

/ Mechanical Draught Cooling Towers /



/ Reuse water instead of wasting it /

Sensible water management saves resources, reduces costs

Providing the required quantity of cooling water at any time and anywhere it is essential to operate cooling systems economically and ecologically.

SPX Cooling Technologies, former Balcke-Dürr – a company with more than 100 years of experience in cost-saving cooling towers

From our extensive experience with a whole range of cooling systems we realize the importance of attaching appropriate significance to research and development at our company.

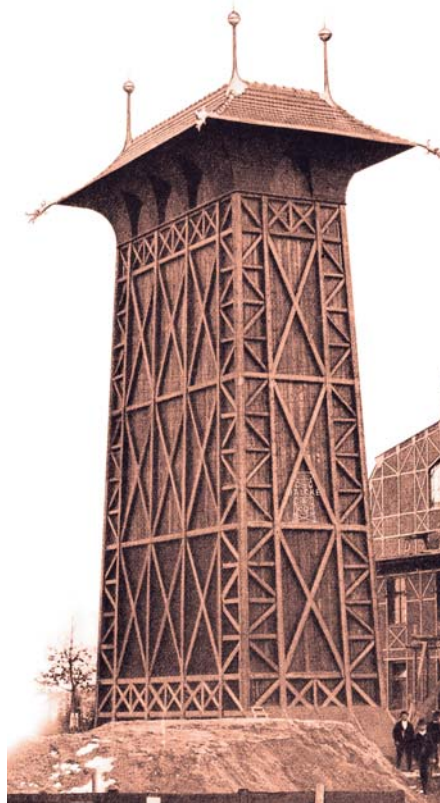
Consequently in addition to wet cooling towers we have created a wide range of products over the years including hybrid and dry cooling towers. Our thorough research work has produced outstanding results in these fields.

Mechanical draught cooling tower – the most frequent in the cooling tower sector

The mechanical draught cooling tower, also referred to as fan-type wet cooling tower, is the most widely used type of cooling tower. The required cooling air being conveyed through the tower by one or more fans. Different types of mechanical draught cooling towers have been developed using the same functional principle.



Test cooling tower at SPX Cooling Technologies' research and development centre



Cooling tower around 1897



/ Circular Cooling Towers /

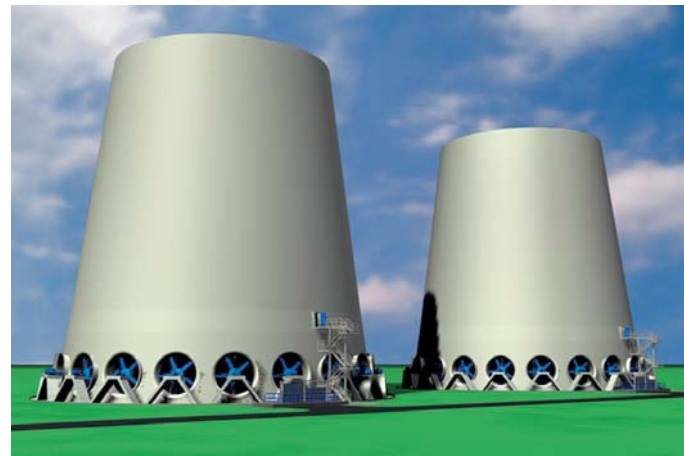
Circular cooling towers – designed for heavier duties

Circular cooling towers are ideal to process larger cooling water flows. In this type of construction the fans are arranged in a circle around the cooling tower and force the air through it; the cooling air can also be drawn through the tower by one or several large fans.

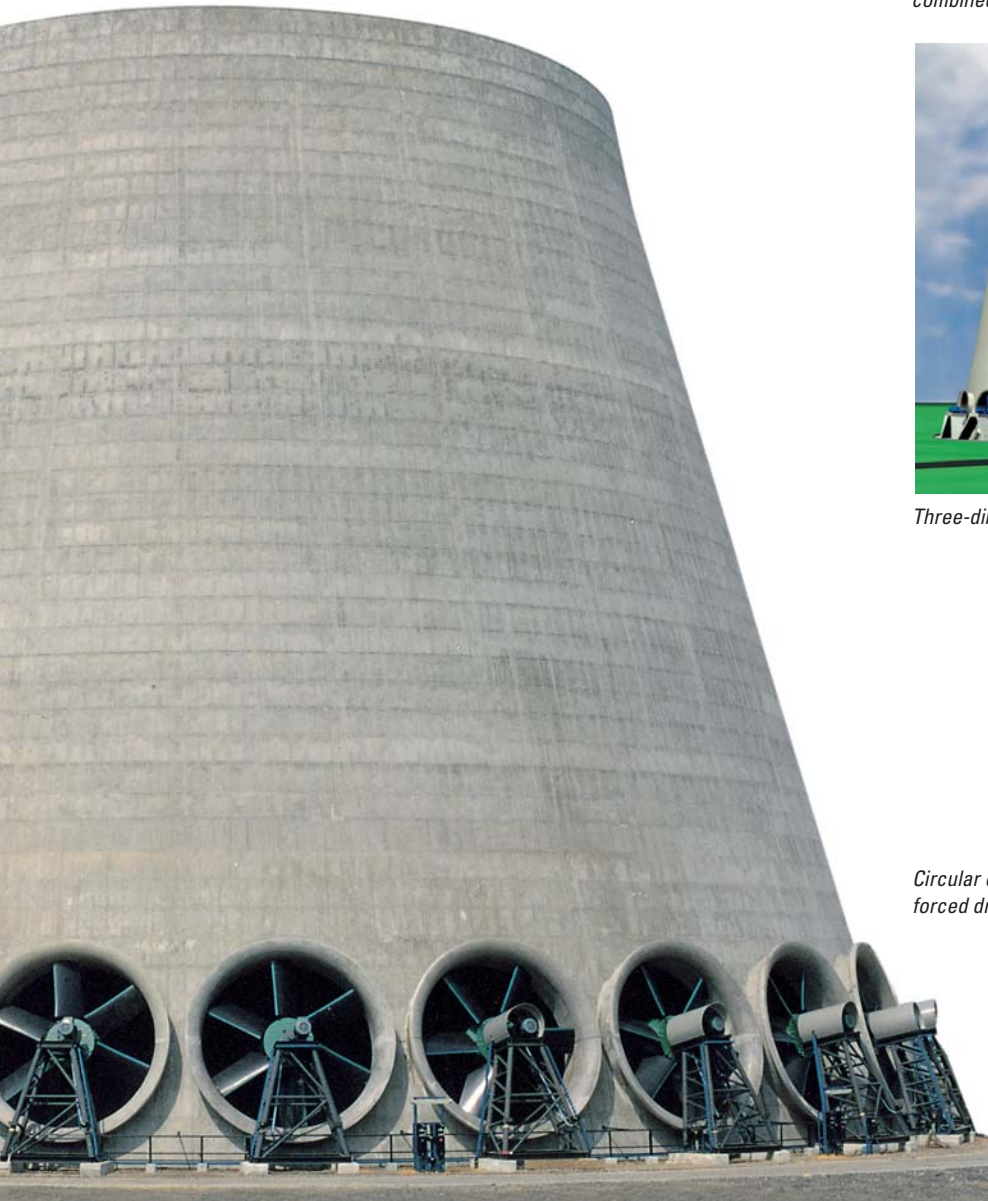
Normally the natural buoyancy of the air contributes significantly to the cooling air flow in circular cooling towers. Consequently, the electrical power requirement is relatively low.



Circular cooling towers with forced draught fans at a combined heat and power station



Three-dimensional model of circular cooling towers



*Circular cooling tower with
forced draught fans*

/ Cell Cooling Towers /

Cell cooling towers – operating in all branches of industry

Cell cooling towers consist of one or several rectangular cells. Their fans convey the cooling air through the towers in induced or forced draught mode. Being the most frequent type built, cell cooling towers are widely used in all branches of industry (e.g. in power stations, the chemical industry, refineries, steel works, etc.). Typically three different types of structural materials are used: concrete, timber and FRP.

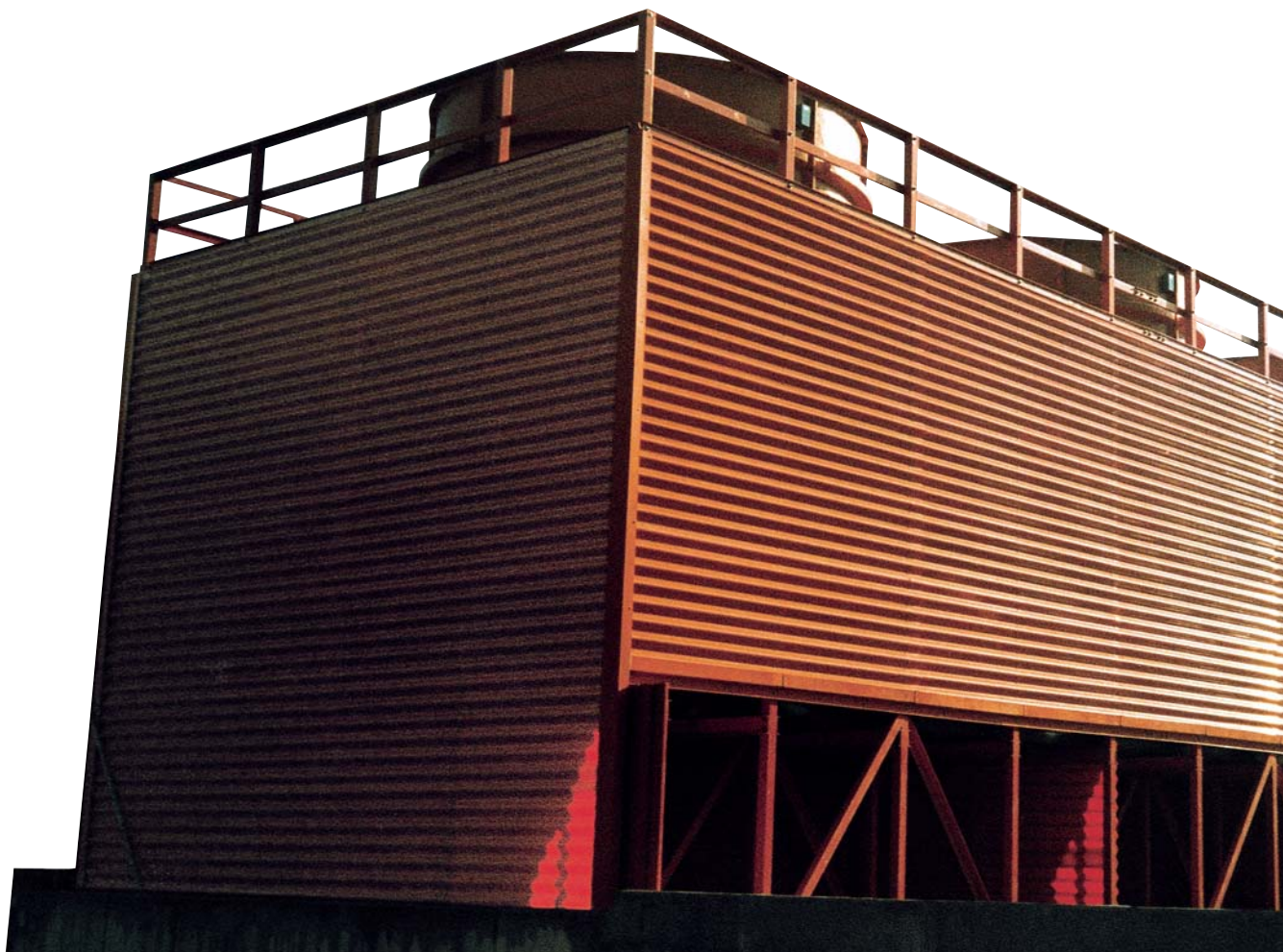
The materials – optimally matched to the re- quirements

A wide variety of building materials is used for the cooling tower casing to meet the different requirements with respect to service life, capital expenditure, locations, etc.

Concrete cooling towers have the longest service life and can be built almost anywhere in the world in cooperation with local companies. Cell cooling towers are built of in-situ concrete or pre-cast concrete with solid concrete walls or plate cladding.



Cell cooling tower (timber construction)





Cell cooling tower (concrete construction)



Three-dimensional model of a concrete cooling tower

Timber cooling towers are special in that they require minimal capital expenditure. They are often used in plants with short depreciation periods. The time required to build them is also less than for concrete cooling towers.

FRP cooling towers are the current trend in both small and large cooling tower construction. The low-maintenance, corrosion-resistant and anti-fouling structure combines small investment and operation costs with reliable service. The FRP cooling towers can also be designed for sea water application and as fire retardant construction.

Sea water cooling towers

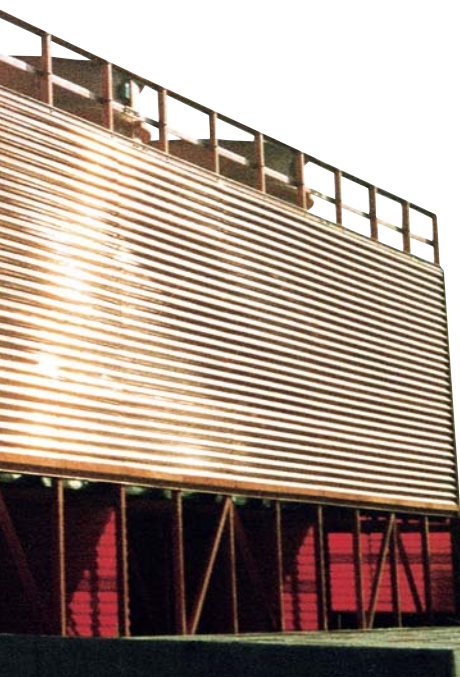
Sea water cooling towers require specific and detailed knowledge in

design and execution. Aspects like salt immission, material choice and cathodic protection need to be considered. SPX Cooling Technologies with its extensive experience in sea water operation of cell and circular cooling towers is the optimal partner for this kind of application.

Constructions tailored to special applications

SPX Cooling Technologies is also the ideal partner when custom-built cooling towers are required, such as cooling towers for acids or other problematic types of cooling water in steel works, cellulose factories, etc. Cooling towers which have to conform to particular erection requirements also need to be structurally flexible.

Cell cooling tower made of pultruded fiber-glass profiles



Cell cooling tower (timber construction)

/ The cooling fill – heart of the cooling tower /

The cooling fill is the most important part of a cooling tower, its “heart” so to speak. As a contact surface it must ensure optimum heat exchange between water and air. It is individually selected for each particular application.

SPX Cooling Technologies cooling towers are mostly designed as counterflow cooling towers. In this construction the water to be cooled trickles from the top through the cooling fill whilst the air is drawn or forced through the fill from the bottom.

Cooling is achieved both through evaporation of a small quantity of the water, latent heat being taken from the cooling water flow, and also through transfer of heat from the water to the cooling air by convection.

Cooling fills – as varied as the local water qualities

- **Film fill made of plastic foils glued or welded together**

This fill achieves the greatest cooling effect and consequently the price/performance ratio of the cooling towers is extremely favourable. The cooling water quality must, however, comply with stringent requirements. SPX Cooling Technologies has optimized its own types of foil for different water qualities which have proven themselves in practice (figures 1 and 2).

- **Trickle grids or trickle blocks made of synthetic material**

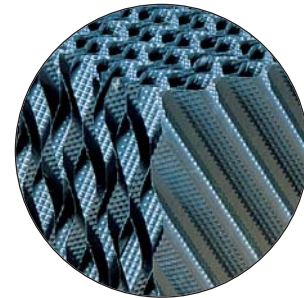
A SPX Cooling Technologies fill which is not only robust and stable but also easy to clean. Cooling towers equipped with this fill have been operating successfully for many years. Many operators prefer this fill because it is robust and less susceptible to fouling than foil packs, although its thermal performance is slightly lower than that of the SPX Cooling Technologies foil (figure 3).

- **Splash grids made of synthetic material**

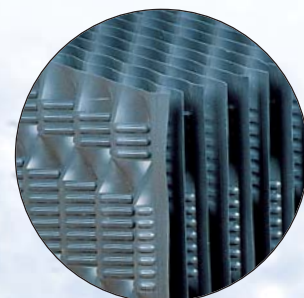
A highly resistant cooling fill for poor water qualities.

- **Splash slats of timber or steel**

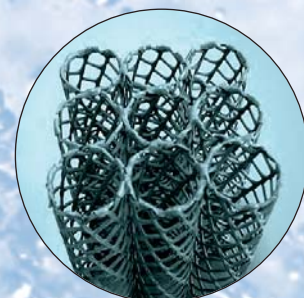
For heavily contaminated cooling water from production processes, e.g. in steel works or cellulose factories. Cooling towers without a cooling fill can also be used for this application.



Film fill (diagonal) ①

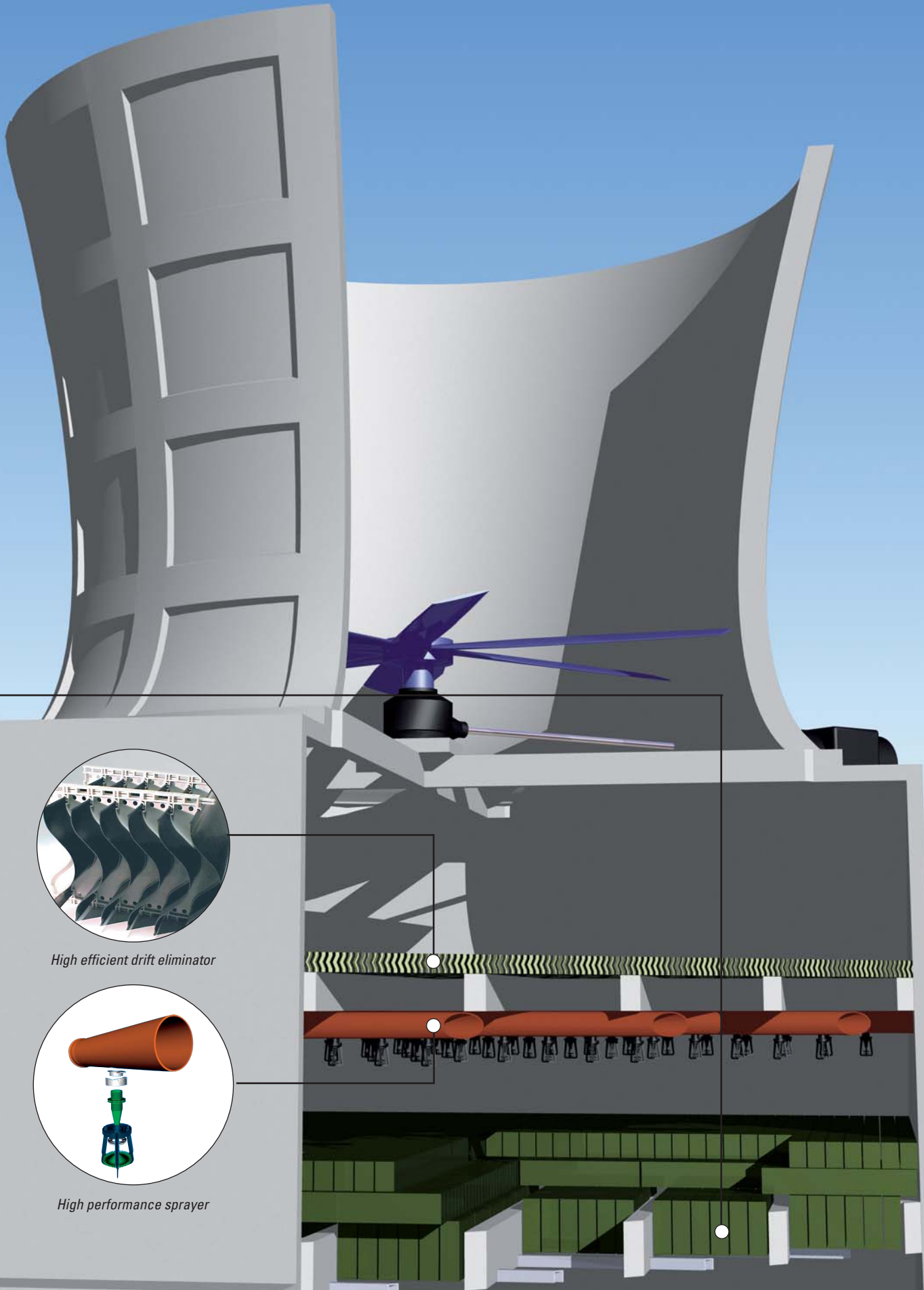


Film fill (vertical) ②



Trickle block ③





/ Good water distribution – a must for every cooling tower /



SPX Cooling Technologies' sprayer

High performance despite low nozzle inlet pressure

Our sprayers are arranged on the pipes and channels. They distribute the water over the cooling fill as uniformly as possible, this being essential for the fill to function optimally.

As the distribution system sprays the water downwards, only a low nozzle inlet pressure is required. Dirt particles in the cooling water are constantly flushed out of the pipes. The entire system drains automatically and therefore freezing cannot occur in winter. The sprayers are not susceptible to contamination.

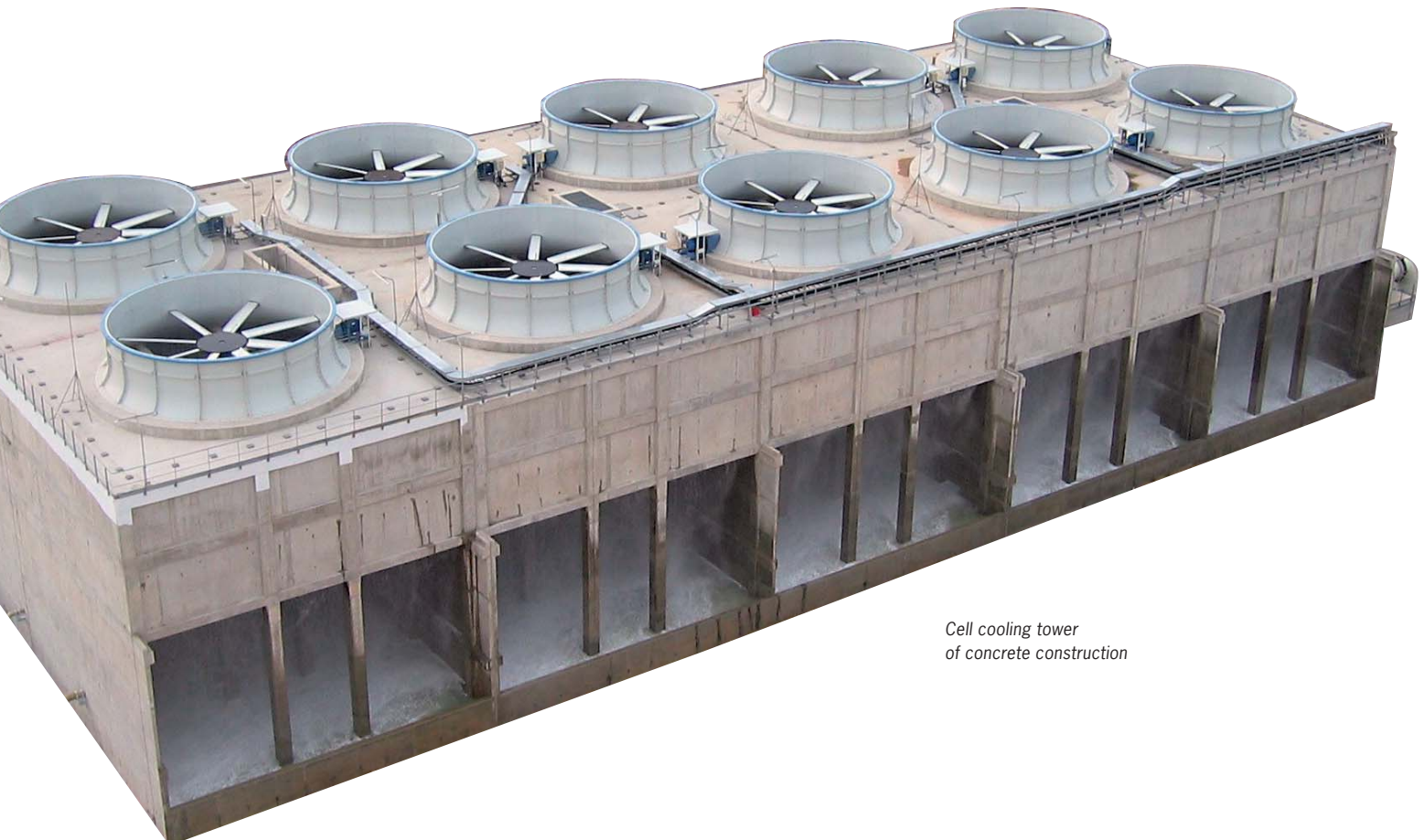


Drift eliminator

Drift eliminators prevent water losses

Drift eliminators made of synthetic material are installed above the water distribution system to prevent water droplets being entrained. They ensure compliance with the high elimination rates required in line with current environmental protection regulations even for salt water applications.

Optimum water distribution plays an important role in the functioning of a cooling tower. The water distribution system consists of a main distribution channel or pipe and the distribution pipes or channels connected to it. Channels have the advantage over pipes when heavily contaminated water is used: they can be cleaned much more easily.



Cell cooling tower of concrete construction

/ Correct dimensioning of fans and machine sets – just a question of experience /

The fans perform an important function in the operation of a cooling tower: they draw or force the cooling air through the tower. It requires a lot of experience in the design and construction of both the fans and the mechanical equipment to ensure reliable continuous functioning of a cooling tower. Our experts have gained this wealth of experience worldwide when planning and constructing numerous cooling towers of all types, sizes and for all applications.

Whether induced draught or forced draught function – “low-noise running” is also decisive

We take the noise emission aspect into account right from the very beginning. This question arises when considering whether to use a cooling tower with induced draught fans or one with forced draught fans.

Being arranged in the lower section of the cooling tower, a forced draught fan is located more favourably from the point of view of sound emission and it can often be installed facing away from the sound measuring point.



Mechanical part of an induced cell cooling tower



Low-noise fans developed at SPX Cooling Technologies

Innovative fans render sound attenuators unnecessary

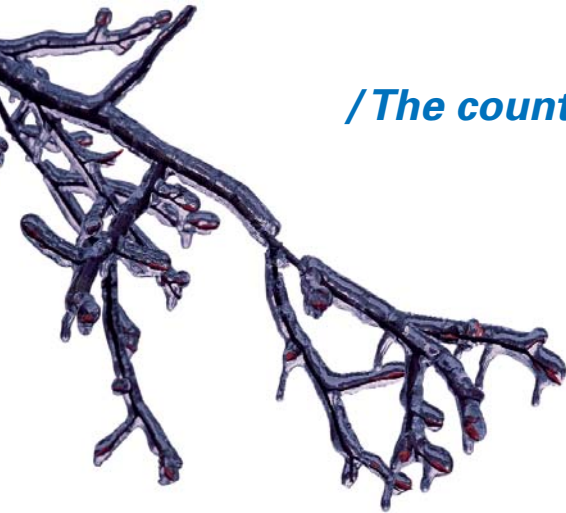
Ultra low-noise, slow-speed fans with blades of fiberglass reinforced plastic are of great significance today. In many cases such fans reduce the sound emissions sufficiently to do without sound attenuators or at least reduce the scope and thus the expense of any sound attenuating measures required.

Designed for difficult conditions

The gears used are developed specially for the conditions prevailing in wet cooling towers (high air humidity, drift, heavy loading, etc.). If necessary, the gears – like the driving motors – are constructed for low noise emission or enclosed. V-belt drives are also used for forced draught fans with lower outputs.

Frequency-controlled drives reduce power consumption

Our mechanical units can be equipped with pole-changing or frequency-controlled motors. The air flow rate decreases in line with the reduction in speed. This is also an advantage for winter operation. Depending on the design conditions, pole-changing or frequency-controlled drives also considerably reduce the electric power consumption of the cooling tower over the entire operation period because the power requirement decreases sharply when the speed is cut. In order to ensure this high adaptability our cooling towers are provided with optimized mechanical equipment to take account of the specific conditions.



/The counterflow construction – just ideal in winter /

Our mechanical draught cooling towers are designed for reliable winter operation when the location requires it.

The counterflow construction is an important design feature to render our cooling towers suitable for winter operation, because the cooling air first comes into contact with the water trickling down and then reaches the cooling fill.

In multicell systems it is possible to increase the temperature level by disconnecting cells stage by stage and discharging the uncooled water directly into the basin.

The possibility to lower the cooling air flow rate by reducing the fan speed is also important.

Reliable even at minus 30° C

If the modes of operation mentioned are combined in an appropriate way, the cooling towers can be operated reliably at air temperatures down to – 30°C. SPX Cooling Technologies' mechanical draught cooling towers are used in many regions with hard winters not least because it is a known fact that they operate reliably in winter. They can be found in Russia as well as in Scandinavia or in the north of the USA.

/To avoid noise pollution /

Standard mechanical draught cooling towers produce a sound emission level which, in locations near residential areas, frequently exceeds the limit values specified in the relevant noise control regulations. There are various types of sound attenuation to prevent this:

- As mentioned above, the mechanical equipment in our cooling towers can be designed for very low sound emission levels by using (ultra) low noise fans.
- If the required degree of attenuation is relatively low, **sound attenuation walls or earthwalls** are erected around the cooling tower.
- **Droplet impact absorbers** arranged above the cold water basin also attenuate the impingement noise from the falling water.



Cell cooling tower with sound attenuation wall

- If these measures are not sufficient, **sound attenuators** are installed at the air inlets and above the air outlets, making it possible to reduce the noise level considerably (refer to bottom picture on page 3).

SPX Cooling Technologies has extensive expertise in sound-attenuated mechanical draught cooling towers. Let us demonstrate to you how effective sound attenuation can be achieved in an optimum and economic way.

/ Team-work to the benefit of our customers /

Control system – a guarantee for optimum operation

A very important factor to ensure the best possible functioning of a cooling tower is a mode of operation which is continuously adapted to the prevailing conditions.

Fully automatic control of the cooling tower is the best way

- to minimize the power consumption of the fans
- to optimize the performance with varying loads
- to ensure reliable winter operation
- to reduce the personnel costs

A SPX Cooling Technologies team of specialists experienced in both cooling tower operation and control systems supports and supervises the planning and construction from measuring equipment right up to the complete control system for the cooling tower and the cooling water treatment plant.



We also take care of the civil work

SPX Cooling Technologies is not only competent to supply the thermal and hydraulic design of cooling towers, we also apply our extensive experience and the required expertise to the civil engineering for the different types of construction. We carry out the complete civil engineering at any site in cooperation with local affiliated companies, licensees and other partners.

Together we are strong

Specialists for thermodynamics, hydraulics, process engineering, instrumentation and control, statics and civil engineering work together in our multidisciplinary engineering team.

Our research and development centre has state-of-the-art equipment and highly qualified personnel at its disposal to meet your requirements.

What is more we constantly exchange information with institutes of technology and universities. Your assignments are therefore in very good hands at SPX Cooling Technologies.

A competent partner.
Even for unusual problems.



Circular cooling tower under construction