Ecarb Srl

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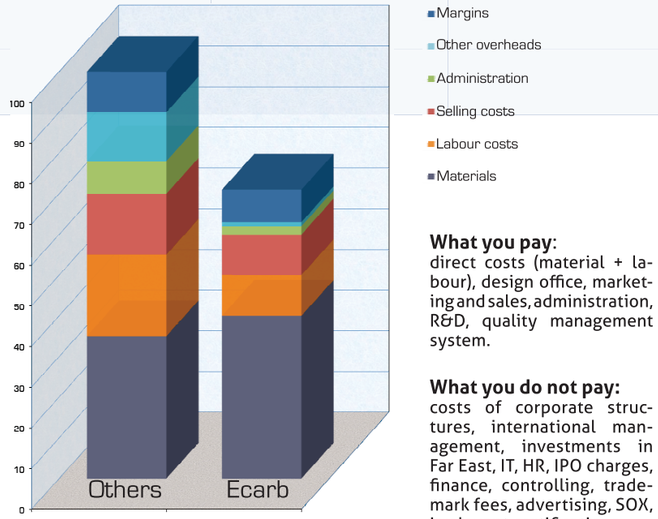
Product Technical Features

Graphec ST • Graphite
Shell & Tubes heat exchangers

Price: technology, nothing else!



What you pay:
direct costs (material + labour), design office, marketing and sales, administration, R&D, quality management system.

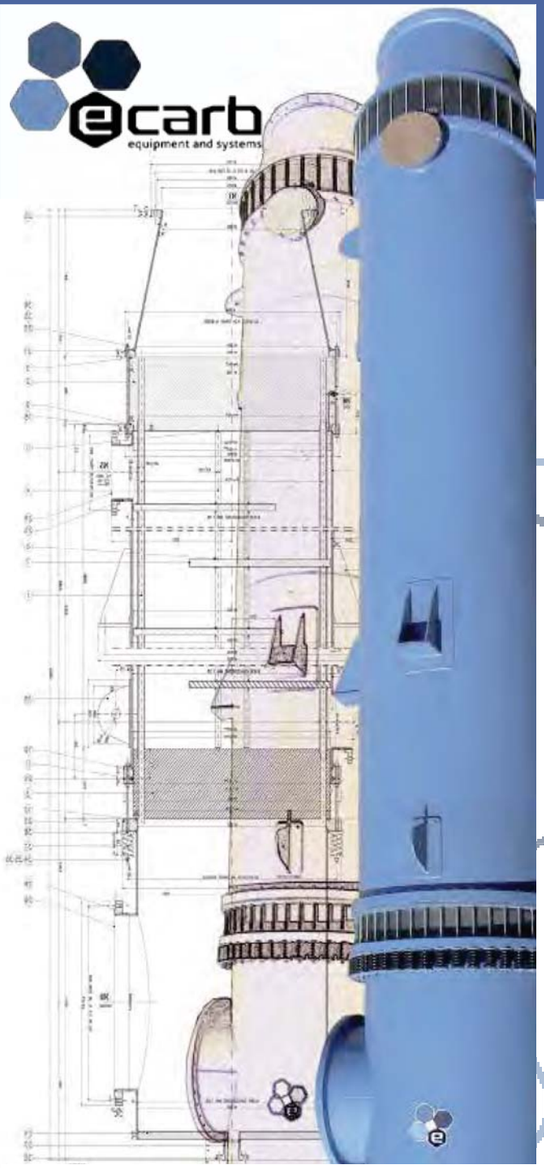
What you do not pay:
costs of corporate structures, international management, investments in Far East, IT, HR, IPO charges, finance, controlling, trademark fees, advertising, SOX, irrelevant certifications ...

Quality by passion

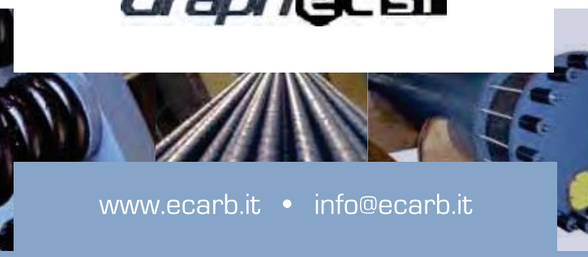
Ecarb Quality Management System is certified according to ISO 9001:2008. Each single procedure was inspired by our core values: **engineering excellence and customer satisfaction**. Graphec products are designed in order to maximize lifetime and ensure easy and safe maintenance and operation. Ecarb's manufacturing system is certified according to European Pressure Directive (97/23/EG). ATEX and GOST certificates are available on demand.Only premium raw material suppliers: Ecarb selects just the material grade that better fits service requirements, to offer premium products at a smart price. Graphec ST are designed using most diffused and reliable mechanical codes.

Applications & References

Hydrofluoric acid at high concentration and temperature, sulphuric acid up to 90%, pickling solution, chlorinated solvents, hydroclhoric acid, phosphoric acid, acid catalysts, etc.: Graphec ST units run with very aggressive media in the most severe conditions. Detailed references are available on demand.



GraphecST



Graphec, graphite process equipment
Rupture disks • Block heat exchangers • Crossed tubes condensers
Mixers • Columns • Quenchers • HCl synthesis units • Systems

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Graphec® Shell & Tubes Heat Exchangers are composed by a graphite tube bundle fitted into a metallic cylindrical shell.
Graphite S&T heat exchangers ensure complete and safe segregation between service side and process side. This is due to lack of gaskets or welding between tubesheets and tubes, which are joined by thermal cementing.
Bundle is a unique monolithic element which is resistant to thermal shock, fully cleanable and easy to operate.

Versatile design makes these units ideal for a wide range of services: they can be used as cooler, heater, condenser, re-boiler, falling film absorber, intercooler.

Model selection: the best solution in a wide range.

Graphec ST product range, cover almost all common heat exchange requirements. Exchange area varies from 0,35 m^2 to >1.000 m^2. Maximum design conditions are 220°C @ 20 barg.
Ecarb performs accurate thermal sizing to define the heat exchanger that better fits with specific process conditions. Tubes diameter, number and length, process and service flow pattern: we explore all possible parameters to identify the optimal design. Just the best possible combination to minimize price, providing easy-to-use and problem free units.
The best choice will never match any available standard product model, so we study each project as a unique case and we offer taylor made solutions. Our flexibility becomes a tangible value for our customers.

Maintenance and operation

ST units are fully cleanable. Headers may be easily disassembled to have direct access to bundle and perform easy and quick repair. Maintenance operations are cheap and simple. It is possible to replace graphite tubes in few hours. Every details is designed to minimise exposure to damages.
Accurate mechanical design is carried out to ensure safe operation and long lifetime. Each unit is fully drainable and easy to vent (self venting, when possible). Antierosion disposals, conveyors, safety valves, PTFE bellows: every useful accessory is considered and included when needed.

Ecarb's model designation

ST	•	32	•	76	•	3650	•	CS
Model		Tube ext. Ø		Tubes number		Tubes length		Shell Material

Example: Graphec Shell & Tubes heat exchangers with 76 tubes (external diameter 32 mm, 3650 mm long) and carbon steel shell.

Tubes: a matter of quality!

Ecarb selects among four sizes of tubes made of ultra fine grain graphite, Graphec® iLP. External carbon fiber wrapping (CFx) can be applied to enhance mechanical resistance and reliability. Ecarb tubes have superior physical features and they are submitted to rigorous test, to ensure resistance and duration. Material and test certificates are available on request. Original length of Ecarb's tubes is 4500 mm.
Longer tubes, long up to 9 mt, are manufactured by thermal cementing.

Tensile strength [N/mm²] [MPa@20°C]	> 30
Compression strength, [N/mm²]	> 45
Eccentricity [mm]	< 0,8
Bursting pressure [barg]	> 60
Maximum temperature (bulk), °C	220
Thermal conductivity [W/mK]	50
Max. length of not cemented tube [mm]	≈ 4500
Permeability (air) [cm²/S]	< 10
Air testing pressure [barg]	20
Hydraulic test pressure [bara]	10
Tube diameters (int/ext, mm)	16/25 • 22/32 • 25/37 • 38/51

Shell

Ecarb produces internally shells and steel parts, thereby controlling quality and lead times. Shells may be made of massive or lined steel:

- CS - Carbon Steel
- SS - Stainless Steel
- RL - Rubber Lined Carbon Steel
- TL - PTFE Lined Carbon Steel
- GL - Glass Lined Carbon Steel

It is possible to select in a wide variety of options (steam distributor, Kettle geometry, etc.)

Gaskets

Ecarb uses only high quality gaskets. Gaskets sealing headers, shell and bundle are expanded PTFE cord supplied by Gore®. A Viton O-ring or a PTFE stuffing box is installed between floating tubesheet and shell flange.

Tightening system

Ecarb's advanced design foresees a double tightening system, ensuring sealing and compensation of thermal dilatation.
One tie rod set serves tubesheet/header joint. The second one is equipped with coil springs to enable free movement of floating tubesheet inside the metallic sheel. This geometry provides important advantages in terms of safety and reliability:

- separate tie rod sets enable optimal compression of each gasket;
- in case springs fail or tie rods are blocked or damaged, no leakage of process media will occur between tubesheet and header.

Tube sheets

Tubesheets are the critical components of heat exchangers and they are continuously stressed during operations.
Tubesheets may be made of Graphec iLP or iSP, eventually reinforced with anti-erosion sleeves or layers, made of amorphous carbon, PVDF or PTFE. Tubesheet thickness depends on design conditions and it is determined using high safety factor (minimum 9 times than theorical values).

Headers

Available construction materials: graphite (graphec iLP or iSP), ebonite, glass or PTFE lined steel. Headers design is adapted to specific service requirements.
Special long headers are made as separation chamber for partial condenser. Headers may be equipped with mixers, anti-erosion baffles or conical conveyors.

CFx (carbon fibre wrapping) is applied around tube sheets and/or headers to provide superior mechanical strength and to minimize leakages in case of damages.
Carbon fibre cords with variable filaments density are tensioned during wrapping operation.
Because of they thermal behaviour (dilatation coefficient is negative), carbon fibre wrapping increases resistance to thermal shock and it enhances lifetime of the unit.