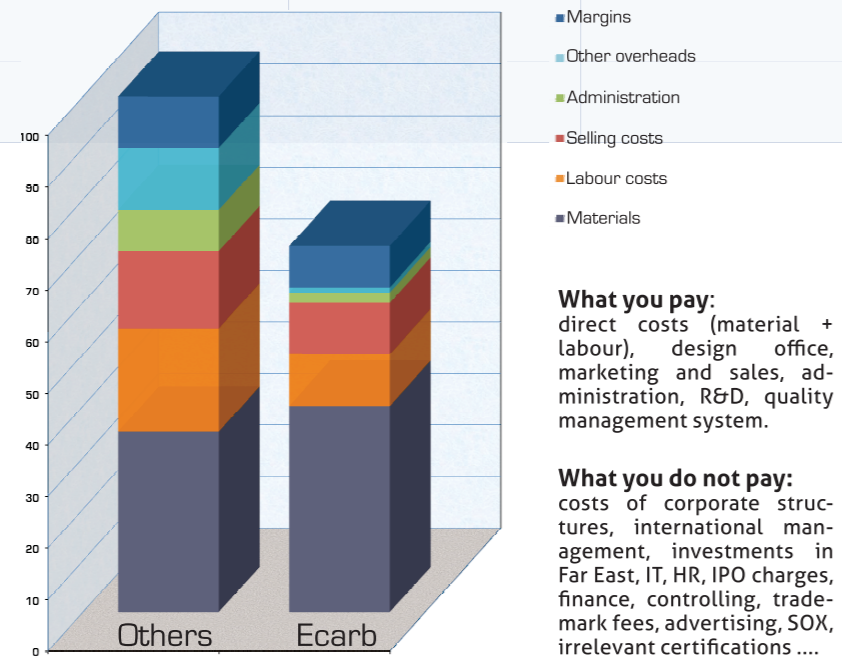


Price: technology, nothing else!



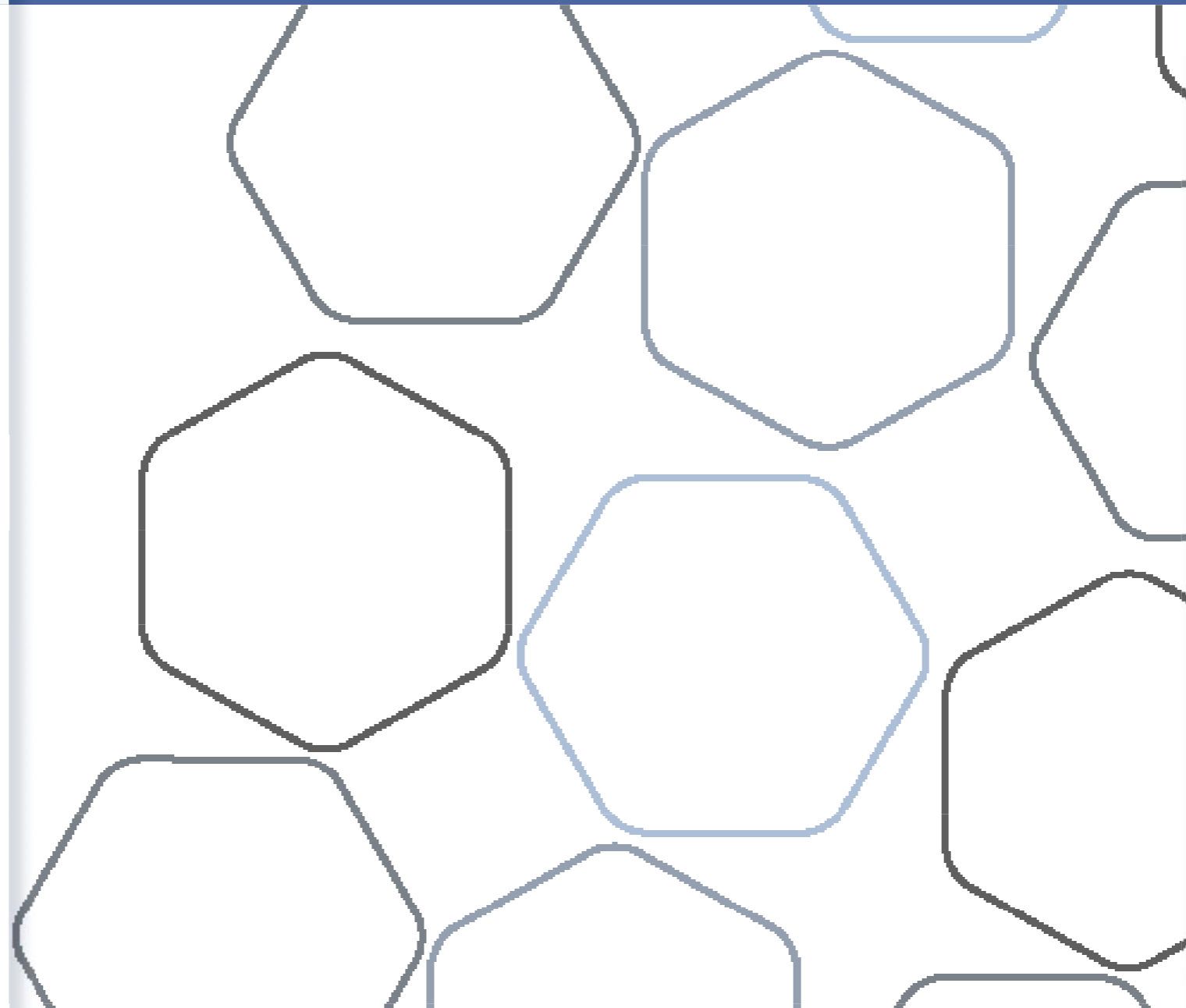
Quality by passion

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 quenchers are designed in order to maximize lifetime and ensure easy and safe maintenance and operation. Ecarb's manufacturing system is certified acc. 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 quenchers are designed using most diffused and reliable mechanical codes.



Applications & References

Graphec quenchers run in very severe condition, up to 1800°C, with highly aggressive media, like hydrofluoric acid, hydrochloric acid, chlorinated compounds, waste fumes, etc. Detailed references are available on demand.



Graphec®

Graphec, graphite process equipment

Block and shell&tubes heat exchangers • Crossed tubes condensers  
 Mixers • Rupture disks • Columns • HCl synthesis units • Systems





Acid gases at high temperature (up to 1800 °C) are obtained as by-products of industrial processes or as flue gas from civil waste incineration. A quencher cools rapidly and safely down hot gases, avoiding dioxins formation, which occurs at intermediate temperatures. Immediate gas cooling is given by sudden vaporization of water inside Graphhec® quenchers. Ecarb may propose complete package for regenerate acid waste solutions in order to produce commercial grade of acids (i.e. hydrochloric acid or hydrofluoric acid).

### Model selection: the best solution in a wide range

Ecarb produces three different series of Graphhec quenchers:

- PQ (pipe quencher), with pipes and inlet crowns
- MPQ (Monotubular quencher)
- VQ: variable cross section, venturi quenchers

Ecarb performs accurate process sizing to define the unit which best fits to specific process conditions, such as high solid content, low pressure drops or flow rate fluctuations.

Model, material grade, internal configuration, number of sections, diameter, height: we cross all possible parameters to identify THE optimal design to minimize price, providing easy-to-use and problem-free units.

### Maintenance and operation

Graphhec® quenchers are easy to install and to disassembly. Cheap and quick repair of each graphite component is always possible. When replacement is needed, Ecarb applies a fair price policy for spare parts, to limit maintenance costs.

Accurate mechanical design is carried out according AD2000 or VSR95. To ensure safe operation and long lifetime, each unit is fully drainable and self-venting. Each single component is studied to run if submitted to severe conditions. Metallic parts are protected by PTFE layers. Carbon fiber packing or expanded graphite sheet ensures sealing among components.

### Ecarb's model designation

PQ • 400 • 3 • CFx-iLP  
Model Nominal Ø Sections number Material grade

Example: pipe quencher, diameter 400 mm, with 3 sections (cooling, quenching and saturation), made of CFx reinforced iLP graphite.

### Our graphite: a matter of quality!

Being not a raw material producer, we are free to select the most suitable material grade from premium global suppliers, just on the basis of the requirements of each specific application, to provide high quality unit at a smart price. Graphhec® quenchers are made of three possible graphite grades, iHP, iSP and iLP. Material selection depends on process media. Tensile strength varies from 12 MPa (iHP) up to > 20MPa (iLP). Ecarb uses only graphite homologated by primary notified body according AD 2000 N2.

### Graphhec PQ: pipe quenchers

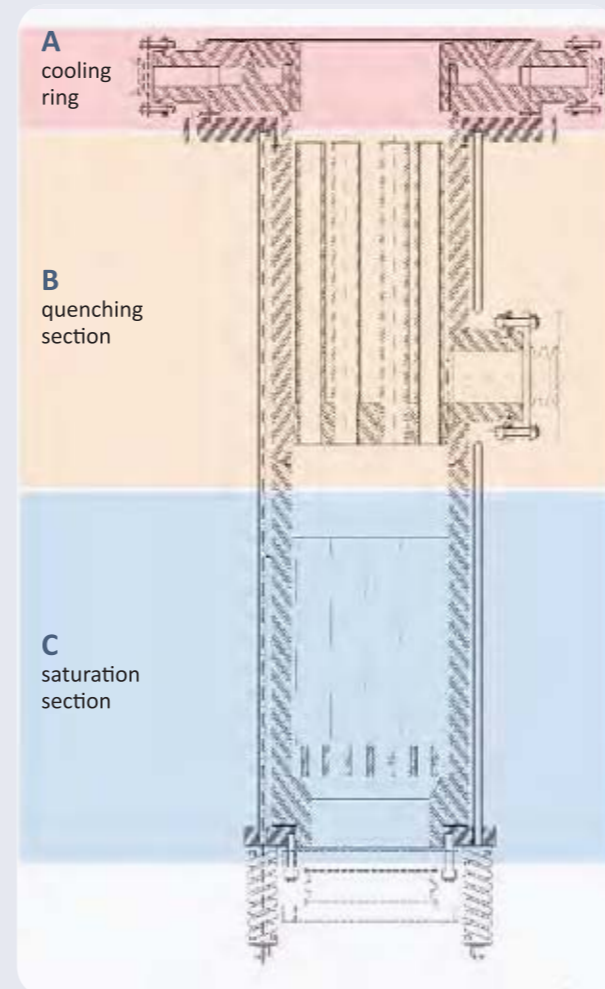
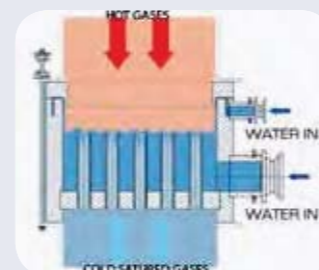
Pipe quenchers PQ is a versatile and universal model.

Quenching section (B in the picture on the right) consists of a cylindrical column, wherein a bundle of open tubes is installed. Tubes are fixed on a bottom tubesheets only, which is cemented inside the column. The hot gases passes through the tubes inlet upper ends, which are shaped as crowns. Quenching liquid overflows inside the tubes, through the carvings of crowns, and it is suddenly vaporized because of intimate contact with hot gases at high velocity (spray effect). Quenched wet gases flow inside tubes at the saturation temperature. Continuous circulation of a large quenching solution flow rate must be ensured to have enough water, to be vaporized inside the tubes. Liquid ensures cooling of the graphite quench body. In case of water breakdown, an emergency stream must be immediately activated to avoid overheating. A continuous film of water is formed along the perimeter of top quencher walls, to protect graphite.

When inlet gases have a temperature higher than 360°C, a cooling section (A) must be added on top of quenching section. Cooling section is normally a large graphite cooling ring, wherein cooling water flows. Inside the large ring an high exchange surface may ensure a sufficient cooling.

A third saturation section (C) may be installed below the quenching section, for very hot feed gases. Saturation section consists of a graphite raschig ring packing.

Pipes diameter, pipes number, crown shapes and quencher diameter are carefully selected on the basis of inlet gases temperature, flow rate and composition.



### Graphhec® MT: monotubular quencher

Graphhec MT is a thin column made of not impregnated graphite protected by carbon fibre wrapping. Hot gases enters through a lateral nozzle, and they are immediately mixed with a stream of fresh water, which is injected from a narrow nozzle located at the top of the column.

MP quenchers are robust, flexible and cheap to install and to run, because there is no need for recirculation of quenching solution, necessary for other models.

### Graphhec VQ: Venturi quencher

Gas is conveyed in a venturi conduct made of graphite, having variable cross sections, where a set of spray nozzles injects the quenching liquid (clean water). A pneumatic actuator moves a cylindrical element, whose movement modifies quencher geometry in order to adapt it to different conditions (i.e. flow rate, temperature, pressure drop fluctuations, etc). Thus, VQ quenchers provide high flexibility and rangeability.



CFx (carbon fibre wrapping) is applied around each quencher body segment to provide superior mechanical strength and to minimize leakages in case of damages. Carbon fibre cords are pretensioned during wrapping operation. Because of their thermal behaviour (dilatation coefficient is negative), carbon fibre wrapping increases resistance to thermal shock and enhances lifetime of Graphhec® quenchers.

### Systems for acid recovery

Quenching is normally only the initial step of a more complex process, aimed to recover acids (normally hydrochloric, sulphuric or hydrofluoric acid), contained in the hot gases. After quenching, gases run through an absorption step, where acids are concentrated, within a falling film absorber (isothermal unit, as absorption heat is removed in a shell & tubes unit) or within adiabatic columns (with external heat transfer equipment). Acids may be further concentrated or purified in further distillation or stripping sections. Ecarb provides turn-key skid mounted units, for a wide range of processes, including acids distillation, absorption, purification and stripping. Our process packages are designed to maximize yield and to limit energy and utilities consumptions.