• Hydro test</li> <li>• Hot gas cycle</li> </ul>

■ most suitable  
■ less suitable

All values are indicative

# Graphite Columns

Carbone Lorraine graphite columns offer reliable and corrosion-resistant solutions to the processes of organic and inorganic chemical industries.

The columns are manufactured with the exclusive graphite developed by Carbone Lorraine: Graphilor®3.

## To learn more about Graphilor®3

As a century-old experienced company in manufacturing fine and ultra-fine structured graphites, Carbone Lorraine has developed its advanced ultra-fine graphite (grain size of 20 microns): Graphilor®3.

### Properties of Graphilor®3

- Excellent refractory qualities and mechanical properties
- Very good thermal conductivity and temperature resistance
- Non-contaminating
- Exceptional corrosion resistance

Various impregnants to ensure the imperviousness, the resistance to corrosion - Temperature and the long-term stability

- Highly cross-linked resin (BS)
- Resin treated at high temperature (C)
- PTFE Resin (TH)

## Focus Application: HCl Adiabatic Absorption

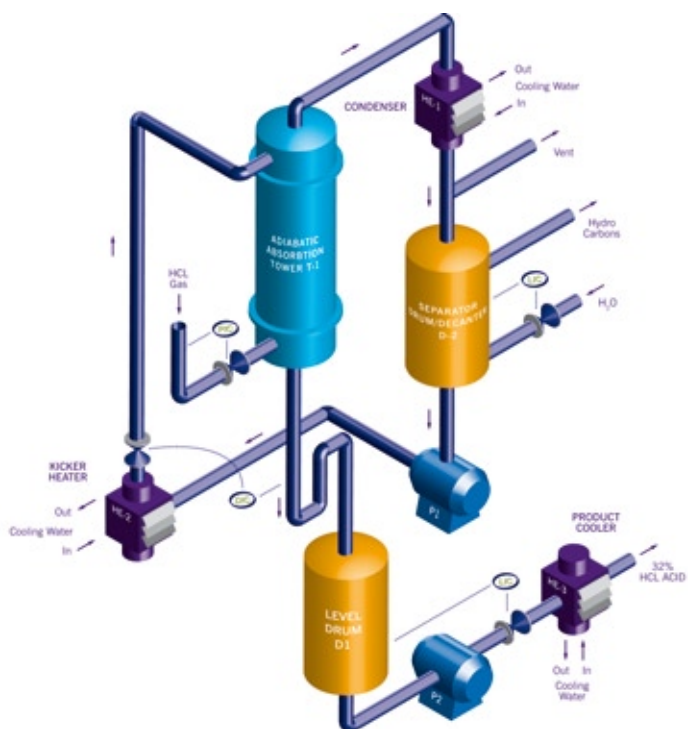
Gases such as HCl gas are dissolved in water in many chemical processes, particularly to store it, purify it or simply to use it in chemical reactions. This operation is called **absorption** which is an exothermic process.

Hydrogen fluoride and bromide are also concerned by the absorption process.

The absorption is completed in a Graphilor®3 column at atmosphere pressure. This column is widely used as a tail tower of HCl synthesis unit.



4



HCl Adiabatic Absorption

# PTFE Lined Columns

Armylor® Columns are manufactured in PTFE lined carbon steel. They are specially designed to comply with high temperature and to resist to corrosive environment. The PTFE liners are made by paste extrusion. PTFE lining is loose, thick and fully resistant to corrosion.

*For diameter up to 64"*

- Seamless liners
- Standard or heavy duty PTFE thickness (up to 10 mm)
- Fine powders of PTFE

*For diameter more than 64"*

- Welded PTFE liners
- Standard thickness 3 or 4 mm

Armylor® column is designed with an assembly of elements without gaskets in between.

## To learn more about Armylor®

Armylor® is Carbone Lorraine material made from PTFE or PFA. It is suitable for almost all corrosive fluids within the temperature range from -50°C to +230°C.

Since 1960's, Carbone Lorraine has mastered all PTFE manufacturing processes such as paste extrusion process, isostatic molding, PFA transfer molding. This know-how allows us to propose the best fluoropolymer lining solution to your equipment.

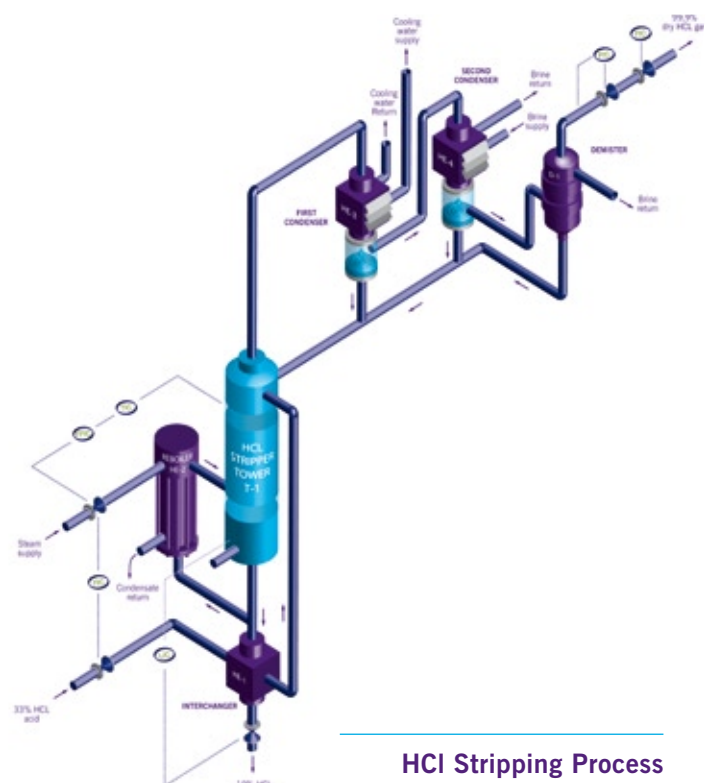
Optionally, our column can be equipped with vacuum resistance system to withstand partial vacuum. As well, Carbone Lorraine is able to offer double lining (ECTFE + PTFE) for more severe applications.

## Focus Application: Stripping HCl

It is a system designed to produce HCl gas from a feed of hydrochloric acid solution, usually 33%. The HCl solution is fed into the top of a column in Graphilor®3 Armylor®, PTFE or Tantalum CL-Clad®.

*The typical uses of pure HCl gas are*

- High purity silicon for solar cell or electronics applications
- Organic chemistry
- Various metallurgical processes



HCl Stripping Process

# Tantalum Columns The High-End Solution

We offer Tantalum columns made by loose lining or CL-Clad® process. Tantalum CL-Clad® plates as well as Zirconium and Titanium, are exclusively produced in CLEGC France and can be shipped to our American or Chinese plants for final manufacturing.

## To learn more about CL-Clad® technology

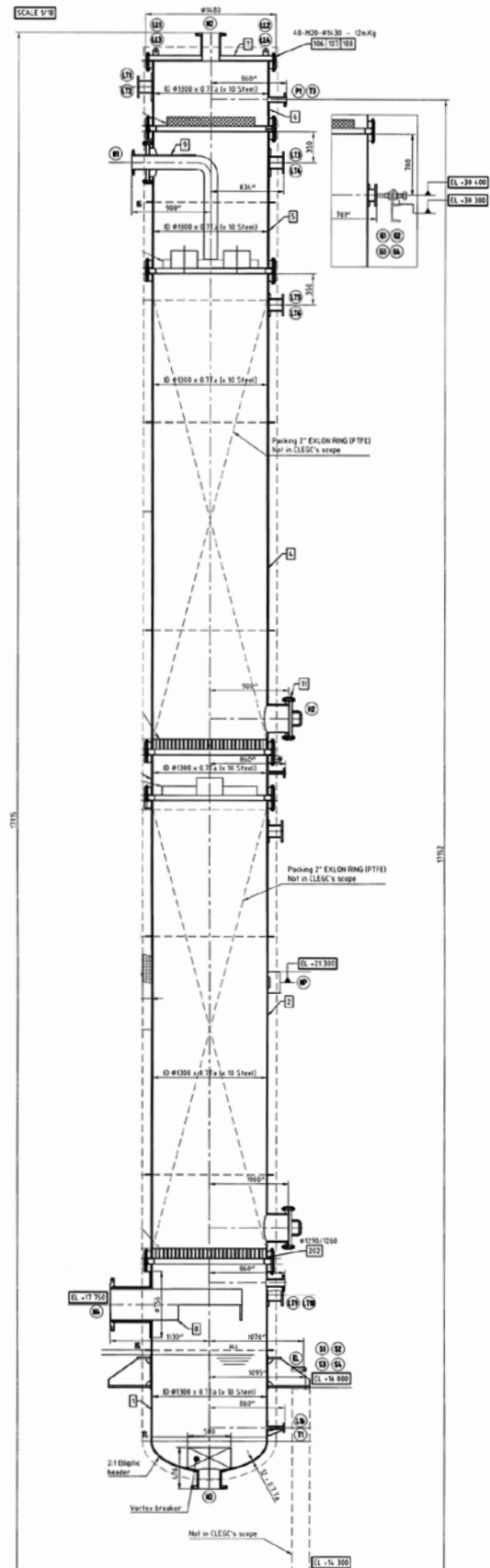
CL-Clad® is a patented cladding process developed by Carbone Lorraine (France). With this process, a thin layer of reactive metal (Tantalum, Titanium, Zirconium) can be cladded onto a carbon steel or stainless steel base plate. CL-Clad® technology is perfectly suitable for big thickness when design pressure is high.

*The CL-Clad® columns have many advantages*

- Cost-effective solution
- Excellent resistance to thermal and mechanical shocks
- Very low maintenance
- Reliable sealing for high pressure or vacuum applications
- High corrosion resistance against most process fluids

## Focus Application: HCl Stripping High Pressure

When a customer requires production of high pressure HCl up to 5 barG, the natural permeability of PTFE liner limits the use of Armylor® column. In such case, a design with reactive metal layer as Tantalum appears as the most reliable solution. We have several references of Tantalum CL-Clad® columns working satisfactorily under hard conditions.



# Zirconium Columns

Carbone Lorraine manufactures zirconium columns (in solid or clad) in its Chinese, French and American manufacturing sites.

## To learn more about zirconium

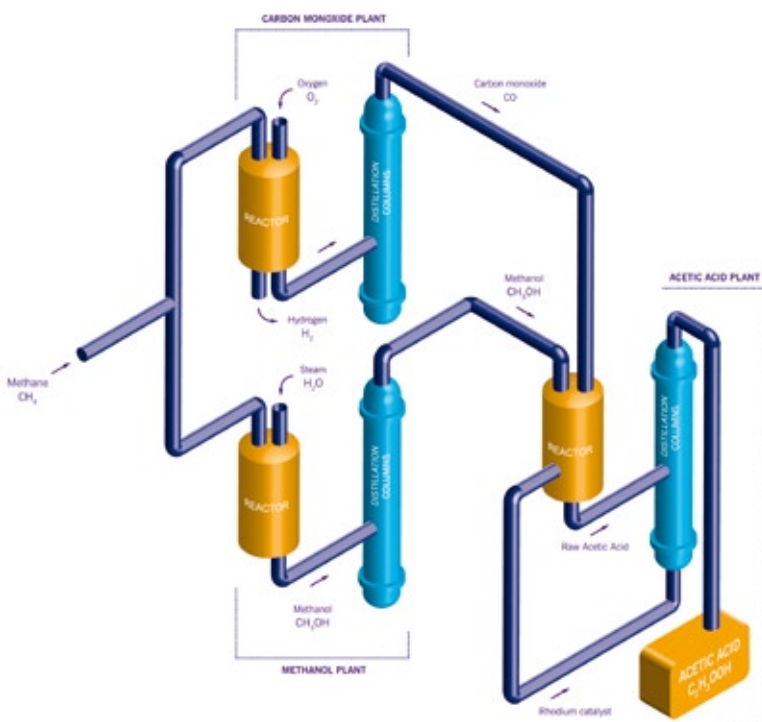
Zirconium is used in a wide variety of industrial and chemical processing applications. It is very resistant to corrosive attack in most organic and mineral acids and strong alkalis.

## Focus Application: Acetic Acid

Acetic acid is a chemical compound used in the manufacture of numerous consumer products, such as paints, cosmetics, plastic bottles and certain drugs. Carbone Lorraine is recognized as the N°1 in supplying zirconium equipment to the major producers of acetic acid: shell & tubes heat exchangers, reactors, columns.

### Type of columns in the acetic acid process

- Drying column
- Light-end column



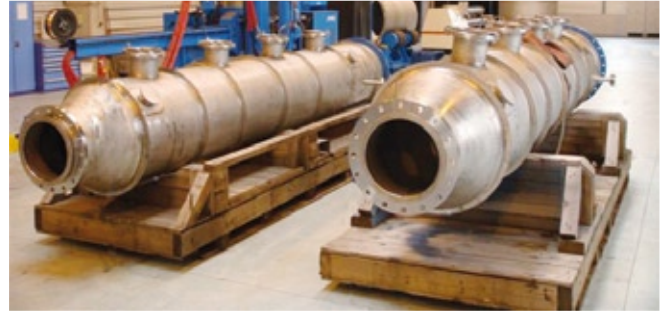
## Acetic Acid Process

# Titanium Columns

Carbone Lorraine manufactures titanium columns (solid or clad) in its Chinese, French and American manufacturing sites.

## To learn more about titanium

Titanium's resistance to the corrosive effect of salt water is among the best available. It is particularly resistant to metallic salts, chlorides, hydroxides, nitric and chromic acids. Different grades of titanium are available (pure and alloys). They can be selected based on corrosion requirements.



## Focus Application: PTA

PTA (purified terephthalic acid) is an intermediate in various plastics production as Polyester or PET. Carbone Lorraine, through its affiliate Astrocosmos, has a very large experience in supplying Titanium equipment to the major producers of PTA. Carbone Lorraine provides reactors, crystallisers, columns, heat exchangers and piping in titanium grade 2 for this application.

- We have successful deliveries by major accounts.



As well, titanium columns are widely used for ammonia water stripping in the coke plant process





# Metallic columns

## Nickel Alloys - Stainless steel - Carbon steel

**Carbone Lorraine, experienced and reliable supplier for various applications:  
Chemicals, petrochemicals, wastewater treatment.**

Xianda, your partner to handle your columns requirements.

Xianda, a company with the Carbon Lorraine Chemical Equipment Division, is specialised in the manufacture of metallic vessel equipment. With more than 150 qualified welders, Xianda is manufacturing columns in:

- Alloy B
- Alloy C
- Alloys 625, 31
- Stainless steels 904L, 916L
- Carbon steels



# Internals and Accessories

Carbone Lorraine supplies various internals made of Graphilor® Fluoropolymer (PTFE, PVDF), metals (Tantalum, Titanium, Hastelloy, zirconium) or other materials on request.

- Demisters
- Spargers
- Distributors, re-distributors



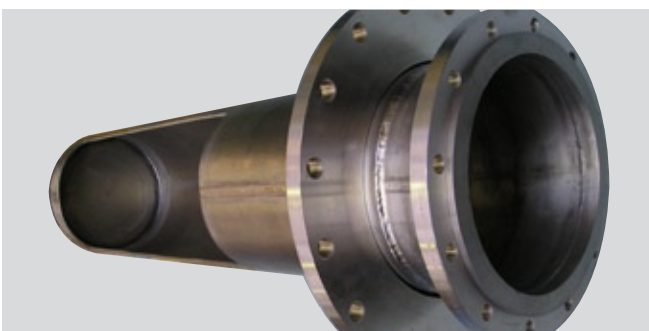
- Support grids



- Packing rings: Raschig rings, saddles, structure packing



- Special pipes



## GRAPHITE RASCHIG RINGS

Dimensions	External diameter	Internal diameter	% of vacuum	Quantity per m <sup>3</sup>	Specific surface m <sup>2</sup> /m <sup>3</sup>
1/2"	12	7	60	442 000	380
	15	10	67	226 000	310
1"	25	16	65	49 000	180
1"1/4	32	22	65	23 900	145
1"1/2	37	25	65	15 100	125
2"	50	37	68	5 820	90
3"	70	50	70	2 220	67
	80	60	74	1 490	59
4"	100	75	74	760	47

## FOCUS: ACCESSORIES OR SPECIAL PARTS IN TANTALUM

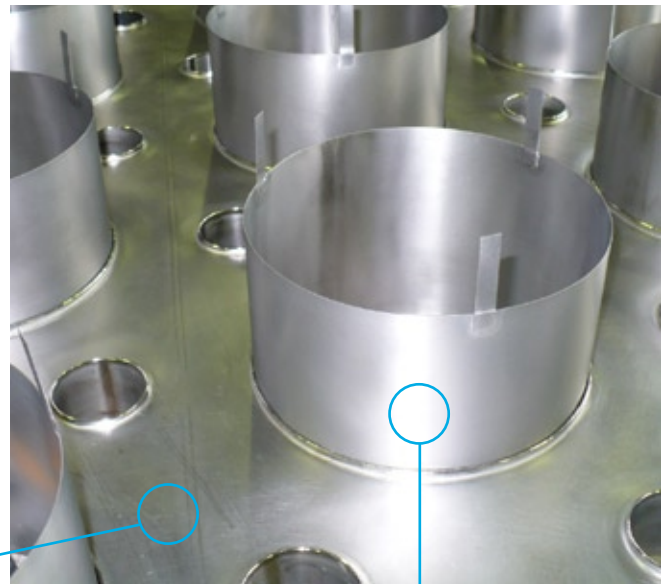
### TA CL-CLAD® DISTRIBUTOR

The Tantalum CL-Clad® Distributor is a combination of Tantalum CL-Clad® and solid parts.

**Applications: Acid concentration**

*Key features of CL-Clad®*

- Cost-effective solution
- Delivery time
- Mechanical strength

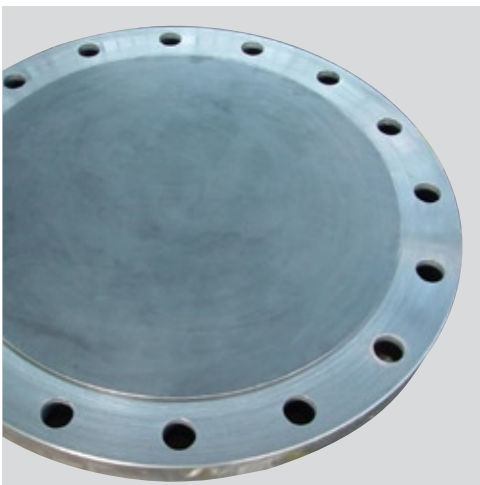


Tantalum CL-Clad®  
a Tantalum layer brazed  
with carbon steel base plate

Solid Tantalum

Ta CL-Clad® Distributor - Diameter 1 400 mm

### TA CL-CLAD® BLIND FLANGE

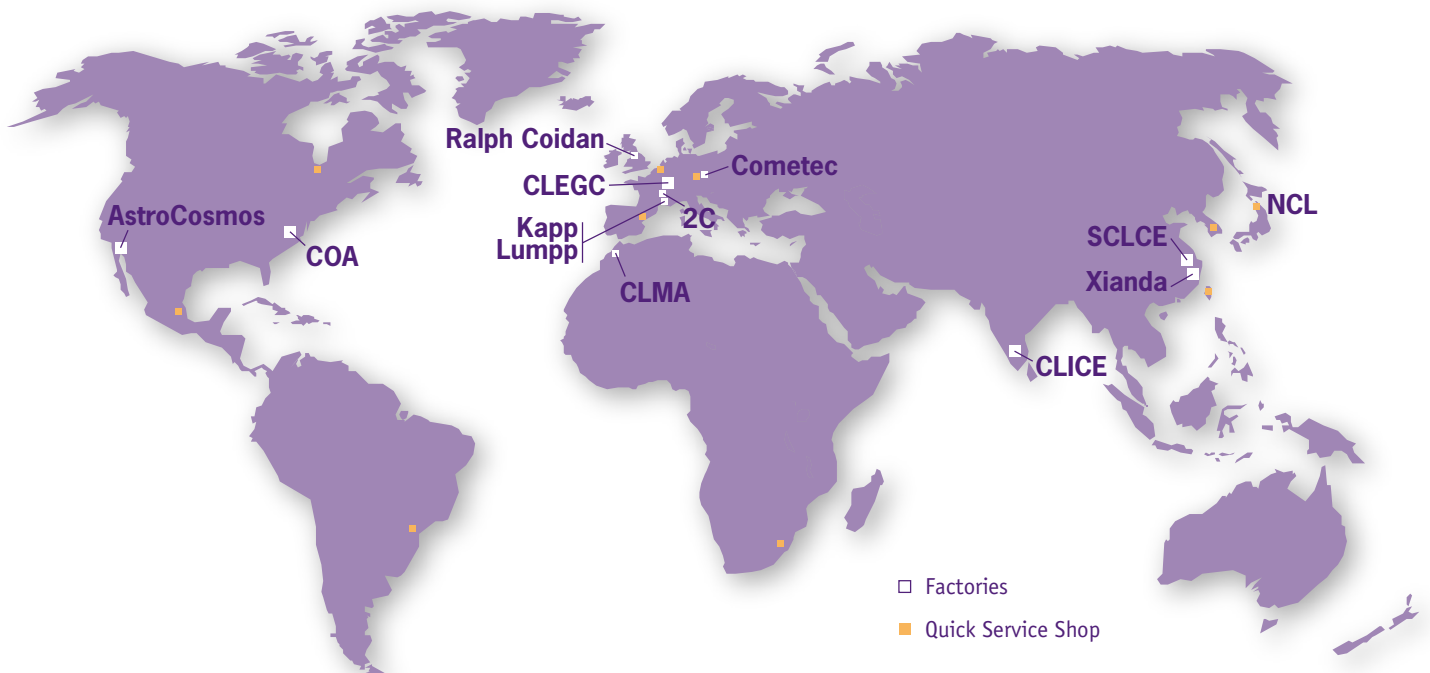


### INSTRUMENTATION



# CARBONE LORRAINE CHEMICAL EQUIPMENT DIVISION

Worldwide presence with several manufacturing sites and workshops close to our customers



**CLEGC** **SCLCE** **COA** **NCL** **CLICE** **LUMPP** **CLMA**

CARBONE LORRAINE EQUIPEMENTS GÉNIE CHIMIQUE

SHANGHAI CARBONE LORRAINE CHEMICAL EQUIPMENT

CARBONE OF AMERICA

NEPPON CARBONE LORRAINE

CARBONE LORRAINE INDIA CHEMICAL EQUIPMENT

CARBONE LORRAINE MAROC



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