

GEA Compact Radiators – Dry Coolers

Top-level engineering solutions

Top-level engineering solutions with operative excellence and dedicated project teams

Our teams are multi-skilled. Their knowledge of their customers' businesses ensures that they will find the optimum solution for each project. They take full responsibility for a project, from design to delivery, or support their customers in calculating the most suitable solution – as value-adding partners. At the same time, customers can rest assured that the GEA's specialists understand their overall processes and, consequently, their critical interfaces by virtue of their combined expertise.

GEA Heat Exchangers

Combined expertise and excellence in heat transfer

The internationally operating GEA Group focuses on process technology and components for sophisticated production processes in various end market applications. In each of its business areas, GEA is recognized by its customers as market and technology leader as well as a top innovator. GEA Heat Exchangers, which is the largest segment within the GEA Group, focuses on all heat exchanger activities and covers the most application areas, extending from air conditioning systems to cooling towers. As a result, GEA Heat Exchangers provides one of the most extensive – if not the most extensive – portfolios of heat exchangers in the world.

Operative excellence and customer proximity of GEA Heat Exchangers are based on the performance and experience of specialized Business Units. They are organized according to product group technologies. The finned tube compact heat exchanger systems offer nature-friendly and cost-effective solutions to cool air or liquids involved in refrigeration processes or industrial machines and engines.

One single technology for the world's industries

The use of air rather than water for cooling applications contributes to ground-water conservation and prevents surface water warming. It also allows the installation of efficient cooling systems at sites where water resources are scarce. GEA is a pioneer in industrial air coolers and a world market leader. With its heat exchanger compact systems, GEA can offer, with just one single technology, economic and safe optimum solutions, adapted to a large number of complex end-user requirements.

Thanks to a worldwide commercial network able to promote these heat exchanger compact systems, GEA can strengthen its technological leadership in products and services with greater customer benefits. GEA Heat Exchangers can also actively design compact systems, involving expertise of our customers and suppliers in future technological developments. Primary advantages for compact systems are high performance density, minimum footprints, and maximum efficiency with high safety standards. This compact technology enables customized engineering solutions even for niche market segments at a quite attractive price for quality and value added proposition. Our wide range of approved compact finned-tube systems, concepts, and designs is recognized throughout the world. In our research, planning, and production centers, these elements are constantly adapted to latest developments in technology and quality standards. This enables GEA to take any known operational condition into consideration and to optimize components.

Compact finned-tube systems, the product lines:

- Closed circuit coolers
- Charge air coolers
- **Compact radiators / Dry coolers**
- Commercial air coolers refrigeration
- Customized air coolers refrigeration
- Air cooled condensers refrigeration

Making the difference

Sustainability, certified quality, reliable service

The GEA's value proposition covers all aspects of its value-added partnership and factors in the entire life cycle of investment in equipment and processes. As part of its process of life-cycle costing, all the relevant criteria – such as planning, installation, efficiency, and operating costs, including maintenance, service, and upgrading – are coordinated and optimized to maximize benefit for the customer.

GEA engineering solutions offer customers the benefits of standardization and modularity, low-maintenance design, great energy efficiency, and top-quality service. Our value proposition includes comprehensive quality management, efficient use of resources, and fewer interfaces. Our solutions are environmentally friendly: low noise level as well as minimized water and electricity consumption. We design and build using the most advanced computerized simulation tools available, assisted by full-scale laboratory testing.

Certified quality:

- ISO 9000, 9001 and 14000
- ASME U-Stamp
- AD Facts Sheet
- Codap
- CE
- Atex
- Nuclear qualifications (RCCM ...)
- GOST-R
- Other certificates
- PED, H1 module

Available certifications and applicable standards

All the GEA production units – as well as our listed suppliers and authorized service workshops – are DIN EN ISO 9001 certified. Our integrated management system is oriented towards safety, environment, sustainable development, and consistent industrial quality at all manufacturing sites. Our installations are able to meet numerous building and control regulations, whether country or industry specific (such as CE markings, Eurovent certification, ASME U Stamp, and many more), or can be executed according to GEA standards, or according to your own requirements.

Quality management and consulting

In our offices and factories we cover all issues dealing with heat exchange: design, thermodynamic calculations, construction, and manufacturing studies. We offer the support of a worldwide company able to provide international monitoring of projects right up to turn-key installations. Our specialists carry out physical measurements and in-depth analysis of your requirements on site, whenever necessary, to offer improvements and reach set targets. Our aim is to ensure that you benefit from the latest innovations – also by providing improvements to already installed equipment.

Service and support

Customers of GEA expect and benefit from outstanding service to ensure optimum performance of installations, 24 hours a day, seven days a week. Our goal is to provide service on heat exchangers during operation and to extend their life cycles.

Center of Excellence

To promote innovative developments, we founded our Center of Excellence within GEA Compact Systems. Experienced specialists work here who are particularly well acquainted with the precise engineering design of the systems they support.

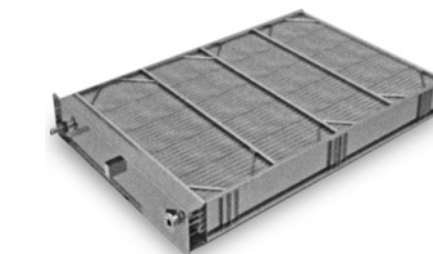
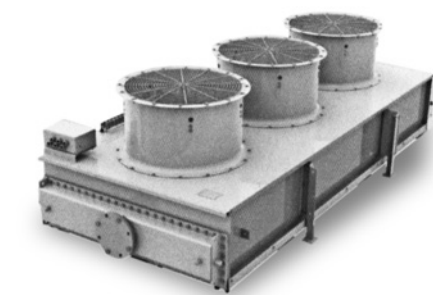


GEA Compact Radiators – Dry coolers

Finned-tube compact systems



Heat exchangers operate under widely diverse conditions in various industrial engineering processes. A broad range of finned tubes with customized materials and geometry represents a significant advantage for optimizing design, construction – and, in turn, the reliability of system operation. Copper, copper-nickel, stainless- and carbon-steel tubes with compact fins in aluminum, marine aluminum, coated aluminum, copper, and stainless steel are available to be adapted to the customer's situation. GEA uses the highest class of epoxy-based, anti-corrosion surface technology for the enclosures of dry compact coolers – and for aluminum fins with PoluAl coating from our partner Blygold.



Customized compact radiators

Our specific compact radiators can be adapted to meet all required demand, technical specifications, and main manufacturing codes. Each project is specifically designed on an individual basis, taking account of your requirements as well as our large choice of heat-exchange surfaces and materials. Fans can be located either above or below the equipment, in induced draft or forced draft mode. Our customized compact radiators feature a design of flat-bed and V-bank units arranged in single- and double-bank configurations. These compact radiators enable the closest possible matching to a required specification, taking into consideration duty, noise level, size, and efficiency (duty and motor input power). Main applications: stationary diesel-engine power plants, gas turbines, combined-cycle power plants.

Energy modular compact radiators (EMCR)

Our range of pre-specified compact radiators enables us to be highly proactive with respect to delivery deadlines – and enables us to offer an optimized cost-benefit ratio. This improved product range is dedicated to large diesel engine power plants that offer high cooling capacity (>2.5 MW). Our energy modular compact radiators impress through a horizontal induced-draft design, with single- or double-bank configuration. They are available in an extensive selection of lengths, two widths, and various bundle characteristics according to individual demands. Motors and fans are fully dedicated to diesel engine power plants. Low noise configuration is possible. Beyond that the series is developed for low power consumption.

Main applications: large stationary diesel-engine power plants.

Configured dry compact coolers

Literally thousands of models, created with modular design and a variety of fan sizes, offer an extensive choice to match your exact requirements. GEA-configured modular dry compact coolers are most effective for power generation as well as for a wide diversity of industrial processes with average to low cooling capacities. Main applications: versatile power units using gas or diesel engines (gensets), HVAC systems, industrial processes.

Transformer oil air compact coolers (TOACC)

Transformer oil air compact coolers can be supplied in various mounting versions. The standard oil air cooler version is designed for direct mounting on the transformer tank. In addition, our range of products comprises free-standing transformer oil air compact coolers designed to customer specifications. Transformer oil air compact coolers are available in various material versions.

Main applications: cooling of power transformer for transmission and distribution of electricity. Oil pumps & flow meters can be supplied as optional items.

Compact bundles for HVAC and industrial processes

The compact bundles are a component of all compact radiators and dry compact coolers, but can also be delivered separately. For specific applications, the drawback of low heat-transmission efficiency can be compensated by a larger exchange area – the finned surface. On the other hand, this produces the advantage of greater process engineering flexibility thanks to variable tube diameters, distances between fins, turbulators, and product headers.

Main applications: chiller and anti-icing compact coils for inlet air, HVAC systems, industrial processes.

Gas turbines and combined-cycle power plants

Water consumption by power-plant condenser cooling is becoming an issue of increasing importance. Significant reduction in plant water consumption can be achieved by the use of closed-cycle dry cooling. The efficiency of combined-cycle power plants can furthermore be boosted by pre-cooling combustion air. This is effective for application in hot climates and also offers the benefit of increasing power output. Detailed information: page 12

Diesel engine stationary power plants

State-of-the-art heat transfer processes and equipment are a key to enhanced efficiency of fossil fuel power generation. In many countries, such plants provide most of the electrical energy used. Fossil-fueled power stations are greenhouse gas emitters – which makes it vital to increase efficiency. Detailed information: page 10

Versatile power units (gensets)

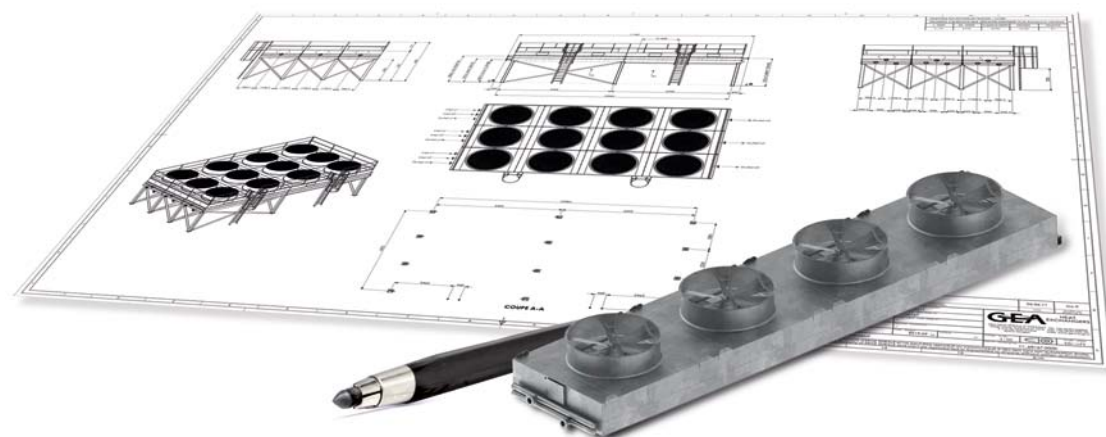
Engine generators are used to supply electrical power to sites where mains power is not available, or where power is needed only temporarily, or as a standby solution. For space reasons, small and efficient heat exchangers are usually installed. Operational reliability is an important criterion for standby solutions in hospitals or urban facilities with essential social responsibilities. Detailed information: page 15

Co-generation power plants

Combined heat and power generation (CHP), also known as co-generation, is the use of a power station to provide both electric power and processes (or district heat). Although such plants emit heat at a temperature higher than normal (to enable building heating and increase overall plant efficiency), calculations show that co-generation is the cheapest method of reducing carbon emissions. Detailed information: page 15

Here we are Compact systems for the energy industry

You will find our solutions in stationary diesel-engine power plants, in gas turbines, in combined-cycle power plants, in versatile power units, and in conventional or nuclear applications. We design and manufacture compact radiators, dry compact coolers, compact bundles, and transformer oil air compact coolers for power generation processes – customized and sustainable. GEA Compact Systems complies with all the standards required for energy operations: Codap, ASME, AD, BS, GOST, as well as all other codes related to heat exchangers.



Stationary diesel-engine power plants

Solutions for smooth continous operation



Diesel power plant in Libya.

Product features:

Energy modular compact radiators

- Improved product dedicated to large diesel-engine power plants
- High cooling capacity (>2.5 MW)
- Range with pre-defined components, offering thousands of models created with the aid of modular compact design
- Possibility of horizontal and induced-draft configurations, with single or double banks
- Copper tubes and cylindrical copper-pipe headers
- S32 fins, made of aluminum, marine aluminum, or copper; availability of epoxy and PoluAl coating
- 4 and 6 feet diameter fans, direct drive
- Large selection of accessories

Among the most outstanding projects is the power plant in Mabruk, one of the largest oil fields in Libya. MAN 18V32/40 diesel motors with an output of 8 MW each were installed here. Induced draft compact radiators with AlMg fins are used for cooling, especially designed for desert conditions and highly resistant against abrasive and corrosive influences.

Energy modular compact radiators (EMCR)

EMCR, top quality products with competitive price and short delivery times, offer an improved product range developed to match the technical requirements of the main players in the large diesel-engine market. With a basis of 40 years of successful applications, even more-advanced technologies now ensure reliable performance in heat transfer and ventilation, with efficiency similar to that of customized compact radiators.

The GEA product range uses horizontal induced-draft design, with single- or double-bank configuration (HT/LT). EMCR are modular compact products made of pre-specified components that are assembled according to analysis by design software. They are completely assembled and tested in the GEA factory before delivery. All components are standard items, and outsourced repetition with a long delivery time are put on stock to ensure ad-hoc availability. Only a limited range of outsourced components (fans, motors, etc.) have been selected; they ensure, however, price-worthiness based on ordering large quantities of similar components. The high modularity of the product ensures sizing as close as possible to the customer's needs. Internal manufacturing allows a maximum of flexibility: a wide variety of dimensions is available, with two widths and over 60 different lengths. GEA software allows quotes, including 3-D drawings, within two days.

Customized compact radiators

Customized compact radiators offer rugged and reliable design. They have been in use at GEA for more than 40 years in all types of industrial applications. They are suitable for diesel applications in which particular specifications are applied. Price and lead time are based on design specifications. An infinite variety of subcontracted items can be ordered specifically for each contract. Very large fans driven by gear transmission or V-belts and pulleys, with possibility of installation in forced-draft configuration, are available to meet very quiet noise requirements and to enable very low power consumption. Bay configurations are available;



they consist of two large bundles installed side by side, overlapped by two large fans. Such configurations are regularly used in diesel engine power plants. Any components available from GEA or from external suppliers can be installed. GEA offers S32 and S40, with tube diameters of 12 or 16 mm and with the materials copper, steel or stainless steel. Any design and manufacturing codes can be applied – such as ASME, Codap, AD, etc. – also to meet all requirements, including those of nuclear applications.

Accessories and equipment

All necessary mechanical accessories are available from GEA for this application, such as steel structures, piping, valves, ladders and handrails for fan access. We can also provide all required electrical components for protection and control of the system, i.e. control cabinets for starting and stopping fans – either in stepped mode or by frequency inverters. Required instrumentation such as temperature probes and vibration switches can also be supplied, as well as any other specific instruments. Electric motors are H-class insulation type, and may be equipped with NT condensation heaters and epoxy painting if required by site conditions. Water spraying can be added to the dry cooling system to enhance cooling capacity for peak temperatures, to effectively avoid oversizing the complete system for only brief operation at high temperatures. Coating of the enclosure for EMCR or customized types is available for highly corrosive conditions.

Fins coating is one of the main competitive advantages of GEA Compact Radiators. We use the highly customized paint PoluAl, which our partner Blygold developed for this application. Without loss of thermal efficiency, it provides highly effective protection against corrosion risks in salty air and at industrial sites. Warranties of ten years and beyond have already been granted for sites with highly severe conditions. Other conventional coatings such as epoxy are also available, but they provide much lower protection, with shorter lifetime of the coolers.

Product features:

Customized compact radiators

- Customized design to meet each and every specific requirement
- Suitable for nuclear applications (emergency gensets), with conformity to the applicable codes
- Use of advanced specific thermodynamic and mechanical design programs
- Copper tubes, 12 mm and 16 mm diameter
- Al, AlMg, or copper (flat, rippled, turbulated). poluAl coating
- Cylindrical copper headers or steel boxes type headers
- Fan diameters from 4 to 12 feet; V-belt or gearbox transmission
- Various configurations (forced-draft bays)
- All required electrical and mechanical accessories

Gas turbines and combined-cycle power plants

Customized compact solutions for each and every case



CCPP in Esch sur Alzette, Luxembourg.



Gas turbines chiller coils in Adana, Turkey.

Product features: Customized fin fan compact coolers

- S32 and S40 fins
- Closest possible match to a wide range of specifications and codes
- Oil and water
- Turbulators for oil cooling
- Free configuration (horizontal, in bays, V-bank, induced, forced)
- No limitation in dimension
- Availability of a great diversity of headers, tubes, fins, fans, casings, and accessories
- Wide range of cooling capacity
- Suitability for various applications: e.g., gas turbines, combined-cycle power plants, with specific design, metallurgy, and numerous industries

A 350 MW combined-cycle power plant operates in Esch sur Alzette in Luxembourg. The customer, Alstom, uses GEA systems for the cooling plant. Cooling water modules were delivered in 1999: a fin fan cooler plus expansion tank, piping, pump skid, and instrumentation. The equipment included alu fins turbulated type plus polual coating. The large fans (8’ diameter) are driven by means of transmissions (pulleys and V-belts).

Fin fan compact coolers

This reliable design has been used at GEA for more than 40 years. Integrated systems include many possible options (described on page 13), fully customized to individual requirements and specifications. V-bank design is also available. A virtually unlimited variety of subcontracted items can be ordered specifically for each contract. Medium-sized fans, directly driven or with gear transmission, are available for very quiet requirements and for very low power consumption. Heat exchange technology is based on S32 and S40 systems from GEA with 12- and 16-mm tubes made of copper, steel, or stainless steel. PoluAl is used as coating on the aluminum fins to prevent corrosion. The enclosures are made of thick carbon steel sheets, normally protected by a specified painting system.

Auxiliary compact coolers (based on Forgo technology)

Auxiliary compact coolers are available for gas turbines and combined cycles. These very rugged systems have been used at GEA with a return of experience and flexibility to customers’ needs similar to fin fan coolers. Integrated systems include many possible options (described on page 13), fully customized to individual requirements and specifications. V-type and roof-type design are also available. A virtually unlimited selection of subcontracted items can be ordered specifically for each contract. Very large fans are available, driven by gear boxes or V-belts and pulleys, with possibility of installation in forced-draft configuration, for very quiet requirements and for very low power consumption. Heat exchange technology is based on Forgo technology from GEA with diameters of 18 and 25 mm for tubes made of aluminium, steel, or stainless steel. TiO₂-based coating is used on the aluminum fins to prevent corrosion. Winterization is available for cooling at very low temperatures. Dry/deluged compact solutions are also possible for cooling enhancement.

Compact bundles

NT-icing and chiller coils for the inlet housing of gas turbines

Dimensions are calculated specifically for each project, according to design parameters and site conditions. S32 or S40 technologies are employed with large fin pitch to keep pressure drop as low as possible. Fins are made of AlMg or coated



aluminum to ensure good mechanical resistance and anti-corrosion features. Water inlet and outlet as well as internal circuits must be designed according to the configuration of the inlet housing of the gas turbine. Design compact solutions take full account of essential requirements such as equipment drainage. For chiller coils, fin spacing and positioning must take into consideration the flow of fin condensation due to temperature decrease. The condensate is collected in a tray installed below the coils.

Accessories and equipment

All necessary mechanical accessories are available from GEA for this application, such as ladders and handrails for fan access, steel structures, piping, valves, pump skids, and expansion tanks (atmospheric or pressurized). We also provide all required electrical components for protection and control of the system, i.e. control cabinets for starting and stopping fans – either in stepped mode or by frequency inverters. Required instrumentation such as temperature probes and vibration switches can also be supplied, as well as any other specific instruments. Electric motors can be equipped with NT-condensation heaters and epoxy painting if required by site conditions. Water spraying can be added to the dry compact cooling system to enhance cooling capacity for peak temperatures, to effectively avoid oversizing the complete system for only brief operation at high temperatures.

Fin coating is one of the main competitive advantages of GEA Compact Radiators. For S32 and S40 fins, we use the highly customized paint PoluAl, which our partner Blygold developed for this application. Without loss of thermal efficiency, it provides highly effective protection against corrosion risks in salty air and at industrial sites. Warranties of ten years and beyond have already been granted for sites with highly severe conditions. Other conventional coatings such as epoxy are also available, but they provide much lower protection, with shorter lifetime of the coolers. TiO₂-based coating is used for the Forgo fins.

Product features: Auxiliary cooler type compact radiators

- Customized design to meet each and every specific requirement
- Based on Forgo technology from GEA with aluminum, steel, or stainless-steel tubes, with 18- and 25-mm diameters
- ASME U-Stamp available
- Various configurations (horizontal, forced-draft, V-bank, roof type)
- Winterization for very low temp. (EGI’s own design)
- Dry/deluged solutions possible for cooling enhancement (EGI own)
- Internal turbulators for oil
- V-bank and roof type
- Bay design available
- Large fans with gear transmissions
- Forced draft

Transformer oil air compact coolers

Efficient and flexible solutions for T & D’s

Product features:
Transformer oil air compact coolers

- No pre-defined dimensions required; wide range for each transformer manufacturer’s specifications and codes
- Possibility of horizontal, vertical, and induced-draft configurations
- S32 copper tubes, S32 and Forgo aluminum tubes under development; availability of internal turbulators
- Fins made of aluminum, marine aluminum, or copper, with epoxy and PoluAl coating available
- Direct drive
- Customized casing and coating
- Availability of GEA oil pumps
- Alternative products (single tube, shell-and-tube) from GEA HX available



Transformer oil air compact coolers

Compact designs here are based on the specifications of leading power-transformer companies, to ensure a very long lifetime (similar to the transformer itself). Application of the strictest standards assures effective cleaning of the inside of the coolers and removal of any metallic particles that could result from manufacturing. Headers are removable to allow inspection of the inside part of the coolers and to assure cleanliness. S32 fin geometry is with copper or aluminum tubes with 12-mm diameter (*new!!*) and aluminum or AlMg fins, typically coated with PoluAl. Forgo-fin geometry with aluminum tube diameter of 18 mm is also available (*new!!*). Each design corresponds to one type of transformer.

The coolers are then customized to the customer’s specific requirements:

- Noise level: fans can be selected for each individual design
- Internal and external protection by customized coatings
- Supporting brackets to allow mounting in various positions
- Dedicated filters to avoid fouling and clogging of the fins
- Dedicated software used for individual components (bundles, fans, options,)

Accessories and equipment

Flow meters as well as oil pumps from Business Unit Shell&Tube are available. Air filters which are used to avoid clogging of the fins are also applicable for transformer oil air compact coolers.

Versatile power units using gas or diesel engines

Space-saving solutions for compact gensets

Dry compact coolers

This range of high-quality configured products was developed to match the technical requirements of the main players in the small- to medium-size diesel and gas-engine market (normally <2.5 MW), with competitive prices and short delivery times. The advanced technology of the finned tubes, used by GEA for decades, ensures great system reliability. Double-bank configuration (HT/LT) is available for our ranges. Fans able to operate under high temperatures are used for this application. Modular compact products made of pre-defined components are assembled according to analysis made by design software. The compact products are completely assembled and tested in the GEA factory before delivery. All major configurations are available: flatbed (induced- and forced-draft), V-bank, or vertical, for all individual cases. All components are standard, and outsourced items with long delivery times are kept in stock to ensure prompt delivery. Only a limited selection of outsourced components (fans, motors, etc.) is used, to ensure favorable prices from suppliers, based on large quantities of similar components. Product flexibility ensures sizing as close as possible to the customer’s requirements, with prompt availability owing to components manufactured in-house (many dimensions are available in our range). The reliability of the compact cooler, also for highest ambient temperatures, ensures the operation of the entire plant. Co-generation power plants of modular design are for landfill gas and biogas extraction as well as for mine-gas extraction to generate electricity and heat. Return cooling of the cooling water circuits of the gas engines is performed by standard dry coolers. The cooler is furnished with ventilators of various noise levels, which comply with local emission regulations.

Accessories and equipment

All necessary mechanical accessories are available from GEA for this application, such as ladders and handrails for fan access, steel structures, piping and valves, and expansion tanks. We can also provide all required electrical components for protection and control of the system, i.e. control cabinets for starting and stopping fans – either in stepped mode or by frequency inverters. Required instrumentation such as temperature probes and vibration switches can also be supplied, as well as any other specific instruments. Water spraying can be added to the dry cooling system to enhance cooling capacity for peak temperatures, to effectively avoid oversizing the complete system for only brief operation at high temperatures. Fin coating is one of the main competitive advantages of GEA Compact Radiators.

We use the highly customized paint PoluAl, which our partner Blygold developed for this application. Without loss of thermal efficiency, it provides highly effective protection against corrosion risks in salty air and at industrial sites. Other conventional coatings such as epoxy are also available, but they provide much lower protection, with shorter lifetime of the coolers.



Mobile genset from Caterpillar.

Product features:
Configured dry compact coolers

- Medium to low cooling capacity
- Range with pre-defined components, with thousands of models possible through modular design
- Possibility of horizontal, vertical, V-bank, induced-draft, and forced-draft configurations
- Copper tubes and copper pipe headers
- Availability of S32 fins, made of aluminum, marine aluminum, or copper
- Epoxy and PoluAl coating available
- Direct drive and VFD control
- Large selection of accessories
- Suitability for small diesel and gas engines

Office buildings with full-façade glazing

Even though outstanding passive building designs are now available, modern glass façades represent great challenges for climate control. For example: it is not rare that rooms on the building side toward the sun must be cooled while heating is necessary on the shady side.

Museums and libraries

For their archiving requirements, museums and libraries require absolutely stable indoor climate conditions. Fluctuations in room humidity endanger works of art and books. Effective air treatment therefore requires far more than mere temperature control.

Hotels and data centers

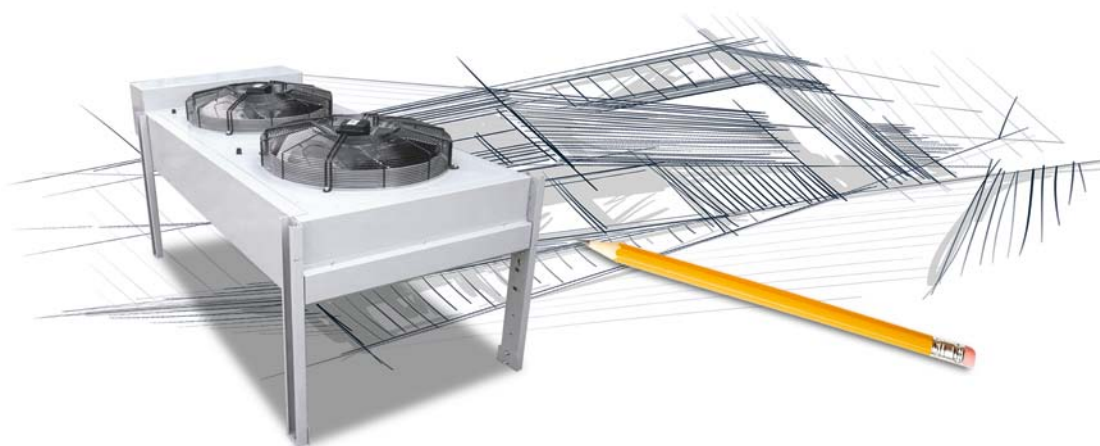
Feel-good climate and temperature is highly individual, whether for hotel occupants or for high tech in computer centers. The design of the air treatment plant must satisfy all demands. This also requires flexible systems and easily configurable components with top security against failure.

Parking garages

Wherever internal combustion engines operate indoors, health protection is critical. Respiratory air quality is the crucial factor for ventilation and exhaust. In parking garages, ventilation systems must also be able to cope with rapid load fluctuation and high peak-performance levels.

Here we are Compact systems for HVAC processes

Where heating, cooling, purification, humidification, and dehumidification of air are required, HVAC Systems makes its contribution to progress. GEA specialists can exploit prepared and globally accessible knowledge within the GEA Heat Exchangers Segment – and can early in the planning stage successfully create an air-treatment system optimized for energy consumption and cost effectiveness.



HVAC systems and processes

We ensure feel-good climate in buildings



HVAC dry compact coolers in Paris.

GEA in the heart of Paris: The client Trane decided on using our innovative systems for air conditioning a building of France Telecom. The dry compact coolers are a component of chillers type RTHD and operate with cooling kits with a capacity of 1,200 kW per chiller. A total of seven were delivered in 2002.

Product features: Dry compact coolers

- Modular design
- Copper tubes with 12-mm diameter
- Aluminum fins, rippled or turbulated
- Cylindrical copper headers
- Availability of V-bank
- Fan diameters from 760 mm to 900 mm
- AC or EC fans
- Low-speed motors
- Eurovent certification
- PoluAl or epoxy coating on fins

Dry compact coolers

This range of high-quality configured compact products has been developed to match all technical requirements (dimensions, noise level, etc.) with competitive prices and short delivery times. The critical technology used in the finned tubes, used by GEA for decades, ensures great reliability of the system, including availability of Eurovent-certified units. EC fans for auto control of output at low temperatures with very quiet operation, and for minimum power consumption, are used for this application.

These are modular compact products made of pre-specified components that are assembled according to analysis by design software. They are completely assembled and tested in the GEA factory before delivery. All major configurations are available: flatbed (induced- and forced-draft), V-bank, or vertical, for all individual cases. All components are standard items, and outsourced items with a long delivery time are put on stock to ensure prompt availability. Only a limited range of outsourced components (fans, motors, etc.) have been selected; they ensure, however, price-worthiness based on ordering large quantities of similar components. Product flexibility ensures sizing as close as possible to the customer’s requirements, with prompt availability owing to components manufactured in-house (many dimensions are available in our range). Integrated quotation software allows quotes with drawings within just a few days.



Compact bundles

For air handling units, compact bundles are used for heat transfer between the different media (water/steam/power). According to the number of tubes of a bundle, the heat transfer area between the media is larger or smaller to ensure that heat transfer (hot or cold) takes place with various degrees of effectiveness. The range includes bundles mounted either into the air handling unit or inside the pipes, depending on the application. Water or environmentally friendly CFC fluids can be used as cooling media. We offer a wide range of possibilities with Co/Al coils, and with cylindrical copper headers always equipped with draining devices. Depending on the application, fins are made of aluminum or copper, and can be epoxy-coated.

Accessories and equipment

All necessary mechanical accessories are available from GEA for this application, such as steel structures, piping, valves, and ladders and handrails for fan access. We can also provide all required electrical components for protection and control of the system, i.e. control cabinets for starting and stopping fans – either in stepped mode or by frequency inverters. Required instrumentation such as temperature probes can also be supplied, as well as any other specific instruments.

HP (100 bar) and LP (3 bar) water spraying can be added to the dry cooling system to enhance cooling capacity for peak temperatures, to effectively avoid oversizing the complete system for only brief operation at high temperatures. Water treatment is also available to prevent sanitary risk of contamination by bacteria such as legionella. Coating of the enclosure is available for highly corrosive conditions. Fin coating is one of the main competitive advantages of GEA Compact Radiators. We use the highly customized paint PoluAl, which our partner Blygold developed for this application. Without loss of thermal efficiency, it provides highly effective protection against corrosion risks in salty air and at industrial sites. Warranties of ten years and beyond have already been granted for sites with extreme conditions. Other conventional coatings such as epoxy are also available, but they provide much lower protection, with shorter lifetime of the coolers.

Product features: Compact bundles for HVAC

- Suitability for various industrial processes as well as HVAC systems
- Complete duty range
- Low pressure drop
- Modular design
- Flexible dimensions to fit all types of air-handling units and ventilation pipes
- Copper tubes 12-mm diameter
- Aluminum or copper fins, rippled or turbulated
- PoluAl or epoxy coating available for corrosive conditions

Energy and gas compression stations

Since most gas-liquefaction plants are installed in dry regions or in areas where acceptable cooling-water quality is not available, air cooling has become the preferred method for the initial section of the gas-cascade cooling process.

Wood, pulp, and paper

Paper machines, felt drying, presses, and any process requiring cooling water and considerable energy: control of heat exchange enables this industry to better manage costs while improving product quality.

Other industries

Hardly any industrial process is imaginable without heat transfer. Drying for powder production, control of air humidity, process-water cooling, and air pre-heating – thermal transfer between materials flows always plays a key role.

Food and pharmaceutical processing

Any equipment used in these industries must comply with demanding environmental, health, and safety regulations. Manufactured in stainless steel, heat exchangers by GEA offer outstanding life-cycle characteristics, with extraordinary reliability in thermal performance. Their perfectly sealed liquid circuits are absolutely essential.

Iron and steel industry

Very high temperatures, a corrosive environment, and air pollution are the challenges in the metalworking and steel industries. Our thick ALMg fins, for example, are extremely robust and support air-processing temperatures up to 200 °C and at relatively high pressure. This GEA technology is suitable for dusty environments and can be cleaned by high-pressure water jet devices, providing a lifetime of full performance for over 20 years.

Automotive industry

The manufacture of motor vehicles involves numerous work steps that require cooling: pressing, welding, the use of robots and compressors, and painting. Cost-conscious solutions are likewise in demand, as well as intelligent utilization of waste heat.

Waste incineration plants

Pressurized steam air condensers for turbines, primary air heaters, equipment to recover smoke and gases, and air coolers for condensation water: all this is essential in waste incineration plants.

Here we are Compact systems for an extensive range of industries

We work for all the world's industries. Look in almost any industrial process, and you will find GEA solutions. They are customized and feature dedicated designs for every individual case. GEA specialists are familiar with all typical process requirements: they will be more than glad to find the optimal solution for your special application.



Many and various industries and processes

Customized solutions with specific design



Automotive industry

Filtered as well as heated, humidified, or air-conditioned supply of air is necessary for the operation of a painting booth. It must be conditioned to 24 °C and 65 % relative humidity. The required cooling capacity is so high that the operation would be uneconomical. An air recirculation system is employed for energy conservation which cleans, filters, and air-conditions the paint-spraying booth exhaust air to a high quality and employs this treated exhaust air as spraying booth supply air. Even though this represents an enormous energy conservation, high cooling and heating output must still be provided. GEA equipped different sites, e.g. Renault and PSA in France.



Gas compression stations

If the distance between a natural gas source and the consumer is greater than 1,300 km, a potential alternative to the pipeline is the liquefaction of gas for the purpose of transportation and storage. Liquefied Natural Gas (LNG) only takes up a fraction of the volume. Natural gas could be considered the most environmentally friendly fossil fuel, because it has the lowest CO₂ emissions per unit of energy and because it is suitable for use in high-efficiency combined-cycle power stations. While gas liquefaction already consumes approx. 10 to 25 percent of the gas's own energy content, reconstitution of the gaseous state (heating from -161 to +5 degrees Celsius at a pressure of 90 bar) also requires significant quantities of energy and/or sea water. Cooling of frequency converters (demin water) and compressors are applications served by GEA Compact Systems in gas compression stations.



Waste incineration plants

Waste incineration plants also belong to the innovative business sectors of GEA cooling technology. The system fulfills the highest demands for efficiency and sustainability. Application areas include the condensation of the steam at the outlet of the steam turbine with pressurized steam condensers, as well as cooling of the ST lube oil for bearing and generator thanks to a dry compact cooler. This advanced compact technology is already successfully in operation by clients such as CNIM, Von Roll Inova and Vinci.



Pharmaceutical and food processing sector

Our compact coolers comply with European standards for pressurized equipment and with health regulations covering food processing and pharmacy. Milk powder, starch powder, yeast powder, medical powder ... the heat exchangers developed by GEA have applications in both drying processes and atmospheric processes used to cool the air carrying the powders. Manufactured in stainless steel, the heat exchangers have an excellent life span and their thermal performance is particularly reliable: temperatures are regulated with great accuracy. In addition, we provide our clients with perfectly sealed circuits, thus avoiding any build-up of powder in the piping.

Use in various processes to dry and transform food products: Compact bundles with different metallurgies involved

Cooling of service water: Standard and customized dry compact coolers

Drying and humidity control: Heating and cooling bundles

These customized compact heat exchangers are also used in the textile, plaster, cement, and chemistry industry to cool service water and dry products.



Pulp and paper

Paper and cellulose production is a highly energy-intensive process. Constantly increasing energy prices force up production costs. The best way to gain a competitive edge in the paper industry is to reduce energy requirements using high-efficiency system components. GEA provides the optimum compact solution with its full range of compact radiators and dry compact coolers. Our equipment helps to achieve lasting reductions in energy costs and to optimize the energy consumption in manufacturing processes such as cellulose production, heat recovery, and waste water treatment. The systems are installed as machinery cooler, engine cooler, and in water process cooling. Renowned customers such as Sonoco-Cascades, Arjowiggins, Ahlstrom, Norske Skog, Egger, and Tembec already profit from this performance portfolio.



Iron and steel industry

For metallurgy, iron, and steel, GEA uses AlMg thick fins, which have low air resistance and are highly resistant to corrosion. They are extremely robust, supporting air-processing temperatures of over 200 °C.

Cooling of furnaces: Customized compact radiators with Co tubes and AlMg fins, cylindrical copper tubes

Cooling of galvanization lines: Compact coolers/compact bundles with CuNi or SS tubes and Al fins, cylindrical copper tubes

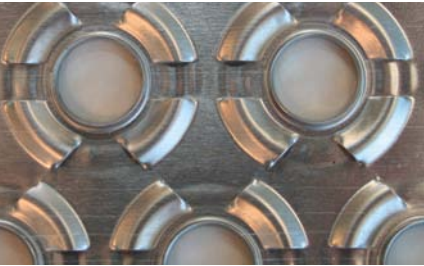
Cooling of electrolyzing bath for production of aluminium (demin water): Customized compact radiators with SS tubes and alu fins

Details on technology and functionalities

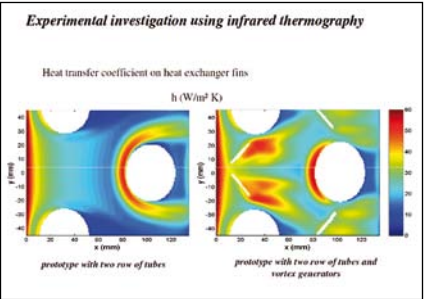
Energy-efficient compact solutions and corrosion protection



Brazer at GES.



S32 turbulated aluminum fins.



IR thermography.



Pumps skid.



Expansion tank.

With more than 80 years of experience and know-how in the design and construction of heat exchangers, GEA has developed countless types of compact fin-tube systems to meet all specific requirements involving media temperature, pressure, noise levels, reduced footprint, vibration, and protective coatings.

Fins

From the wide GEA finned-tube range, the following three are most commonly used due to their technical flexibility and cost-effective advantages: turbulated, rippled, and flat. GEA turbulated fins provide the best ratio efficiency/pressure drop of the market today, and are not sensitive to clogging risks thanks to its high-tech turbulator acting as a guide of the cold air behind the tube and not as an obstacle to generate turbulences. In compact systems, the fins are punched by high-precision machines. The shape of the turbulators and the sophisticated tube-fin connection, achieved by expansion of the tube diameter, enable the top performance of the system. The choice of material used for the fins depends on environmental constraints. For example, high-resistance AlMg alloys enable high-pressure jet cleaning without damage.

Pumps skid, manifold, and inter-connection piping:

Design and manufacturing to the customer's requirements with suction and discharge interconnection pipes, valves, filters, and required instrumentation such as pressure sensors. The pumping skid normally has two circulating water pumps (one in service, the other in stand-by) sized to meet the designed pressure drop of the complete loop (heat exchanger, piping, and customer's equipment) and flow requirement of the application.

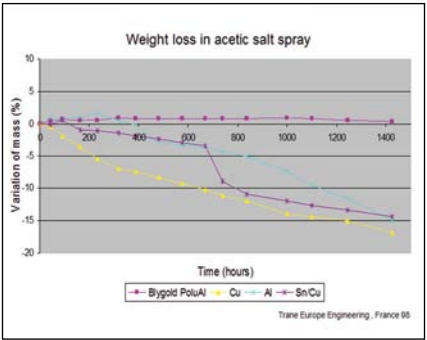
Expansion tanks

Atmospheric or pressurized types made of either galvanized or painted carbon steel. Its function is to allow the expansion of the fluid to be absorbed during rises in temperature in the circuit. It is made of steel, with internal and external treatment against corrosion. In most cases, the atmospheric type is preferred, and fitted on top of the unit. Its position should always be above the highest point of the circuit, so as to avoid overflows and air pockets. Vent and charging holes connected to the input and output headers by flexible pipes permit continuous venting of the installation. Equipped with level detectors and alarms. The pressurized type will contain a bladder blown by air inside, and can be fixed on ground level.



Coating with a unique corrosion protective system

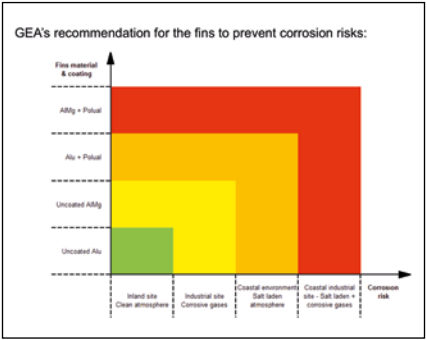
In partnership with Blygold, GEA has designed and developed a unique automated process to apply a perfectly graduated coating. It protects the compact finned coils against harsh environmental conditions such as erosion by sand or salt. It provides a barrier and avoids the risk of electrolytic reactions between the two metals involved. The coating contains aluminum to maintain the thermal performance of the compact coil, resulting in extension of the lifetime, maximum cooling capacity, and reduction of energy costs. Moreover, in the event of any incident or shock to the exchange surface, the fins and the film can be repaired on site without changing or even moving the dry cooler or radiator.



Acetic salt spray test.

Adiabatic dry compact coolers with HP misting system and bacteria control in the water

Most installations are sized according to maximum temperatures occurring only rarely during the year. This situation is worsened by increased heat-wave phenomena of recent years, which has resulted in oversizing and a larger footprint, higher noise levels, and greater investment in terms of non-productive exchange surfaces. Adiabatic dry compact coolers retain the advantages of a dry air cooler. GEA's exclusive process involves a very high pressure misting system (>100 bars) as well as hydrodynamic cavitation and UV rays to destroy biofilm and kill all pathogens bacteria – including Legionella – allowing to reach the highest cooling performance in fully safe conditions, and conform to ACOP L8 and NSF55 Class A regulations. Water consumption remains limited because spraying operates only at the hottest times of the year. This concept avoids oversizing of dry compact coolers, and therefore reduces the dimensions of the exchanger, lowers the amount of power used by the fans, and dampens the noise level of the installation. GEA also offers another type of adiabatic cooling system consisting of induced draft dry/deluged coolers with horizontal cooling deltas. A continuous water film on the flat fins enhances cooling performance. The deluging system operates only in hot summer hours and dramatically reduces cooler size.



Fins type vs site conditions.




Adiabatic dry compact cooler with HP misting system.

Your GEA experts for radiators/dry coolers worldwide

Reachable always and everywhere

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Sales/Distribution



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Expect one-stop solutions

By concentrating various performance fields into a single, one-stop solution, GEA especially enables more effective control of the complex processes in heat transfer. It also speeds up order execution and simplifies preventive and remedial maintenance of heat transfer facilities. In this way, GEA creates clear and personally addressable responsibility for the entire process of project implementation. In a global, tightly meshed network, our highly qualified staff provides all key processes industrial production and air treatment. GEA has set a new standard for efficiency, reliability, and availability in heat exchange. With production and service locations around the world, GEA Compact Systems as part of GEA Heat Exchangers offers, based on a single-source technology, a unique industrial network to provide excellence in engineering and expertise in local services and comprehensive support of our customers in a wide range of dedicated applications.



Excellence

Passion

Integrity

Responsibility

GEA-versity

GEA Group is a global mechanical engineering company with multi-billion euro sales and operations in more than 50 countries. Founded in 1881, the company is one of the largest providers of innovative equipment and process technology. GEA Group is listed in the STOXX Europe 600 Index.



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