

# Improved solutions for corrosives processes with Graphite Technologies

## Equipments

GT-BLOC  
GT-TUBE  
GT-CUBIC  
GT-DISC  
GT-PLATE  
GT-TOWER  
GT-BATH  
GT-FIN  
GT-JET  
GT-CP  
GT-PF

## Materials

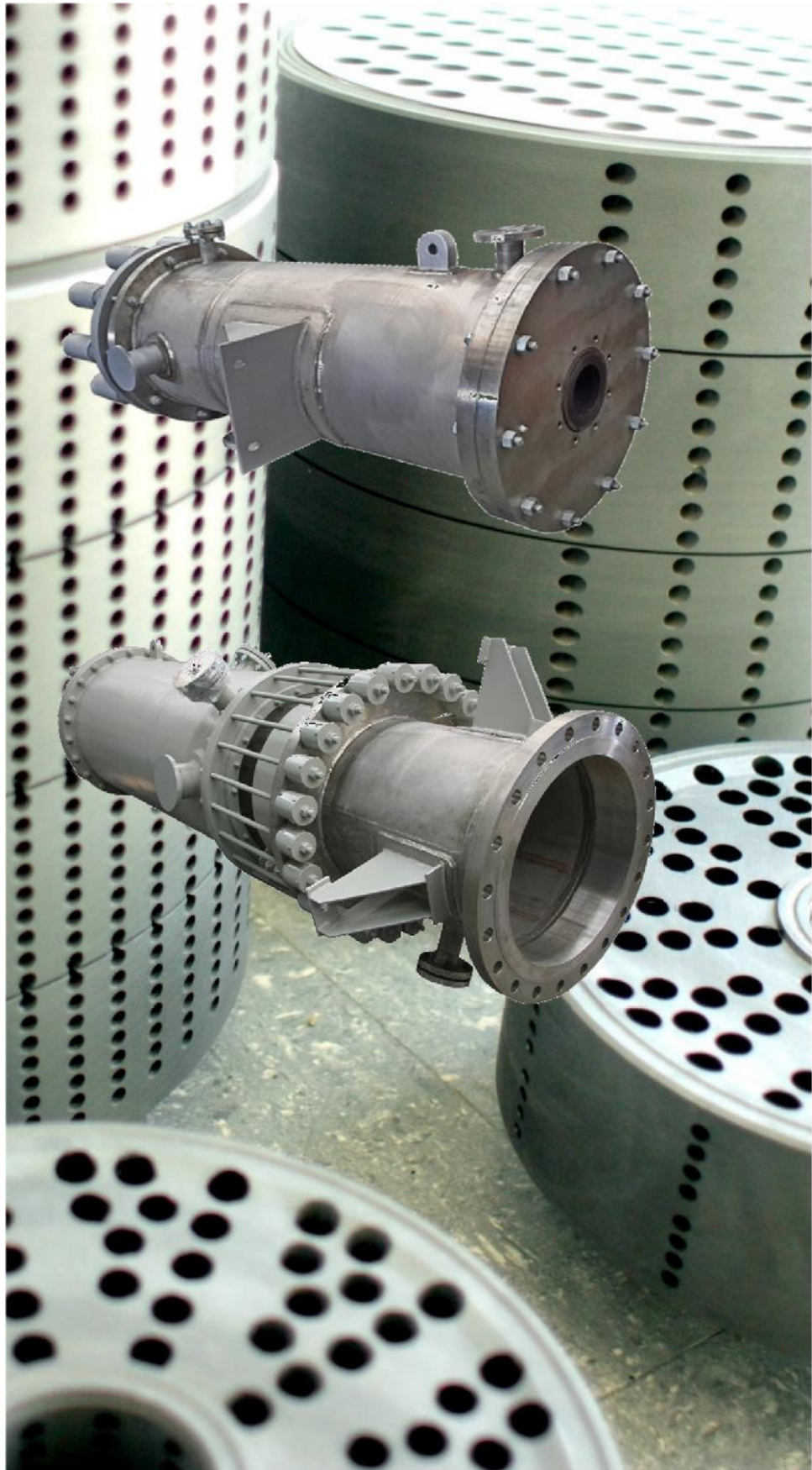
GT-KELITE  
GT-KELITE+  
GT-FLON  
GT-OXY FLON  
GT-CARB  
GT-CARB+

## Systems

Absorption  
Dilution  
Concentration  
Reaction  
Mixing



Graphite Technology



## Our Mission

Allow customers to confidently and smoothly operate media in harshest conditions of corrosion, fouling, temperature and pressure.

Allow customers to push forward the efficiency and cost effectiveness of their chemical processes.

Offer and supply process systems, equipment and components made of carbon-based materials.



## Our Company

Graphite Technology, a synonym for outstanding solutions using graphite components for the chemical processes industries. You can rely on our graphite and you can rely on the specialists of Graphite Technology – The Graphite Experts Company!

Since years specialists at Graphite Technology have developed and constructed graphite components with the highest resistance to corrosion. Our engineering team performs not only process design for heat exchangers, but also stress/mechanical calculations for the equipment which comply with worldwide standards.

## Our advantages

Our projects include design and efficiency improvement, revamping and debottlenecking existing exchangers.

Propose the widest portfolio of solutions for chemical processes industries.

Propose the most reliable equipment on the market with user friendly features.

Our equipment are designed to be used in the harshest conditions with unique features improving reliability, extending lifetime, reducing maintenance costs. Unique and patented technologies to protect against erosion, water and steam hammering, vibrations, mechanical and thermal shocks.



## The complement and alternative to high nickel alloys, Tantalum, Titanium for corrosive applications.

### Main markets

- Pharmacy
- Fine chemical
- Agro chemical (pesticide, herbicide, fertilizer)
- Steel industries (pickling and acid regeneration plant)
- Hydrometallurgy
- Petro chemical (plastics)

### Main applications

- Heating, cooling, evaporation, condensation of corrosive medium
- Waste acid, waste water and gas treatment (scrubber, falling film absorber, boiler)
- Concentration, crystallization by evaporation with hydrochloric acid, sulfuric acid or phosphoric acid
- Separation and purification of corrosive chemical products
- Acid dilution units
- Vacuum steam jet technology
- Chemical reactions

### GT, synonym of graphite heat exchangers and equipment with improved design.

Our unique equipment design is “user friendly” and allow harshest operating conditions.

- SHOCK PROTECT® and HAMMER PROOF® against water / steam hammering stress
- STABLE LOAD® against thermal stress fatigue
- STRESS FREE® against piping stress
- High thermal shock resistance

### GT, synonym of exceptional graphite grade for extended lifetime.

TOYO TANSO manufactures the world highest quality graphite in Japan.

TOYO grade selected by GT for heat exchanger, shows the highest mechanical strength and fatigue resistance on the market.

GT-TOYO grades are characterized by:

- The highest level of corrosion resistance among graphite materials
- The highest mechanical performances on the market
- The highest thermal transfer efficiency on the market



*HCl pickling liquor heater*



*Reactor condenser for xylene / thionyl chloride, pharmaceutical*



*Chlorine incinerator scrubber unit, weak acid cooler*



*Sulfuric acid 85 % - 160 °C cooler*

**TOYO TANSO**  
Inspiration for Innovation

[www.sttanso.com](http://www.sttanso.com)



Graphite Technology

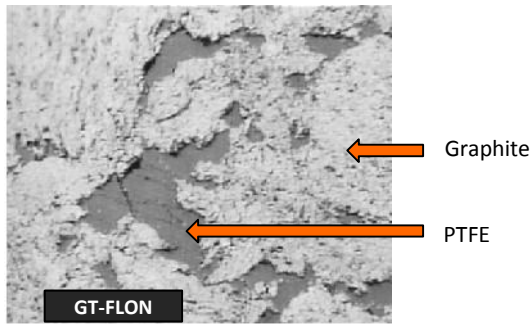
[www.graphite-technology.com](http://www.graphite-technology.com)

# Outstanding corrosion resistant materials

## Highly oxidative medium

Our grades GT-FLON & GT-OXY FLON are insensitive to solvents, organics media which usually corrode or dissolve traditional “phenolic resin” impregnated materials. Outperform in pharmaceutical batch processes, agro chemical, stainless steel pickling baths.

Unlike metals, corrosion resistance is seldom affected by contaminants (chlorides, fluorides,...).



Micrography of impregnated graphite structure ( x1000)

Impregnation of graphite will give imperviousness property. We use proprietary resin and latest technology which shorten production lead time. Four grades of impregnated graphite, using three different resin types are available to cover most applications.

Our PTFE impregnation process is unique. Our GT-FLON & GT-OXY FLON show extraordinary corrosion properties outclassing traditional phenolic resin impregnated graphite.

Typical severe application examples

Media		Conc. up to (%)	Temp up to (°C)
HF	hydrofluoric acid	60%	200°C
HNO <sub>3</sub>	nitric acid	40%	150°C
H <sub>2</sub> SO <sub>4</sub>	sulfuric acid	95%	180°C
HBr	hydrobromic acid	100%	200°C
HCl	hydrochloric acid	100%	200°C
H <sub>3</sub> PO <sub>4</sub>	phosphoric acid	100%	200°C
NH <sub>4</sub> Cl	ammonium chloride	100%	200°C
CaCl <sub>2</sub>	calcium chloride	100%	200°C
CuCl <sub>2</sub> , CuSO <sub>4</sub>	cupric chloride & sulfate	100%	200°C
FeCl <sub>3</sub>	ferric chloride	100%	200°C
KOH, NaOH	caustic potash & soda	100%	200°C

Grade GT G	GT-KELITE	GT-KELITE+	GT-FLON GT-OXY FLON	GT-CARB/CARB+
Graphite grain size (mm)	0.8 - 0.5	0.043 - 0.008	0.043- 0.008	0.8-0.008
Impregnant type	Phenolic		Pure PTFE	Carbon
Density	1.82	1.89	1.92	1.76-1.89
Flexural strength (MPa – ASTM C651)	27.0	43.0 – 50.0	32.0 – 42.0	32.0 – 42.0
Compression strength (MPa – ASTM C695)	65.0	118.0 – 159.0	91.0 – 130.0	80.0 – 130.0
Young modulus (GPa – ASTM C559)	9.0	11.0	11.0	9.0-11.0
Max permissible material temperature ( C)	200	250	300	500 (1500*)
Recommended for	Moderate pressure / temperature / corrosion.	Higher pressure / temperature. Frequent thermal cycling. Higher corrosion resistance.	Highest corrosion resistance even in oxydative and strong base media. Frequent thermal cycling.	Highest temperature in non oxydative media.

GT-FLON®, GT-CARB® & GT-KELITE® are registered trademark, \* 1500° C in reducing environment



## GT-BLOC : round modular blocks heat exchangers

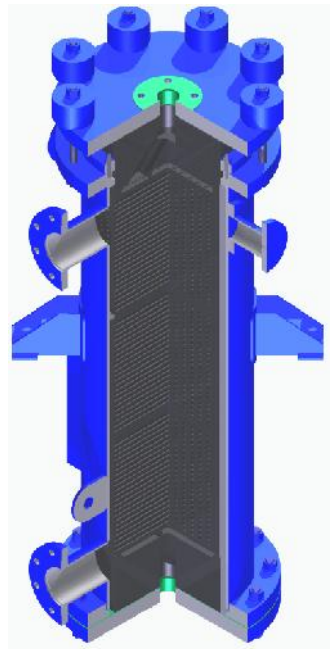
- Compactness
- Modular construction
- Fast assembly / disassembly
- Standardized spare parts
- Possibility to use corrosive media on both side with a protective coating / lining on shell side.
- Available in GT-KELITE(+) / GT-CARB+ / GT-FLON
- From 0.3 m<sup>2</sup> to 800 m<sup>2</sup>.
- Monoblock or multiblocks configurations

### In standard

- SHOCK PROTECT<sup>®</sup>
- STABLE LOAD<sup>®</sup>
- STRESS FREE<sup>®</sup>
- FILT-IN<sup>®</sup>
- HAMMER PROOF<sup>®</sup>

### Optional :

- C-HARD<sup>®</sup> erosion reinforcement



## GT-TUBE : shell and graphite tubes heat exchangers

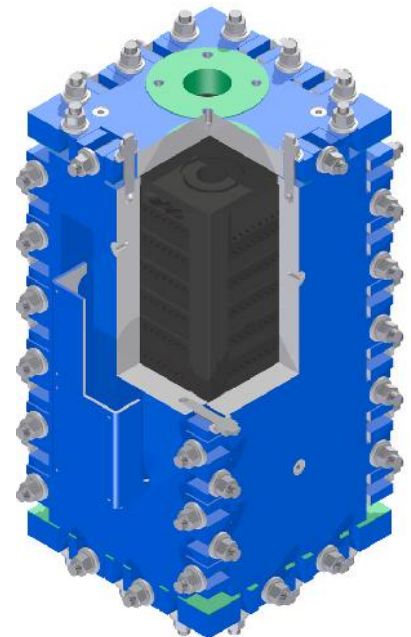
- High heat transfer area, heavy duty.
- High process / service section for big flow (15,000 m<sup>3</sup> liq./h)
- Gaskets only at tubesheet and header location.
- Available in GT-KELITE (+)
- Gasketed baffle on service side for cooler

### Optional :

- Falling film design
- C-HARD<sup>®</sup> erosion reinforcement
- Carbon fiber reinforcement for high vibrations and stress resistance

### In standard

- SHOCK PROTECT<sup>®</sup>
- STABLE LOAD<sup>®</sup>
- STRESS FREE<sup>®</sup>
- FILT-IN<sup>®</sup>
- HAMMER PROOF<sup>®</sup>



## GT-CUBIC : cubical block heat exchangers

- Possibility to use corrosive media on both sides (economizer)
- No gasket between 2 sides media (no contamination with gasket failure)
- Outstanding corrosion resistance (GT-KELITE(+)) / GT-CARB+ / GT-FLON)
- Monoblock or multiblocks configurations

### In standard

- STRESS FREE<sup>®</sup>

### Optional :

- HAMMER PROOF<sup>®</sup>



## GT-DISC : discs and frame heat exchangers with slot or annular groove design

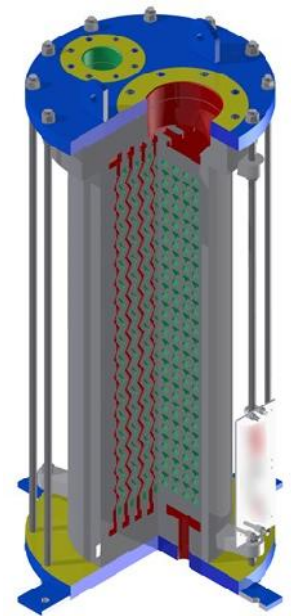
- Excellent heat transfer adapted to reactor condenser and subcooler
- Compactness
- Modular design with ability to reduce or extend capacity or footprint
- Fully dismantle without heavy components, easy cleaning
- Possibility to use corrosive media on both sides (economizer)
- Low pressure drop, free-flow
- Auto dry surface.
- Available in GT-KELITE+ / GT-CARB+ / GT-FLON
- From 0.5 m<sup>2</sup> to 50 m<sup>2</sup>.
- Temperature up to 500 °C, pressure up to 10 barg
- High performance with viscous media

### In standard

- STRESS FREE®

### Optional :

- HAMMER PROOF®



## GT-PLATE : plates and frame heat exchangers

- High performances
- Compactness
- Modular design with ability to reduce or extend capacity or footprint
- Possibility to use corrosive media on both sides (economizer)
- Available in GT-KELITE+ / GT-CARB+ / GT-FLON
- From 0.3 m<sup>2</sup> to 80 m<sup>2</sup>
- Temperature up to 300 °C, pressure up to 8 barg

### In standard

- STRESS FREE®

### Optional :

- HAMMER PROOF®
- FREE FLOW for dirty media

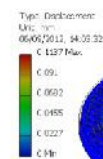
## GT-TOWER : columns, reactors, scrubbers & internals

- Column for distillation, stripping and absorption
- Distributors, trays, packing support grids, mist eliminator supports, dip-pipes... for tantalum, graphite, fluoro lined and glass lined tower
- Available in GT-KELITE (+) / GT-CARB (+) / GT-FLON
- From 0.05 m<sup>3</sup> to 10 m<sup>3</sup>
- Temperature up to 500 °C, pressure up to 10 barg incl. vacuum



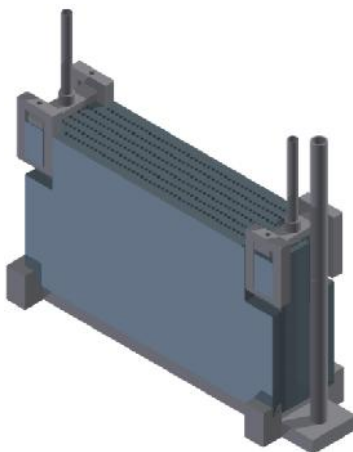
Distributor in GT-KELITE for distillation column (MCA process)

### Displacement



- In standard
- STABLE LOAD®
  - STRESS FREE®

- Optional :
- HAMMER PROOF®



## GT-BATH : immersed heaters/coolers

- Equipment immersed in the process bath or tank
- No pump and circulation piping required
- Economical, easy adaptation for existing processes
- Outstanding corrosion resistance (GT-KELITE(+)) / GT-CARB+ / GT-FLON)
- Outperform immersed heater in Tantalum or PTFE pipe thanks to high turbulence conception
- Low footprint, light structure without steel parts



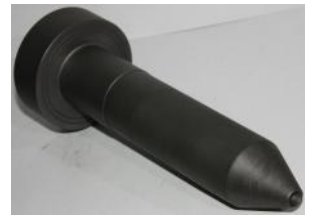


## GT-FIN : gas heaters/coolers

- Modular blocks with extended surface fins for gas cooling or heating
- Outstanding corrosion resistance (GT-KELITE(+)) / GT-CARB+ / GT-FLON / GT-OXY FLON)
- High flexibility of design
- Low footprint, light structure
- Custom design

## GT-JET : ejector mixers and jet vacuum technologies

- Jet vacuum systems
- Ejector mixer for chemical reactions (gas/liquid, liquid/liquid)
- Outstanding corrosion resistance (GT-KELITE(+)) / GT-CARB+ / GT-FLON)
- Custom design



## GT-CP : special equipment for chemical reactions

- Reactors with /without thermosyphon, agitation, cooling / heating functions
- Storage tank for hot media
- Custom design, lab scale
- Outstanding corrosion resistance (GT-KELITE(+)) / GT-CARB+ / GT-FLON / GT-OXYFLON)
- Up to 500°C and 10 barg



## GT-PF : pipings and fittings

- Straight pipe / Elbow / Tee / Cross
- Custom design even for lab size
- Outstanding corrosion resistance (GT-KELITE(+)) / GT-CARB+ / GT-FLON / GT-OXYFLON)
- Up to 500°C and 10 barg
- Custom design, lab scale



## PROCESS SYSTEMS : chemical processes design



- Absorption HCl, HF for waste gas treatment and acid recycling.
- Mixing chemical products liquids/liquids, liquids/gases (static mixer, jet mixers, ultrasonic mixer)
- Chemicals reactions and heat control
- Acid concentration (sulfuric, hydrofluoric, phosphoric and hydrochloric acids)
- Acids dilutions



### Services

- Start-up & Operating assistance
- Dedicated maintenance during lifetime of your units
- Quick support - Field Service – Spare-Parts availability
- Replacement, optimization and repair of your existing equipment without piping modification
- Expertise to remedy recurrent failure or lack of performances
- Corrosion tests
- Pilot equipment



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