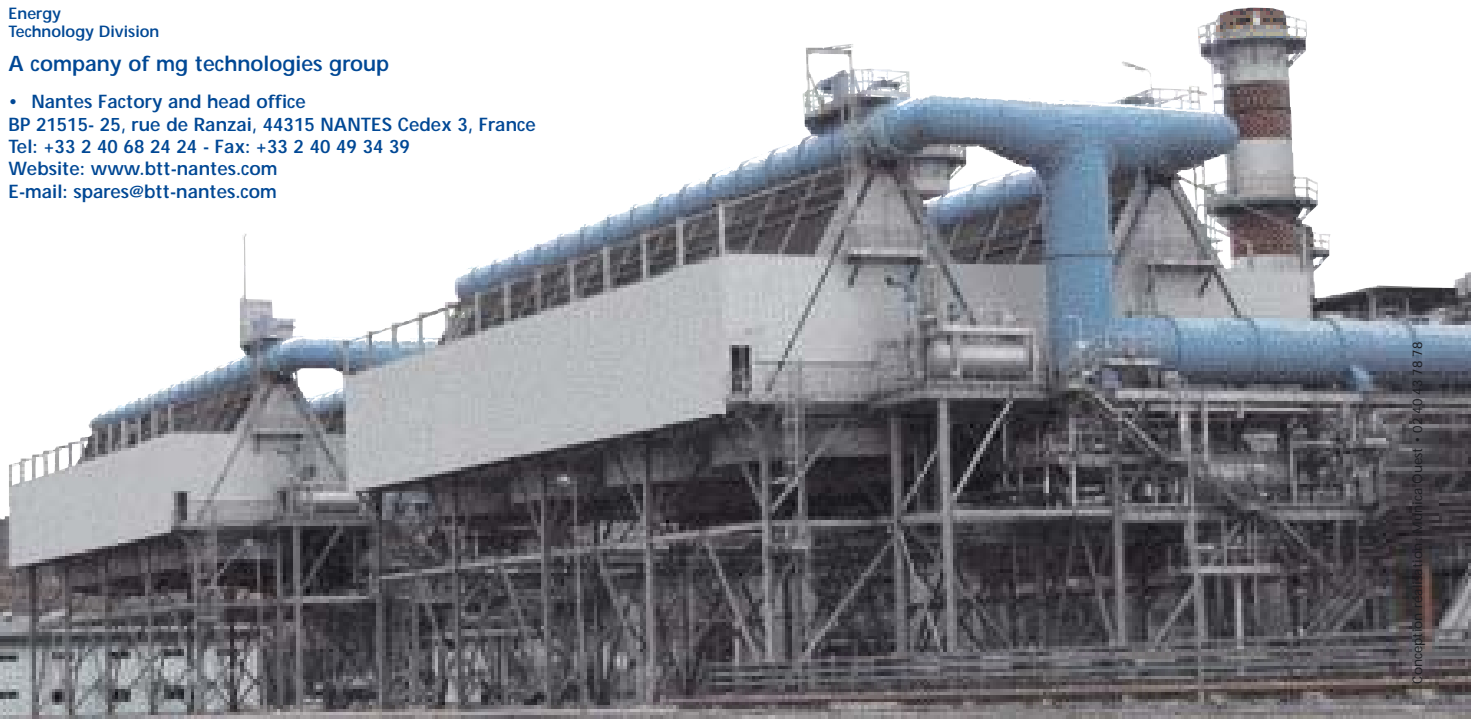


Btt
Batignolles Technologies Thermiques

Energy
Technology Division

A company of mg technologies group

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SERVICES



**AIRCOOLED HEAT
EXCHANGERS**

AIRCOOLED CONDENSERS

COMPONENTS







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GEA-Btt

Batignolles Technologies Thermiques

1958: Delivery of the 1st API Aircooled Heat Exchanger in a French manufacturing plant. This Aircooler activity started under the licence agreement with Hudson Products Corporation from 1958 to 1979.



Staff:
250 persons,
including 50
engineers and
managers.

GEA Group, which federates more than 250 companies throughout the world, is the leader in heat transfer technologies.

Site surface: 125,000 m²
46,000 m of which is covered.

The Nantes factory bought in 1985 by GEA, asserts its 1st position as manufacturer of API 661 Aircooled Heat Exchangers worldwide, due to its 50 years experience and technical innovation. Furthermore GEA-Btt develops its expertise in the area of Vacuum Steam Condensers suitable for oil and gas specifications.

Productivity per week:

- 30 tube bundles,
- 50 km of extruded tubes,
- 48 km of L and G tubes.



A True Leadership

Strong Innovation and Design Capacity

Permanent development and updates:

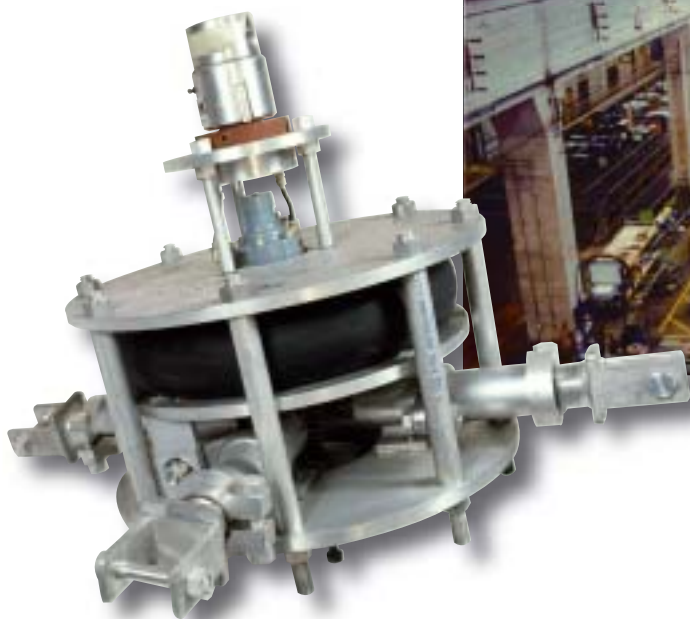
- finished elements analysis of the components and critical sub-assemblies,
- specific softwares for Aircooled Heat Exchangers calculations and 3D drawings,
- ERP management system under SAP.



1st world production capacity of API 661 Aircooled Heat Exchangers

In 2004:

- 600 Aircooled Heat Exchangers bays = 20,000 tons of material,
- 95% are exported, 4/5 out of the European Union.



After-sales Service

BTT supplies spare parts and services to all the Aircooled Heat Exchanger's users.

Our multivalent technicians are highly experienced.

Quality Insurance

BTT is certified according to ISO 9000 since 1994, and ASME (U, U2, S stamps) since 1978. The company complies with the latest European regulations not only in design area but also in the manufacturing area: EN, PED, ATEX...



Services

■ Helping you resolve the problems

- Product physical properties change: thermal duty raise.
- The environment of the Aircooled Heat Exchanger changes: obstructions to the fresh air intake, hot air re-circulation.
- Heat transfer surface is fouled: static pressure raise.
- Belt drive slips, fan blades pitch varies: air flow decrease.
- Water spraying on tubes to improve performance: deposits causing a thermal barrier, static pressure increase, irreparable damage.
- Bearings are damaged too fast, eventual causes: vibrations, incorrect setting of the pulleys, inadequate tightening of the bearings.
- Leakages on tube bundles: tubes/tube sheets connections are getting lost, gasket seats are damaged, plug threads are crushed.

■ GEA-Btt provides you a multidisciplinary staff to develop technical solutions with your engineers

Take advantages of our professional skills:



- thermal synthesis: evaluation of the real capacity of the Aircooled Heat Exchanger compared to its nominal duty,
- vibrations analysis: adjustment of the fans and drives settings to extend service life,
- leakages search: a professional skill operation highly complex on Vacuum Steam Condensers,
- supervising the re-tubing operations: securing the schedule duration because of our supervisors' long-term experience,
- supervising the assembly or modification work: reduction in work schedules and commissioning with a guarantee of performance,
- **sealing works:** re-tubing, mechanical and thermal design re-worked to extend reliability of finned tubes, header boxes, tubes/tube sheets connections.





1. Sound level testing
2. Blade setting with torque wrench
3. Cleaning
4. Air flow measurement/ sound level testing
5. Bearing adjustment
6. Retubing

Services

■ Improving the performance of your Aircooled Heat Exchangers and Aircooled Condensers

GEA-Btt enables you to improve the performance of your Aircooled Heat Exchangers and Aircooled Condensers by combining thermal sizing, mechanical design, manufacturing and assembly on site.

3 steps for the debottlenecking:

Site survey:

- checking of the heat transfer surface: fouling detection, fins condition (bonding, bending, corrosion).
- checking of the air flow, rounds per minute, pitch angles, vibrations frequencies, sound power level.
- data gathering by Customers Processes Engineers: temperature/flow/pressure data recorded during production.

Analysis, design and manufacture:

- analysis of the data by our thermal Engineers,
- performing improvement simulations
 - air flow increase: optimized adjustment, driving power increase, fans upgrading,
 - extending of the heat transfer surface so as to absorb the new thermal load.
- mechanical design and manufacture.

Assembly on site:

- supervision of your teams or modification of the Aircooled Heat Exchangers on a turn key basis: disassembly, assembly, adjustment and commissioning in compliance with shut down schedule.
- curative cleaning of the transfer surface if necessary.
- performance tests.



1. Cleaning
2. Bundles erection
3. Blade pitch angle adjustment
4. Integration on old system
5. Louvers
6. Inlet bell fitting



Components

■ Original Spare Parts

GEA-Btt manages the records of drawings and the part-lists of equipment manufactured. We use microfilmed records from 1959 to 1997 and electronic data base from 1998.

GEA-Btt proposes identical or interchangeable spare parts, designed and manufactured in compliance with the most recent standards and international codes.

GEA-Btt proposes a 10-working-day delivery time for most common parts.

GEA-Btt can also propose an expedited delivery concept (less than 72 hours) on request for parts on stock.

For important quantities, GEA-Btt will propose you a specific delivery time complying with your request.

Pressure parts:

Gaskets, header plugs, cover gaskets, cover bolting.

Rotating parts:

Fan shaft bearings, shafts, pulleys and belts, hubs and fan blades, positioners, vibrations switches...

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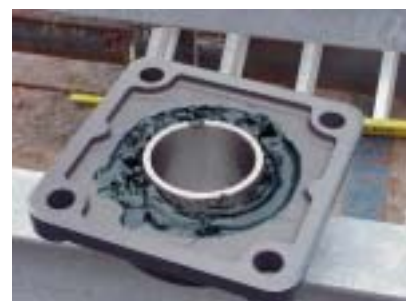
2



- 1. Moore fan
- 2. Louver actuator
- 3. Gear drive
- 4. Vibration switch
- 5. Louvers



4



Components

■ Finned Tubes

The heat transfer surface of Aircooled Heat Exchanger is extended using aluminium spiral fins. The thermal conductivity of this material is efficient. Moreover the purchasing and conversion costs are competitive.



Bimetallic extruded

- 300 °C/570 °F
- Excellent
- Excellent
- 125

A core tube, carefully degreased, is fitted into an aluminium sleeve. This tube-in-tube assembly is then fed into the finning machine equipped with three spindles, 120 degrees spaced and each fitted with a gang disc. These discs which are stepped in profile and diameter will first extrude and shape the fin, and then bond the fins on core tube.

GEA-Btt has developed a high performance bimetallic extruded with 11 fins /inch. Since 1992 a 2 inch diameter extruded finned tube has been brought in production. It combines a large flow area with a long life duration suitable for vacuum steam condensers.

G (embedded)

- 400 °C/750 °F
- Poor
- Acceptable
- 105

The fin consists of an aluminium strip, which is tension-wrapped and embedded into the core tube wall. This results from the combined action of a set of tools. Operating sequences are as follows:

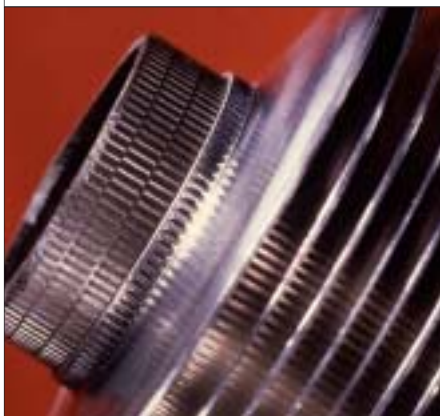
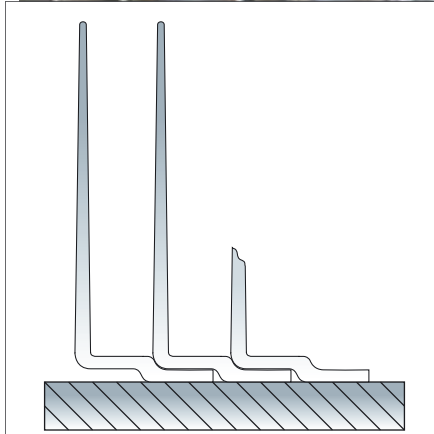
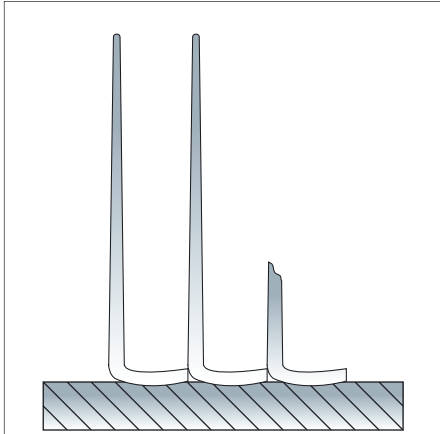
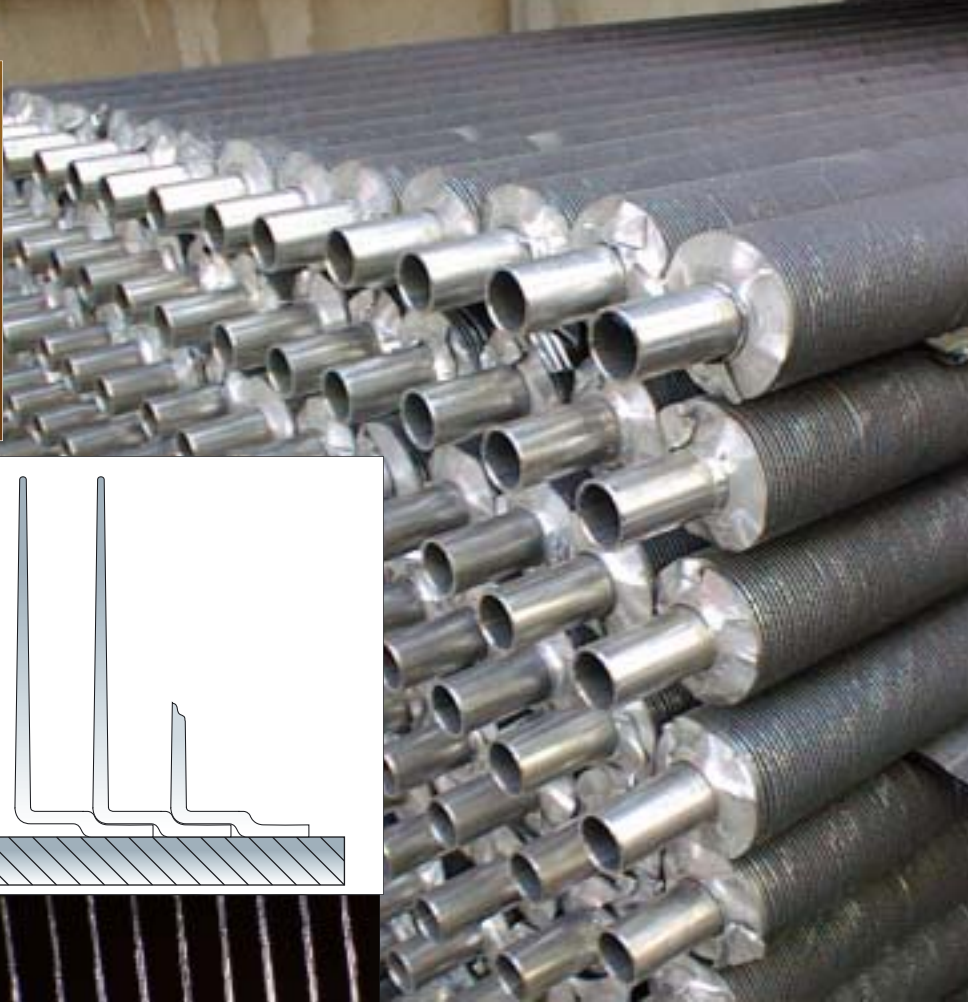
- the first disc (groover) spins a groove into the tube wall;
- the ring spacer leads the strip foot-edge into the groove;
- finally the second disc (backfiller) firmly embeds the strip foot-edge into the groove by "caulking" the groove lip.

L (wrap-on)

- 120 °C/250 °F
- Acceptable
- Poor
- 100

The aluminium strip foot section is first formed into an L-shape, then tension wrapped onto the primary tube. The wound fin base sections are close to each other so as to ensure a continuous cover on the primary tube surface. Finally, the fin strip will be fastened at both ends to prevent loosening or unravelling.





Knurled L

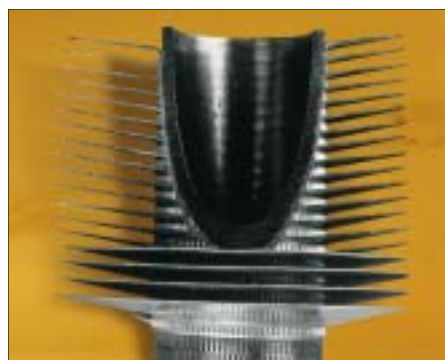
- 250 °C/480 °F
- Medium
- Acceptable
- 102

Double L

- 120 °C/250 °F
- Medium
- Poor
- 105

- Maximum working temperature
- Atmospheric corrosion resistance
- Mechanical resistance
- Price index

An aluminium strip is folded to form an L-shape and then wound around the base tube. The feet of the fins are joined together so as to ensure a continuous cover on the primary tube surface. The whole width of the foot of the fin is knurled simultaneously with the inner tube, thus ensuring a tight contact between the spiral fin and the primary tube.



The aluminium strip foot section is first formed into a double L-stepped shape. This results in a fin base twice as large as that of a single L-shape. The LL-fin strip is then wrapped onto the primary tube so as to obtain an overlapping on the 1st stepping of the LL-shaped fin. A continuous and double strip cover against corrosive environment then efficiently protects the primary tube.

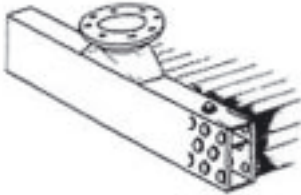


Components

■ Tube Bundles

The bundle, composed of finned tubes and headers, assembled in a support frame, is the main part of Aircooled Heat Exchanger.

To extend operational life of your old Aircooled Heat Exchanger, we propose to manufacture new bundles which comply with current regulations and standards, with the same or even increased heat transfer capacity.

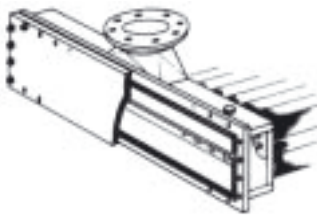
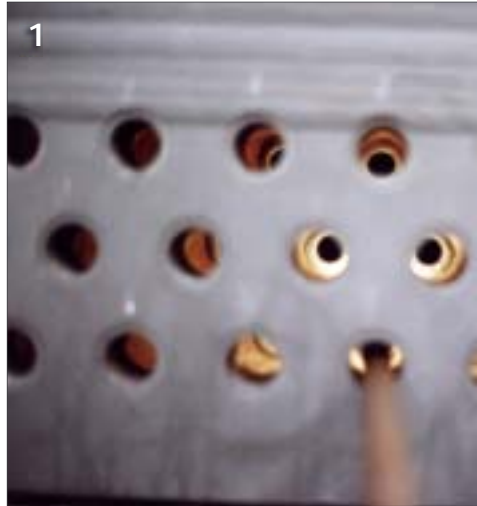


■ Plug Header

The plug header is suitable for working pressure up to 350 bar.

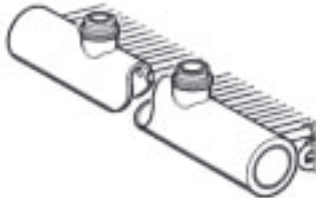
The plug hole opposite each tube allows expansion of the tube in the tube sheet, mechanical cleaning, and plugging in case of leakage.

In case of high partial hydrogen pressure, tube attachments can be sealed or strength welded through plug hole.



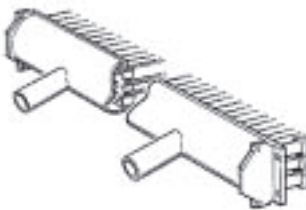
■ Cover Plate Header

The cover plate header is used for fluids with high fouling factors, up to 40 bar maxi when a frequent mechanical cleaning is necessary. They are used for very corrosive fluids to periodically check the corrosion allowance.



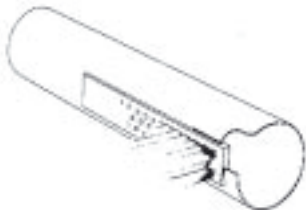
■ Pipe Header

The pipe header is used for working pressures over 200 bar when no inner access is necessary. Finned tubes hair pins are assembled with TIG butt weld. Welds can be thermally treated and X-rayed if needed.



■ Welded Bonnet Header

The welded bonnet header is used for ammonia condensers. Freon condensers and vacuum steam condensers. The advantage is the full welded construction, perfectly sealed.

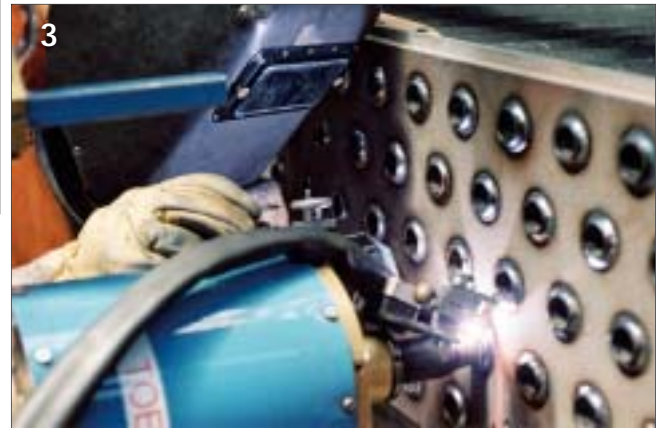


■ Manifold Header

A large circular manifold is used when the allowable pressure drop is very low. This large manifold ensures an equal distribution of fluid flow in the tubes. The tube sheets are directly welded to the manifold. This type is used for vacuum steam condensers and refrigeration units.



1. Strength welding
- 2, 3, 4 - TIG welding tube / tube sheet
5. Support boxes
6. Incolloy pipe
7. Plug header



7

