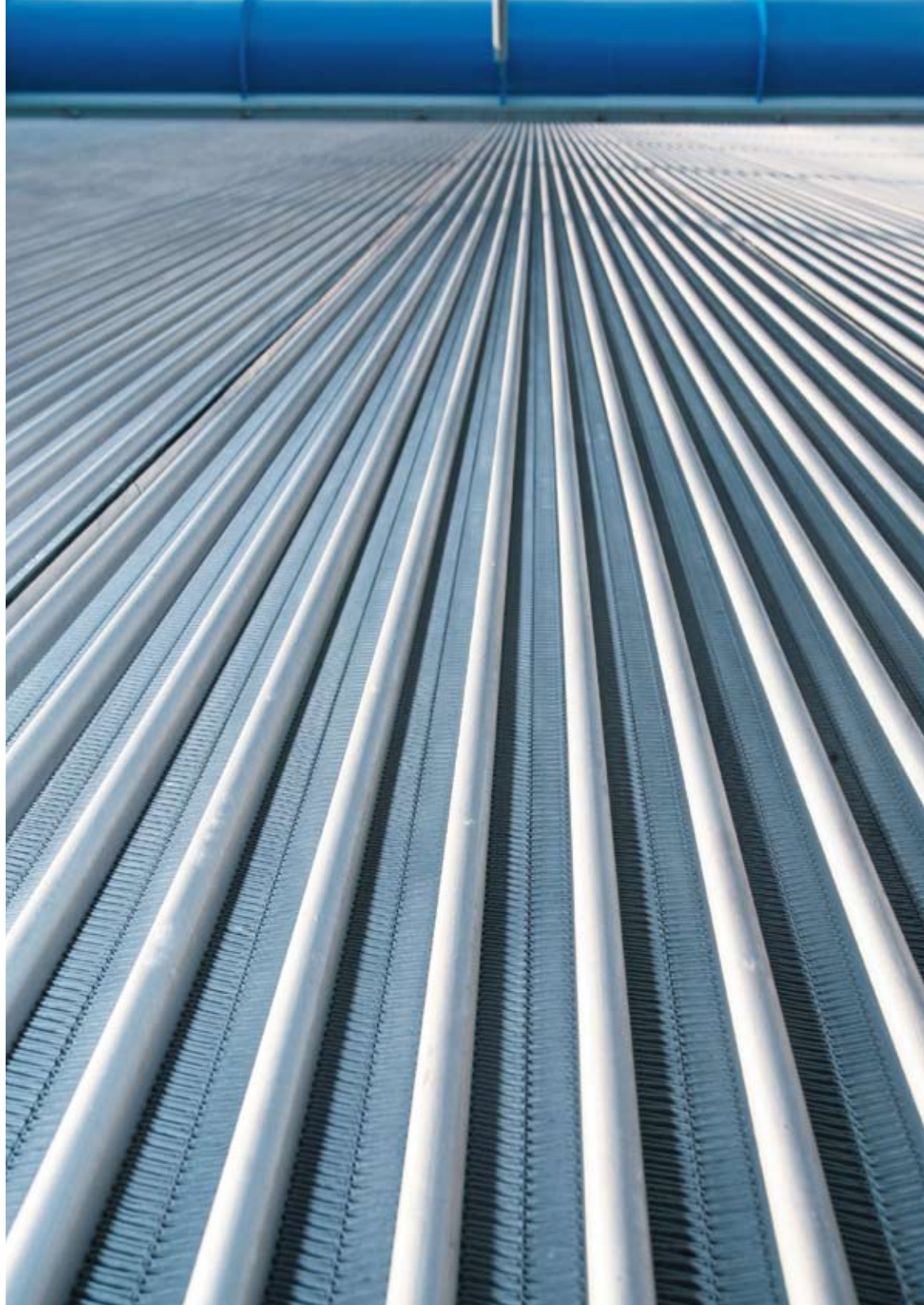




Reliability. Powered by Experience.



Customers appreciate our quality and reliability, based on almost 90 years of experience from our global manufacturing network, approved products, and the division's membership GEA Group.



Background.

Bringing your company forward.

As a division of the GEA Group, Thermal Engineering Division combines quality with the power of a global player, to act as a dependable, customer-orientated partner in the global arena.

The Thermal Engineering Division is part of the GEA Group, a globally active technology group specializing in mechanical engineering and systems development, particularly in the field of process engineering and equipment.

The GEA unites the long traditions of many well-known companies in 50 countries. About 90 percent of the companies involved are market and technology leaders in their fields. It is their products and services which for a long time have provided decisive innovations in key sectors ranging from chemicals and pharmaceuticals to the food industry and energy sector, as well as biotechnology and environmental engineering. Founded in Germany in 1881, GEA's leading position has been developed and consolidated over many years.

The program of the Thermal Engineering Division is an offshoot of the present GEA Group. The program of the Thermal Engineering Division now includes products and systems for:

- Direct Dry Cooling
- Direct Condensing
- Wet Cooling
- Indirect Dry Cooling
- Special Applications
- Services

These tried and tested technologies are used by power station operators as well as by customers from the processing industry. Here, the main emphasis is on chemicals, refineries, petrochemicals, GTL and LNG plants. Many of our developments, e.g. the "plume-free" Heller® GEA cooling towers set standards throughout the world. In addition to the required efficiency and economy, the thing which our safety-orientated customers appreciate most is our complete dependability. Almost 90 years of experience and recognized quality standards together with our global manufacturing network are the best prerequisites to continue to meet these demands in the future.

- Air Fin/Fin Fan Coolers
- Air Cooled Condensers
- Natural Draft Cooling Towers
- Cell Cooling Towers
- Hybrid Cooling Towers
- Heller® Systems
- Surface Condensers
- Desublimators
- Post Reactors
- Shell & Tube Heat Exchangers
- BoP Engineering

GEA Thermal Engineering's knowledge management system makes knowledge from individual projects readily available to all companies in the division.



Alex Air Cooled Condenser:
A solution for a 34MW
biomass power plant
in Siegerland, Germany



Build your future on safe foundations with our wealth of experience.

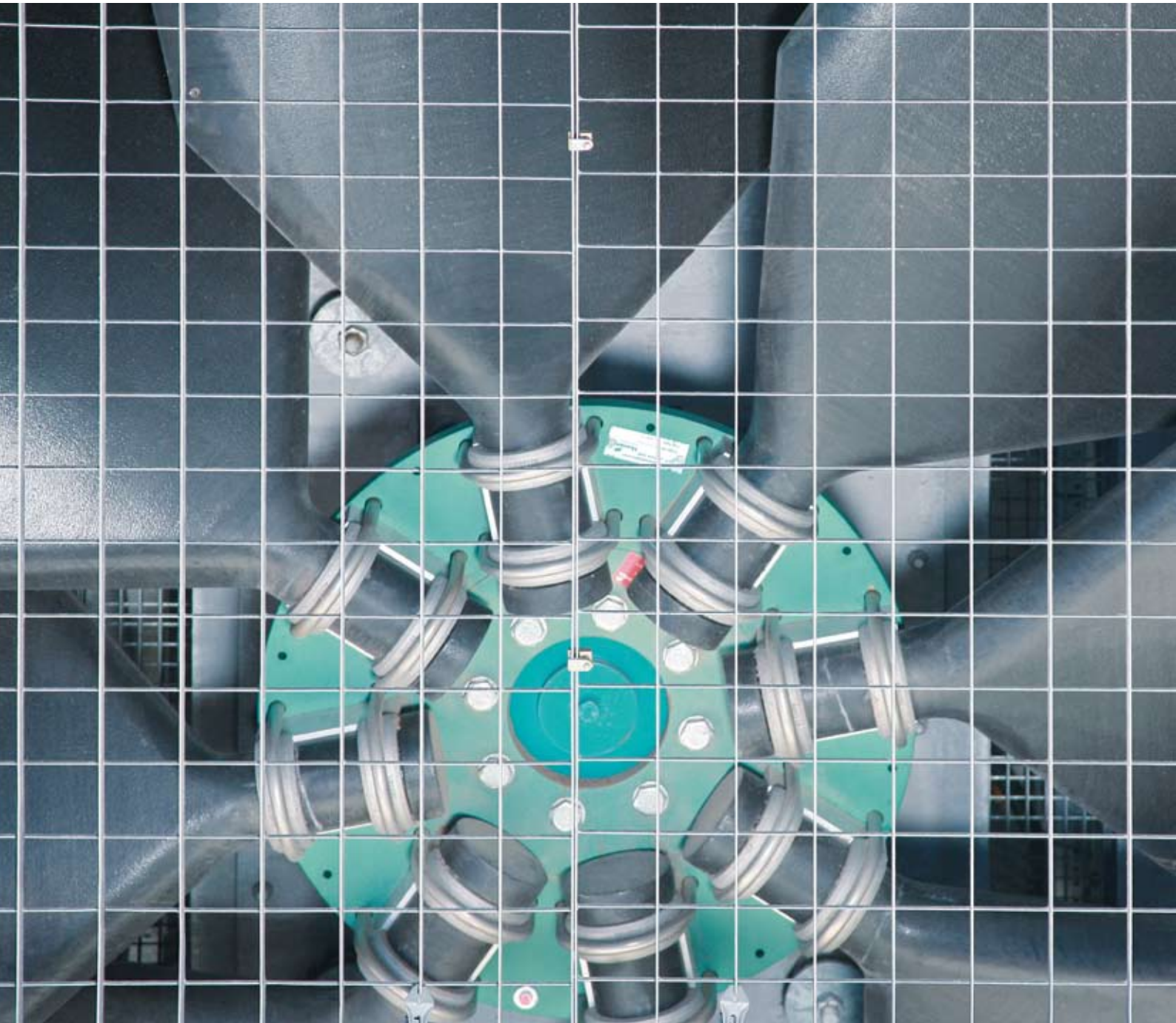
Experience is gathered at a divisional level and made available to all companies. This transfer of knowledge is a decisive benefit to our customers.

GEA Thermal Engineering Division creates a valuable pool of knowledge. Its companies – the centers of excellence – bring in a wealth of experience which is systematically collected at division level, processed and transferred to the other companies. All centers of excellence have the same high level of knowledge. In this way, there are more possibilities of avoiding errors and the potential for optimization is exploited even more rapidly.

This knowledge management also benefits our customers directly, because all GEA Thermal Engineering Division companies are always in a position to make use of this support to provide the very best solution for their customers – directly and with no loss of information.

The Alex Air Cooled Condenser has also proven to be a solution for big coal-fired power plants such as the 2x 600MW Datong II power plant in Shanxi Province, China

The GEA Thermal Engineering Division network ensures cooperation between the companies in the division, which always has the ultimate goal of providing the customer with the “objectively” best solution.



Inside view of
the Alex Air Cooled
Condenser



Synergies. Offering you the best solutions.

The cooperative network of the individual companies of GEA Thermal Engineering Division produces synergies which can be used to provide customers with the best possible solutions.

GEA Thermal Engineering Division deliberately combines various divisions from the complementary fields of heat rejection to enable an intensive cooperation, whose actions are always in the interests of the customer.

This cooperation gives rise to many synergies. The great challenges of the modern energy sector can be worked on individually and in various constellations. Strengths can be combined, and specialists consulted as required. In addition, the joint view of a project also makes it easier to find the right solution. Ultimately the goal is always to find the "objectively" best solution for the customer, regardless of which of the GEA Thermal Engineering Division companies is managing the project. All considerations are orientated to the life cycle benefit which promises to provide the maximum benefit over the entire life span of the plant. Against this background, the division's networking system always ensures that the customer can plan and invest with confidence.



Bergkamen Biomass Power
Plant: Air Cooled Condenser
engineered and manufactured
by GEA Energietechnik



Experience in handling big projects: Natural Draft Cooling Towers for the Boa II power plant in Germany

Project management for safe operation of power plants in summer: Air Cooled Condenser, manufactured by GEA Luftkühler, keeps the water temperature of the lake under control


Project management. Optimizing your processes.

GEA Thermal Engineering Division does not think in terms of individual technologies, but rather in an interdisciplinary way. Its project management ensures high-performance processes in which everything is optimally harmonized.

Whether in power plants, refineries or in LNG terminals, thermal engineering now involves complex processes to an even greater extent. Everything must match perfectly to ensure that the result is right. For GEA Thermal Engineering Division the customer's processes are the focus of attention.

Through the individual companies in the division, the customer is provided with an interdisciplinary project management. This is the starting point for a process-orientated engineering. Here not only the various technologies and components are coordinated, but also the cooperation between the global engineering and manufacturing network involved in the project. The result is a performance which is optimized from A to Z for greater efficiency and economy.

This project management is the essential guarantee of success, especially in the planning of new plants and the supervision of large projects. The individual companies in the division are the first contact partners for our customers. Through them, the interdisciplinary project management of GEA Thermal Engineering Division is made available.



The individual companies of the division are the first points of contact for our customers.

These companies make the interdisciplinary project management of GEA Thermal Engineering Division available.

GEA Thermal Engineering Division companies also have everything under control in joint projects. Well-coordinated and without interface problems, they ensure rapid solutions and safeguard against unwanted surprises.



Cell Cooling Tower
in a chemical
plant, manufactured
by GEA Polacel



Water distribution in
a cooling tower

Teamwork. Catering for all your needs.

Through its various special companies GEA Thermal Engineering Division guarantees a high degree of flexibility. In joint projects our cooperation experience ensures that unnecessary interface problems are avoided.

GEA Thermal Engineering Division unites many specialist companies from the field of process heat exchangers. Each of these companies has its own area of expertise and represents the state-of-the-art in its own field. Because of this variety the division is in a position to offer the customer a highly flexible service which exactly corresponds to their requirements.

Of course, not just one company of the division may need to be called on. It may be advisable to combine two or more companies according to the requirements.

In this case it is a great advantage that the companies of GEA Thermal Engineering Division have a long tradition of cooperation. They know each other very well from many previous projects. This experience saves valuable time and money. However, the main advantages include the fact that there is practically no problem with interfaces. All technologies are optimally matched to each other. The customer is therefore protected against unpleasant surprises.



Air Fin Coolers at the Total refinery Mitteldeutschland, Germany



New Fuels: Air Fin Coolers and Air Cooled Condensers in a GTL plant, manufactured by Batignolles Technologies Thermiques

Decentralization. You stay where you are.

The decentralized structure of GEA Thermal Engineering Division ensures that we are as close to the customer as possible. Decisions can be made quickly and flexibly – on site.

GEA Thermal Engineering Division has deliberately decided on a decentralized structure of the division. First of all, the principle of many special companies instead of a large unit has a simple geographical advantage, because they are spread around the world and the customer always has a contact partner close at hand. Services and products are available more quickly – a definite advantage in global markets, where now more than ever time is money. At the same time the companies of the division are completely familiar with local customs – they speak the same language.

However, the decentralized organization of the division also has other advantages. The homogeneous units have the freedom to work on their own responsibility, and are therefore in a position to make decisions flexibly and quickly. In addition, divisionalization promotes motivation within the individual companies – in the interests of the customer.

Because of the division into several special companies, the customer always has a contact partner near at hand, who knows the region and can react flexibly to the customer's requirements.



The special service and support is greatly appreciated by customers, because it is a dependable way to avoid poor planning and cost pitfalls.



From engineering to reality:
Installation of an Air
Cooled Condenser in the U.S.



Special service and support. Caring for your investments.

The service of GEA Thermal Engineering Division goes far beyond maintenance and the supply of spare parts. Special service and support also includes expert opinions, examinations and studies to protect customers' investments before a project has begun.

It is a matter of course for the individual companies of GEA Thermal Engineering Division to offer a comprehensive after-sales-service with the associated maintenance and supply of original spare parts. However, the special service and support of the division goes far beyond these standards. Comprehensive expert opinions, technical examinations, vibration tests, feasibility studies and other services give customers the security which they need, even before a project has begun. GEA Thermal Engineering Division has the technological facilities and is pleased to make these available as a project-orientated competence centre.

This special service and support is especially appreciated by GEA Thermal Engineering Division's customers for particularly large projects with a very high investment volume, for example new power plants or refineries. In such cases it is even more important to thoroughly investigate any innovations which come into question with regard to their functionality and economy, in order to identify possible false planning and cost pitfalls in good time, or to avoid them from the outset. This service reinforces the engineering excellence to which GEA Thermal Engineering Division orientates all services regarding the life cycle benefit of the plants.

This is also a root of our success:
both economically and ecologically,
GEA Thermal Engineering Division
designs everything for sustainability.



Renewable energy:
Air Cooled Condenser in a
biomass power plant

Sustainability. Taking care of your resources.

Whether for the long-term security of investment through life cycle benefit, or the protection of natural resources: all of GEA Thermal Engineering Division's activities are based on sustainability.

In the energy sector or in the chemical and petrochemical industry, the importance of sustainability is twofold. On the one hand for the security of investment for the plant and on the other hand for the responsible use of raw materials and energy. Both aspects have the highest priority for GEA Thermal Engineering Division.

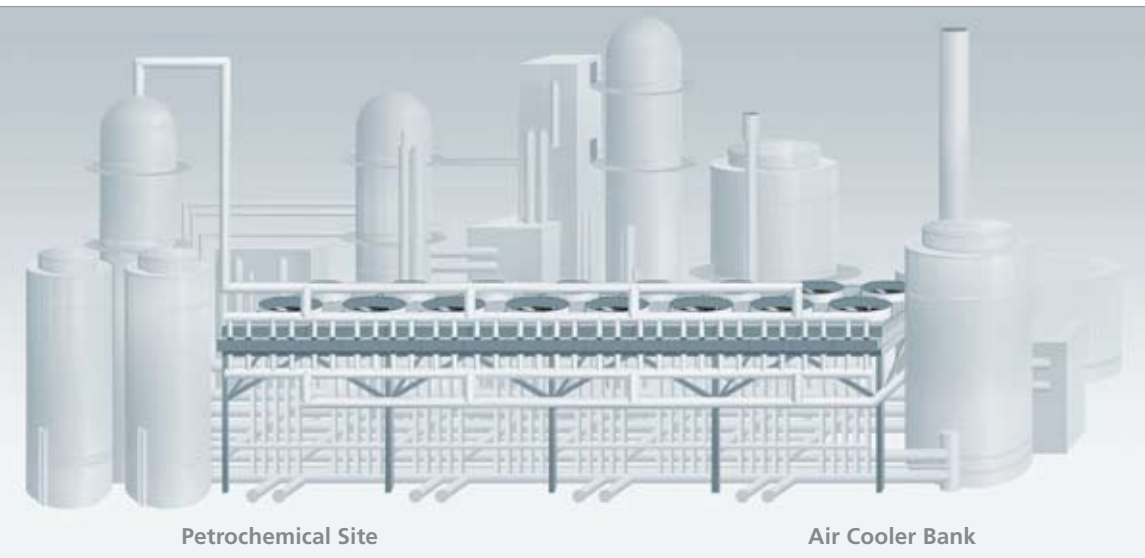
The ecological dimension can be seen from the fact that our developments repeatedly set standards in low energy and water consumption. At the same time the reliable operation of the plant is a priority. Particularly with such safety-orientated plants as power stations, gas pipelines or refineries, an essential prerequisite is to not endanger either people or the environment.

From an economic perspective this is the philosophy of life cycle benefit. From planning, installation, commissioning to production parameters and operating costs up to servicing concepts at GEA Thermal Engineering Division, all criteria are coordinated in order to maximize their benefits over the entire lifetime of the plant. In other words this means increased performance, reduced costs and secure profits over the entire lifetime of the investment.



Fan Assisted Natural
Cooling Tower in the
Ribatejo power plant
in Portugal

GEA Products and Systems. Fulfilling your challenges.



Direct Dry Cooling is the direct cooling by air of any process medium such as water, oil or gas. Products using this process are referred to as Air Cooled Heat Exchangers.

Direct Dry Cooling

For several decades GEA has been one of the world's leading companies in the field of Direct Dry Cooling.

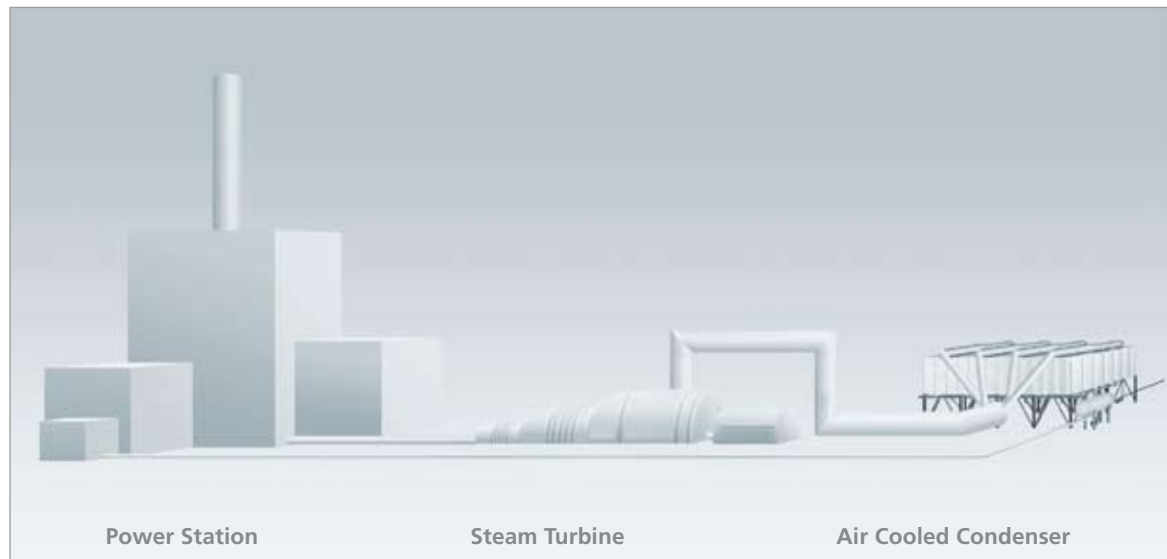
Air Cooled Heat Exchangers – in short Air Fin or Fin Fan Coolers, are used in any application where large amounts of heat need to be transferred. This includes the chemical and petrochemical industries, refineries, power stations, waste-to-energy facilities and steelworks.

Using air rather than water for cooling is not only a cost-effective alternative, but also controls the thermal overload of rivers and lakes. Moreover, Direct Dry Cooling offers substantial advantages, since air is generally non-corrosive and available in unlimited supply. GEA supplies customized Air Fin Coolers, based on cutting-edge design and manufacturing technologies, featuring a wide range of different

fin shapes and headers in any material.

Air Fin Coolers are designed, manufactured and tested in accordance with all relevant international codes and regulations. Standard thermal designs are based on induced draft, forced draft, recirculation units and humidified air coolers. Of course, more sophisticated designs for special process applications are available. Air Fin Coolers are built with operating pressures up to 700bar and the capacity to handle temperatures up to 400°C. GEA coolers are not only made from standard carbon steel, but also from specialized materials such as stainless steel, and other high-alloy steels. Corrosion protection of the outside can be achieved by using galvanized Fin tubes.

Direct Condensing ensures the condensing of steam generated by a power plant or any process system, by means of an Air Cooled Condenser.



Direct Condensing

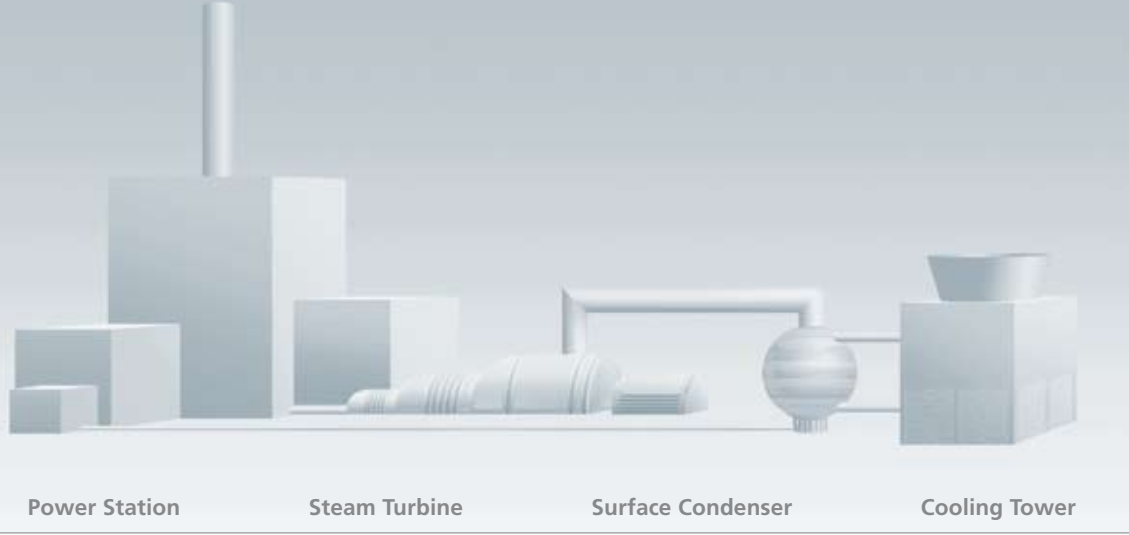
From the first Air Cooled Condenser designed and commissioned nearly 70 years ago, GEA is now the leading supplier of all varieties of Direct Condensing Technologies.

Air Cooled Condensers supplied by GEA provide efficient and reliable steam condensation systems for the power and process industries. Development is based on nearly 70 years of successful experience. GEA technology has evolved through the development of various designs, configurations and materials, and now represents the state-of-the-art in Direct Condensing Technology.

The GEA Air Cooled Condenser is composed

of finned tube bundles in an A or V frame configuration on a concrete or steel support structure. Vertical and almost horizontal configurations are also available.

GEA employs a two-stage, single-pressure condensing process to achieve efficient and reliable condensation. The steam from the turbine or the process is conveyed into a number of fin tube bundles by means of one or more large ducts. Depending on the design parameters in the customer's specification, and always considering the most efficient and economical layout, GEA can offer solutions ranging from the galvanized two-row solution to the aluminum single-row ALEX system.



Wet Cooling, a two-stage method, first cools the cooling water in a wet cooling tower and then re-cooled water cools or condenses the process fluid or steam.

Wet Cooling

GEA has been building corrosion-free cooling towers since 1967, and is a leading company when it comes to efficiency and noise reduction.

The GEA product range comprises an extensive variety of technologies and concepts, such as: Mechanical Draft Cooling Towers, Natural Draft Cooling Towers, Hybrid and Combined Wet/Dry Cooling Systems (PAC-SYSTEM®). The wide range of cooling tower designs available from GEA ensures that the solution will meet all economical and environmental requirements.

An in-house research and development department guarantees the latest state-of-the-art technology for medium flow directions, types of fill, drift eliminators, fans and spray

systems. GEA designs, manufactures and maintains cooling towers for the process and power industries. We can offer any type of cooling tower design, including counter flow or cross flow cooling towers. In order to achieve the optimum technical and economical performance for the customer, GEA selects the best solution from an extensive variety of configurations such as Cell Cooling Towers made from engineered composites, concrete or wood, and Natural Draft Cooling Towers. Standardized Design Cooling Towers for the power and industrial markets have been designed to reduce costs and delivery times. Special applications have been designed for Low Plume Abated Cooling Towers and for increased efficiency by retro-fitting existing towers with a Combined Wet/ Dry Cooling System (PAC-SYSTEM®).

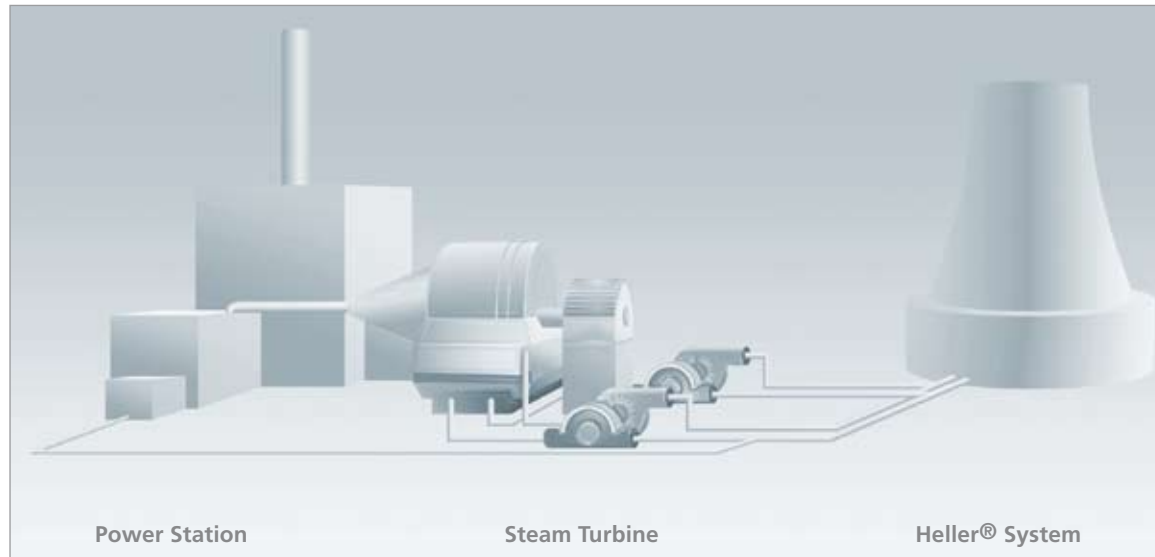
Indirect Dry Cooling

As a world leader in Indirect Dry Cooling technology, GEA provides competitive Indirect Dry Cooling solutions that have been designed according to the Heller® principle.

GEA provides optimized solutions not only for large, standard utility plants but also for power units with individual site-specific requirements. The Indirect Dry Cooling System can be built as a natural draft or a mechanical draft version, as well as a combination of both.

Individual solutions targeting maximum power generations at optimized life cycle cost must, at the same time, consider environmental impact. Indirect Dry Cooling offers solutions for all kinds of steam power cycles – for fossil-fuelled and co-generation power plants. Special features include Stackin-Tower and FGD-in-Tower solutions which save investment costs and minimize the environmental impact of the plant.

Indirect Dry Cooling consists of two steps. First, the cooling water is cooled in a Dry Cooling Tower (Heller® technology), then the re-cooled water cools or condenses the process fluid or steam.



Special Applications

GEA provides the process industry with an extensive range of effective solutions for special applications.

Surface Condenser

GEA designs, supplies and commissions Water Cooled Condensers, including the associated auxiliary packages such as the vacuum system, the condensate pumps, and the protection and instrumentation equipment. The outer shell can be constructed up to a diameter of 5,000 mm. Modern 3D design tools optimize the configuration of the condenser and the selection of the best materials for the construction. Applications ranging from mechanical drives in chemical processing, refinery systems, power generation, waste incineration and desalination plants with steam turbine powers up to 120 MW can profit from GEA surface condensers.

Desublimator

GEA invented the first industrial desublimator in 1954, and has since installed this equipment in more than 1,200 plants. This technology involves a reaction gas flow entering

a group of pressure vessels where a substance is directly converted from the gaseous to the solid phase by means of oil cooling. The solid phase is then liquefied as the oil heats up, and is collected at the bottom of the vessel. Various sizes are available, and all weldable materials can be handled. References are available for substances such as Phthalic Acid Anhydride, Naphthalene, Nitroanthraquinone, Butyl phenol, PDMA etc.

BoP Engineering

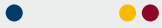
Balance of Plant (BoP) engineering is an integral part of GEA's capability, demonstrated by experience in the supply of boiler plants and heat recovery units, water treatment plants, fuel handling and storage systems, as handling, disposal systems and power plant related BoP installations. We also provide the project management and engineering for the supply of turn-key conventional power generation and co-generation plants, including diesel plants, combined cycles and district heating plants, with proven experience in up to 150 MW.

USA

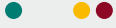
GEA Power Cooling Inc. (GPC)
Lakewood, USA
www.geapowercooling.com



GEA Rainey Corporation (GRC)
Catoosa, USA
www.gearainey.com



GEA Polacel LLC (PCLUS)
Houston, USA
www.polacel.com

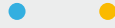


GEA Power Cooling Inc. (GPC)
Clearwater, USA
www.geapowercooling.com



EUROPE

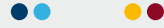
GEA Energietechnik Ltd. U.K.
Staffordshire, Great Britain
www.gea-energietechnik.com



2H Aqua Ltd. UK (ZHKUK)
Huntingdon, Great Britain
www.2h-kunststoff.de



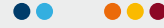
Batignolles Technologies
Thermiques S.A.S. (BTT)
Nantes, France
www.btt-nantes.com



GEA Airflow Services
S.A.R.L. (AFS)
Nantes, France
www.btt-nantes.com



GEA Ibérica S.A. (GIB)
Igorre, Spain
www.geaibericasa.es



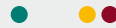
GEA Scambiatori di calore
S.r.l. (GSC)
Monvalle, Italy
www.gea-sc.com



EGI Contracting/Engineering
Co. Ltd. (EGI)
Budapest, Hungary
www.egi.hu



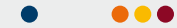
GEA Polacel b.v. (PCL)
Doetichem, Netherlands
www.polacel.nl



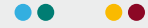
2H Kunststoff GmbH (ZHK)
Wettingen, Germany
www.2h-kunststoff.de



GEA Luftkühler GmbH (GLK)
Herne, Germany
www.gea-luftkuehler.de



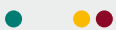
GEA Energietechnik GmbH (GET)
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MEXICO

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www.geapowercooling.com



GEA Power Cooling de Mexico
S. de R.L. de C.V. (GPM)
Mexico City, Mexico
www.geapowercooling.com



BRASIL

GEA Sistemas de
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Alphaville, Brasil
www.geapowercooling.com



AFRICA

GEA Nilenca Ltd. (GNL)
Germiston, South Africa
www.geanilenca.co.za

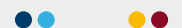


GEA Aircooled Systems
(Pty.) Ltd. (GAS)
Germiston, South Africa
www.gea.co.za



QATAR

Batignolles Technologies
Thermiques Qatar L.L.C.
(BTQ)
Doha, Qatar
www.btt-nantes.com

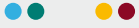


RUSSIA

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Moskau, Russia
www.gea-energietechnik.com



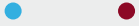
Beijing GEA Energietechnik Co., Ltd. (GBJ)
Beijing, China
www.gea-energietechnik.com



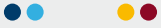
EGI Cooling Systems Trading (Beijing) Co., Ltd. (EGIC)
Beijing, China
www.egi.hu



GEA Power Cooling Technology Co., Ltd. (GPCT)
Langfang, China
www.gea-energietechnik.com



Batignolles Thermal Technologies
(Changshu) Co., Ltd. (BTTC)
Changshu, China
www.btt-nantes.com



GEA Power Cooling
Technologies
Langfang, China



GEA Energietechnik
manufacturing facility
in Herne, Germany

Centers of Excellence. To make your decision the right one.

No matter which GEA Thermal Engineering Division company you chose as your partner – you are always making a decision for efficiency and reliability.

Each of the companies involved in the division is a center of excellence, which is always available to the customer along with the entire expertise of GEA. Wherever they are needed throughout the world, there is a center near you as a first contact partner. Through networking, an optimum customer-orientated solution will be realized. That means efficiency and reliability. A good decision.

- Air Fin/Fin Fan Coolers
- Air Cooled Condensers
- Cooling Towers
- Heller® Systems
- Special Applications
- Service
- Company with Manufacturing Facility

GEA Cooling Tower Technology
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