

HAMON

Wet Cooling Systems

COOLING TOWERS



Hamon in a few words

Hamon started its industrial activity in Europe (Belgium and France) a century ago and developed the cooling tower business. With growing mining and heavy industry sectors, demand growth prompted Hamon to move into the energy business.

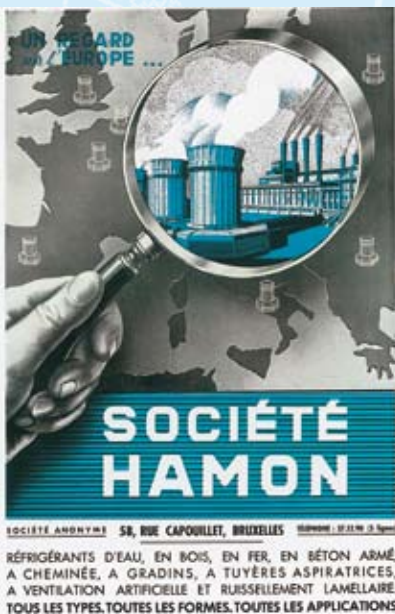
Hamon spread its wings geographically in the seventies and further consolidated the thermal business in the nineties. Hamon became a world leader in the product lines it chose to be in, respectively:

- wet cooling towers
- air-cooled heat exchangers
- air pollution control: ESP, bag filters, flue gas treatment
- chimneys



Concept of centers of excellence was implemented. Hamon Thermal Europe with its engineering department and R&D center supports a network of factories and sister companies, which locally assure contracting, procurement and field services in the UK – Germany – Spain – Italy – South Africa – United Emirates – India – Korea – China – Thailand – Indonesia – Australia – Brazil...

Numerous installations and equipment operating worldwide in a wide range of industrial plants are evidence of Hamon's capabilities and experience. Whatever the industry you name, Hamon has supplied cooling towers for it: power plant, refinery and downstream petrochemical plant, fertilizer, paper industry, steel mill, sugar mill, zinc smelter and other metallurgical installation, chemical plant, etc.



Our commitment to the industry

Hamon Thermal aims at offering the best economical solution for the whole lifetime of **field erected cooling towers**. Hamon cares for most of the industries and is particularly expert in:

- accurate design meeting expected performance
- economical solutions with the best cost/quality ratio
- strong field capabilities
- development of new solutions reducing further environmental impact
- repair and maintenance
- dismantling
- recycling used PVC components

Hamon has a **wide range of heat transfer media** suitable for:

- any industrial water
- sea water
- low pH solution

Depending on the application requirements, the equipment is designed to customer preferred combination for efficiency, long-life expectancy, power saving and respect of environmental local regulations.

In order to meet these specifications a **wide choice of solutions is available in layout, arrangement, structure, internals and mechanical equipment.**



Natural draft cooling towers

In the seventies and early eighties, many large power plants were built and equipped with tall natural draft cooling towers (NDCT) in Europe, US, South Africa, India, China, etc.

NDCT were erroneously associated with nuclear plants. Since the mid-eighties, very few were built in the Western countries because of lack of large power plant projects, visual impact constraints, and a general feeling of pollution associated with them.

The trend is now reversing as in many places, natural draft towers are now regarded as environmentally friendly thanks to the power saving that they generate.

Beyond the power saving, NDCT offers the following advantages:

- limited plot area
- no mechanical noise (no fan)
- limited maintenance

- high longevity (generally more than plant life expectancy)

The payback period of an NDCT is 8 to 16 years depending on several factors. The main one is the local construction cost, which may dramatically vary from one country to another. Hamon can either supply the turnkey tower or the thermal part with services like civil work design, construction steering, supervision, erection...

Hamon has designed and built more than 300 NDCT and has a wide experience even for high seismic and severe weather conditions.

Hamon is at your disposal to help you developing your project anywhere on the globe, preparing budget proposal, civil work included, and selecting the most appropriate solution for performance, heat transfer media, noise reduction, etc.



Natural draft cooling tower rehabilitation

Along the years the environmental concern and consequent rules, have strengthened and the water rejection conditions have been changing; the use of chemical additives has been restricted. Therefore, the water characteristics are such that scaling and fouling will occur more frequently. Another exchange surface than the original one should be selected for the new water conditions. Indeed, the thermal performance must be considered on a long-term basis. The media which seems to offer the best qualities can lose them very rapidly if operating conditions and water quality have not been taken into account. Hamon's ex-

perience will help you evaluate the most effective heat exchange surface.

Rehabilitation will restore the performance of the original design of a Hamon cooling tower. In other cooling towers, we will probably reach a performance improvement.

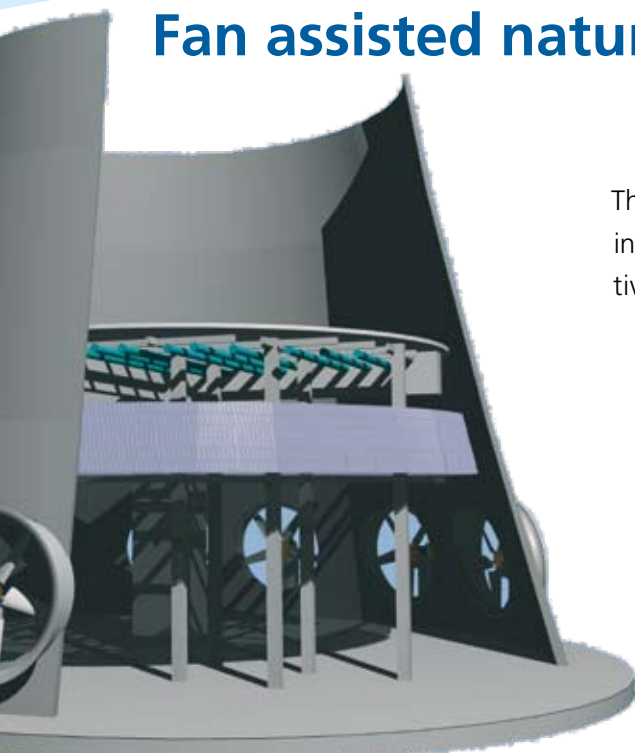
Another concern may also be the time available for such an operation resulting in the total shut-down of the tower. Our erection teams have proven their efficiency and commitment to safety: e.g. a NDCT of 106 m diameter and 126 m height. Scope: removal of existing film fill, installation of

10 000 m³ new fill, replacement of sprayers, removal, cleaning and re-installation of drift eliminators, repair of de-icing system grids and several small other repair works. Work performed in 3 shifts, 6 days/week in 22 days.

Hamon is also fully qualified to remove asbestos cement sheets and to replace them with the best suited material.

Hamon also offers solutions for the recycling of the PVC in order to re-use it as raw material in other production processes.

Fan assisted natural draft cooling towers



The fan assisted natural draft cooling tower (FANDCT) is an attractive option when:

- the available plot area does not allow mechanical draft narrow bar construction
- height is limited for visual reason
- due to the climate conditions fans to boost the air flow are required. The investment in a tall shell becomes therefore economically unjustified.

Mechanical draft cooling towers

Thanks to its flexibility and cost effectiveness, the mechanical draft cooling tower (IDCT) ideally answers most cooling duties and plant requirements. With approximately 5000 references in this type of tower, Hamon has come across most of the application requirements and has developed the technology to meet them. Each customer takes full advantage of this technology data base and enjoys a product that is fine tuned and fills his requirements and budget.

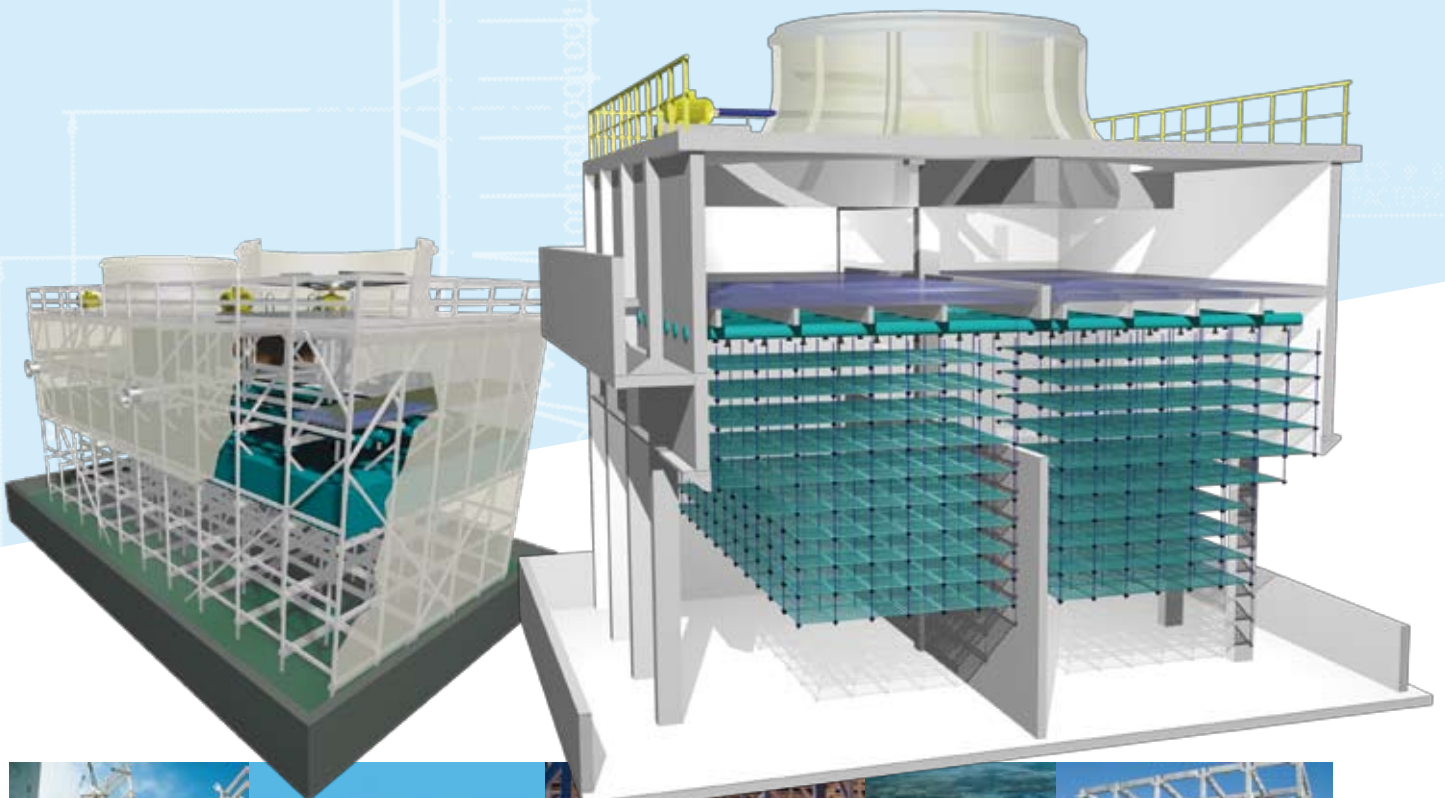
We build any size of IDCT with all type of structures (steel, wood, FRP, prefab concrete, cast con-

crete) and many heat exchange surfaces (from splash grids to high performance film). All system elements, beyond customer specific requirements guide our design:

- water quality
- air environment (chemicals, dust, ...)
- noise and plume limitation
- available plot area
- local labor costs

All our equipment is supplied with an O&M manual that clearly specifies operation, maintenance, health and safety requirements and recommendations.

For all cooling towers, we clearly advise the impact on the environment such as performance, drift loss, noise level, etc. In order to help in the prevention of legionella, our cooling tower designs follow the best practices and allow cleaning and access to the internal parts of the tower.



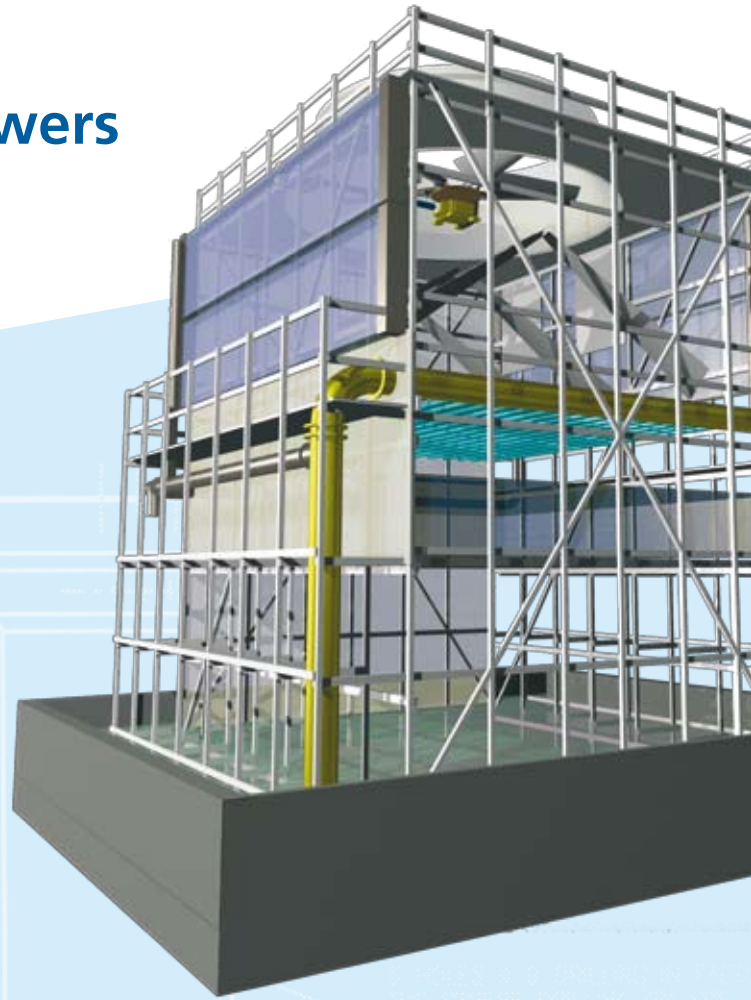
Plume abated cooling towers

A plume abated cooling tower (PABCT) is the best available solution where local constraints are such that the presence of plume is not accepted in normal conditions (along motorways, airports, close to residential areas...).

This tower is an IDCT offering the same flexibility, adaptability and all features listed in the previous page. Compared to other technical solutions, it combines the following advantages:

- no plume visibility
- outstanding performance of an evaporative cooling tower
- cost attractiveness

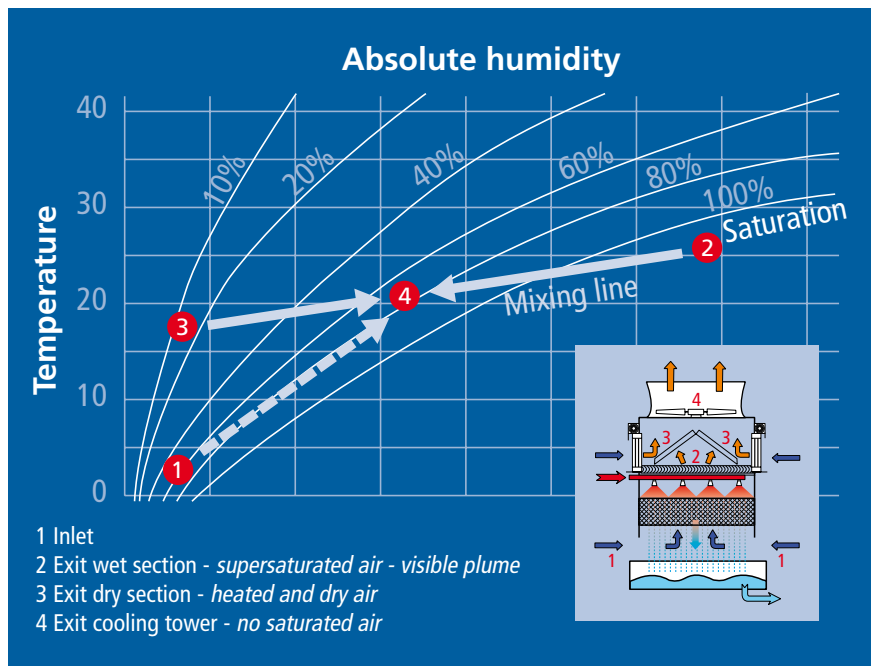
In this area, also called hybrid or wet/dry, Hamon's technology is unrivaled.



Principle of plume abatement

Outlet air of the wet section of the cooling tower **2** is mixed with the air heated **3** by the finned tube bundles installed in the walls above the wet section. Outlet air characteristics **4** will then be positioned on the line linking points **2** and **3**.

If the line linking points **4** and **1** does not cross the 100% humidity curve, no plume will be visible.



Special applications



Sea water

When close to the sea shore, many plants are cooled by a once through sea water system. The investment for such a system is huge and the heat rejection back to the sea can either generate hot water recirculation and/or impact the sea ecosystem beyond acceptable levels. Replacing the once through system by a cooling tower circuit tremendously reduces both initial investment costs and sea environmental impact of the power plant. The design of the cooling tower will take, among others, the salt concentration into account. Special care is given to construction materials (structure in concrete, protection for mechanical parts, etc.) and fill media type. Hamon sea water cooling towers are cooling millions of cubic meters in many places in the world. All design arrangements are available with sea water: NDCT, FANDCT, IDCT, PACT.

Noise attenuation

In order to limit the noise level, actions can be taken at three level:

- at the source with low noise fans and mechanical devices
- at the emission area with louvers, baffles, motor enclosures, special casing type
- between the noise source and the reception point with screens, walls or embankments

Flue gas dispersion through natural draft cooling towers

In thermal power plants, where flue gas are treated by wet desulphurization, flue gas temperature is such that large chimneys and ventilation extracting systems are required. A cost effective alternative is to reject these gases in a NDCT, where they are then mixed with exhaust air and rejected at high level. The natural draft cooling tower assures a better dispersion in the atmosphere than a conventional chimney. Hamon has developed a design in which the flue gas pipe is supported by the shell and penetrates it at flue gas washer exit level.

Cooling towers for zinc electrolysis

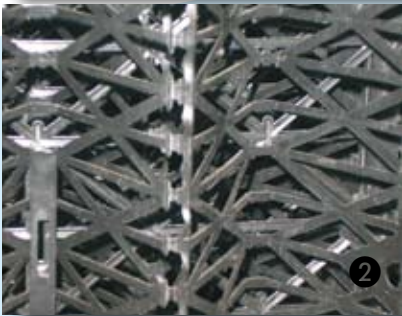
Hamon has developed a cooling tower specially designed to handle zinc electrolyte solution or highly corrosive liquid (PH =1). This process has been proving its efficiency for many years. Due to the very aggressive environment in which these towers are operating, easy maintenance is essential. We have therefore improved the internal accessibility – no scaffolding is necessary – and we use removable sprayers. The drift loss has also been minimized to 0.001% and lower.



Heat transfer media

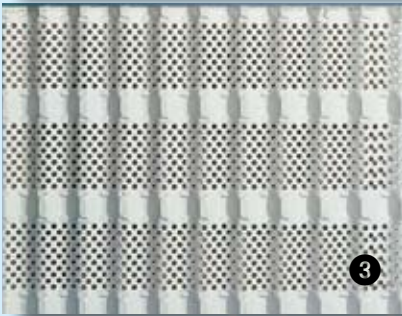


The selection of the heat transfer media is essential to guarantee the optimal efficiency of your cooling tower. As a result of Hamon's continuous thermal research, we can offer you a full range of fills covering all cooling water types.



The **COOLDROP®**, the real splash fill, is the all purpose solution suitable for most water qualities, including sea water and heavily contaminated water. This heat transfer media consists of trays (the Hamon diamond grids) hung from beams located above the water distribution. The diamond grids, their supports and spacers are made of polypropylene; the wires according to the water aggressiveness are in SS316 or in a more exotic alloy.

Maximum debris size (diameter): 50 mm



The **DROPPACK®** fill combines splash and film heat exchange process with the advantages of low fouling capability of the splash fill and the good thermal efficiency of the film fill. It is well adapted to any induced or natural draft cooling tower using poor industrial water quality. Water with high concentrations of suspended fibres is not recommended.

Maximum debris size (diameter): 30 mm



The **COOLFREE®** is the most advanced film fill combining low-fouling and low-scaling properties whilst retaining good thermal performance. The main application is for cooling towers using very poor water quality, in some cases even without water treatment. It is also very good for film fill cross-flow cooling towers.

Maximum debris size (diameter): 30 mm



The **CLEANFLOW®** film fill is qualified worldwide as the best film fill combining low fouling properties with good thermal performance. It is well adapted to any induced draft or natural draft cooling tower using poor quality industrial water. It is also suitable for other severe applications such as laminated decanting and gas cleaning.

Maximum debris size (diameter): 32 mm

The **CLEANFLOW PLUS®** is the improved technology of the cleanflow fill by increasing its thermal performance whilst retaining its fouling resistance. It is well adapted to any induced or natural draft cooling tower using poor industrial water quality, in particular sea water.

Maximum debris size (diameter): 22 mm



The **COOLFILM®** is probably the most thermally efficient fill worldwide. It is well adapted to any induced draft or natural draft cooling tower using normal industrial water quality.

Maximum debris size (diameter): 17 mm

Service



A preventive maintenance program is essential to ensure smooth operation avoiding unexpected costly shutdowns and problems associated with legionella. Furthermore, for several reasons (ageing tower, increased power need, technical improvements, etc.) other works are required during the life time of the cooling tower.

Customers recognize Hamon for its finely tuned service assuring:

- short shutdowns
- reliable diagnosis
- focus on the action needed

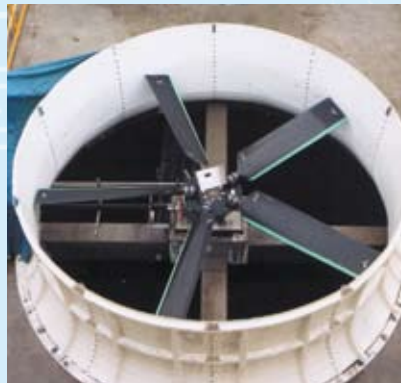
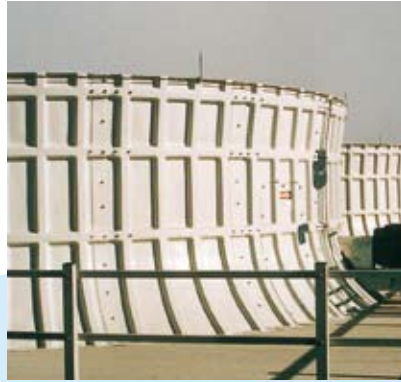
Thanks to the outstanding cooling tower competence of its site teams, Hamon can consider any type of repairs and upgrades. Here are some non exhaustive examples of regularly performed jobs.

- fill:
 - replacement of asbestos-cement sheets by polypropylene grids
 - in a natural draft tower installation of a new wooden framework and new film fill

- drift eliminators:
 - replacement of eliminators to improve efficiency
 - cleaning of existing: (disassembling – cleaning wave by wave – reassembling with new spacers and rods)
- water distribution:
 - replacement of steel or asbestos cement pipes with FRP/PVC materials
 - partial renovation of distribution pipes
 - replacement of wooden open trough with FRP material.
- installation of anti-slip roof covering, restoration of the casing material
- fan-motor group
 - replacement of cardan shafts by composite transmission shafts
 - replacement of fan and gearbox by low noise devices
 - installation of a walkway to gearbox
 - installation of backstops to the fan
 - repair of fan blades...
- replacement of wooden or steel fan stacks with FRP material

- structure
 - wood: partial or total removal and replacement of the upper part of the tower, local replacement or reinforcement of the frame...
 - concrete: partial renovation or consolidation
- renovation of large natural draft cooling towers
- conversion of a cross flow to a counter flow cooling tower
- hybridisation of an induced draft cooling tower
- split of double cells in single ones

Our test team consisting of high level, experienced thermal Engineers can perform any test: performance, fan flow, hydraulic, noise, vibrations.



Spare parts

Hamon spare parts centre located in France is servicing our traditional commercial channels, which remain at your disposal for spare parts. Your local office will liaise with the centre if required. Hamon manufactures its own products (fan stacks, film fills, drifts eliminators and water distribution components).

Hamon can supply all your spare parts requirements such as:

Fan stacks

manufactured in Hamon factory

Fan-motor group

- fan blades, hub, clamping blocks, hardware
- gearbox, all gearbox spares
- transmission shaft – transmission shaft spares – replacement of steel shafts by composite ones
- motor
- vibraswitch

Drift eliminators

manufactured in Hamon factory

- wave 45 and 25 mm pitch
- cellular

Distribution

Hamon design

- pipes, sprayers, nozzles, head supports

Heat exchange media

manufactured in Hamon factory
see page 9

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