



YOLYAPI®



**Expert engineering,
International reach,
World-class quality:
Yolyapi Cooling Towers**



Yolyapi Cooling Towers Co.

What is a wet cooling tower?



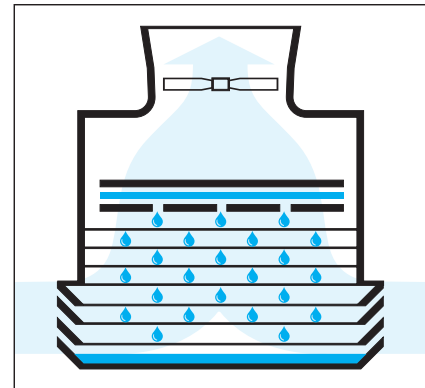
A wet cooling tower is a heat rejection device that extracts heat from the moving water stream to the atmosphere thereby reducing the water temperature significantly. The type of heat rejection in a cooling tower is termed "evaporative" in that it allows a small portion of the water being cooled to evaporate into a moving air stream to provide significant cooling to the rest of that water stream. If we think about something hot being cooled down by pouring water onto it, a wet surface cools down much faster than a dry one. Similarly, evaporative heat rejection devices such as cooling towers are much more effective than

their dry counterparts. Common applications for cooling towers are providing cooled water for industrial processes, air-conditioning and electric power generation.

The mechanics:

There are two main types of cooling towers: cross-flow and counter-flow. In a cross-flow cooling tower, air moves horizontally and upwards through the fill as the water moves downward. In a counter-flow cooling tower, which is a preferred technology, air travels only upward through the fill, opposite to the downward motion of the water.

A counter-flow cooling tower is an enclosed structure with internal means to distribute the warm water fed to it over a labyrinth-like packing or "fill". The fill provides a vastly expanded air-water interface for heating of the air and evaporation to take place. The water is cooled as it descends through the fill by gravity while in direct contact with air that passes up through the tower. Mechanical-draft cooling towers rely on power-driven fans to draw or force the air through the tower. The cooled water is then collected in a cold water basin below the fill from where it is pumped back through the process to absorb more heat. The heated and moisture-laden air leaving the fill is discharged to the atmosphere.



Wet bulb temperature

Wet bulb temperature (WBT) is the dynamic equilibrium temperature reached by a water surface when exposed to air in a manner such that the sensible heat transferred from the gas to the liquid is equal to the latent heat carried away by evaporation of water vapor into the gas. The WBT represents the minimum temperature that the water would theoretically reach with infinite time of contact between water and air in a cooling tower.

Project wet bulb temperature

Project WBT is the assumed WBT according to the local climatic conditions at the location where a cooling tower will be built. The project WBT is a major determinant of cooling tower size and cost.

Approach to wet bulb temperature

The approach to WBT is the temperature difference between cold water temperature and the chosen project WBT. In theory, the minimum approach to WBT is 0°C although in practice it is not less than 3°C.

About Yolyapı



Yolyapı specializes in engineering and contracting services for all types of industrial applications of wet cooling towers. Since 1982, we focus solely on cooling towers. We closely follow global technological progress in this area. Besides, we conduct an in-house R&D effort in order to adapt technology to the needs of our customers. With our state-of-the-art technology and our team of experts, we guarantee our customers the most efficient and durable solutions for their cooling needs.

Yolyapı develops a unique project for each customer depending on their different needs and operating conditions. First, we provide our customers an engineering service drafting a cooling tower design proposal with the optimal operating

and maintenance requirements. After delivering the cooling tower that best meets the cooling needs of the facility, we guarantee customer satisfaction by periodical maintenance, repair and spare parts services.

The foremost principle of our company is to utilize our expertise on cooling towers to the best of our customers' advantage and provide them with the most efficient cooling tower that is specially designed for their operating conditions.

The advantages of Yolyapı towers

Yolyapı wet cooling towers are superior to alternative products in all aspects. Their energy consumption and maintenance expenses are low. Their useful economic life is long (15-20 years) and this makes them a highly cost-effective investment. Since their cooling performance meets or surpasses demand, they increase the productivity of the plant and save money from their installation onwards. Besides, their spare parts are relatively inexpensive and readily available.

When all these factors are considered Yolyapı wet cooling towers excel among their competitors in terms of product quality and reliability. In fact, this explains why customers like Cargill, Toyota, Ford, and Bosch return to us for their second, third or even more repeat orders for Yolyapı cooling towers.

Wet cooling tower materials and parts

Nozzles:

Nozzles are used for spraying the circulating water over the fill.

Types of nozzles:

- Upspray/Downspray nozzle
- Downspray nozzle
- Target nozzle
- Open channel nozzle



Nozzles



Target nozzle

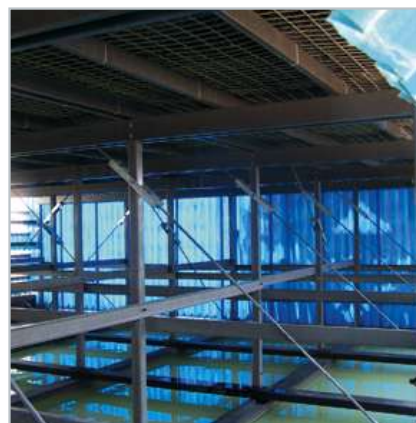
Upspray/Down spray nozzle

Downspray nozzle

Open channel nozzle



Impregnated wood



GRP Profile

Main structure:

The main structure can be manufactured of impregnated wood, pultruded GRP profiles or concrete. The fastening elements such as screws, nuts and bolts are made of hot dip galvanized or SS304 stainless steel.

Drift eliminators:

Drift eliminators are placed inside the tower between the upper fan group and the water distribution system. They decrease the loss of water drops drifting out from the fan stack.



Water distribution pipes



C-Type Drift eliminator

water temperature, the water distribution system is built from GRP, stainless-steel pipe or polypropylene material. In facilities with dirty water, an open channel water distribution system is preferred.

Types of water distribution systems:

- PVC Pipe
- GRP Pipe
- GRP Open Channel
- Impregnated Wood Open Channel



Service window

Service window:

The service hatch (manhole) is made of non-corroding material and is placed on the side wall of the tower. It allows maintenance personnel to check the inner parts of the tower.

Water distribution system:

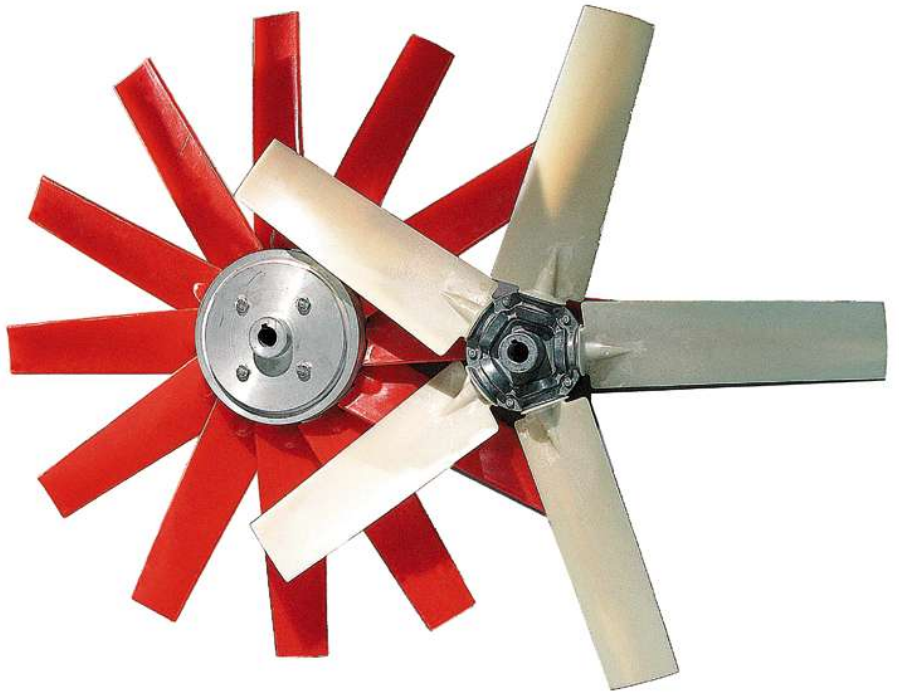
Water distribution system is usually made of PVC and placed between the drift eliminators and the fill inside the tower. For systems with high

Fan system:

The fan group is placed inside the fan stack at the top of the tower. It pulls the air from the louvers at the bottom of the tower towards the fan stack and throws away the exhaust air into the open atmosphere.

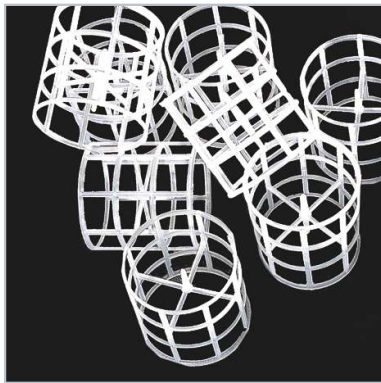
Parts of Fan Group:

- Fan blades and hub
- Fan motor and gear reducer
- Shaft
- Vibration switch



Fill:

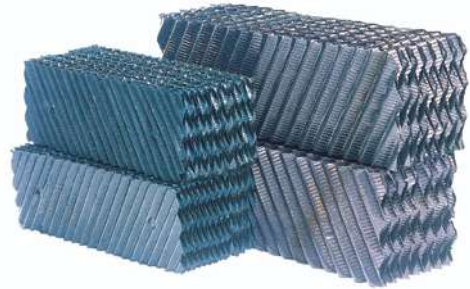
The fill is placed above the louvers and beneath the water distribution system. It breaks the water into tiny droplets for effective heat transfer. Depending on the impurity of system water, different types of fill can be used as given in the below table:



Ring



Splash Grid



Film Fill

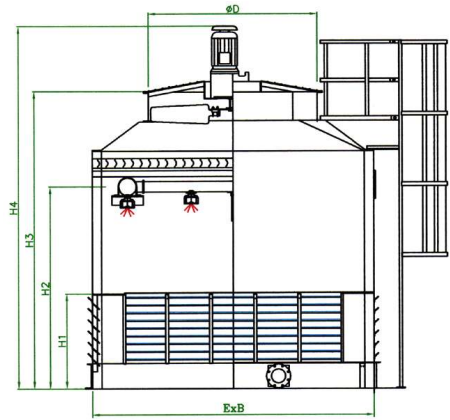
Quality of circulation water	Ratio of suspended solids		Fill type	Fill wet surface m ² /m ³
	For short periods of operation (≤10 hr)	For long periods of operation (≥24 hr)		
Clean operating water	100-200ppm	70-120ppm	PVC Film Fill	~150-240
Medium dirty operating water	500ppm	300ppm	PP Ring	~90-150
Dirty operating water	Unlimited	Unlimited	PP Splash Grid	<90

Our products:



Yolyapı has over 1000 references both in the domestic and international market. Our towers are divided into two categories:

- Package Type
- Site Erected Type



Package type cooling tower:

Package type cooling towers are preferred in facilities with a water flow rate of upto 1200m³/hr. Since these cooling towers are produced with Glass Reinforced Polyester (GRP), a material with a longer lifespan than most of its alternatives, they have low operating and maintenance costs. Furthermore, package type cooling towers are easily transportable since they are modular.

The structure of the tower as well as its columns and beams are produced with GRP. Various parts of the tower in direct contact with water such as drift eliminators, the water distribution system, and the fill are made of corrosion-resistant material like PVC, PP, GRP or stainless steel. Furthermore, the cold



water basin at the bottom of the cooling tower can also be produced with GRP.

Since the material used is corrosion-resistant and compatible, package type cooling towers have much longer operating lives compared to other alternatives.

Advantages of package type cooling towers:

- Longer operating life compared to alternatives
- Transportable because of compact structure
- Low cost of maintenance and operation
- No need for paint or extra maintenance for tower shell
- Capacity easily increased by adding extra modules



Antalya Airport



DHT Metal, Azerbaycan



Bosch

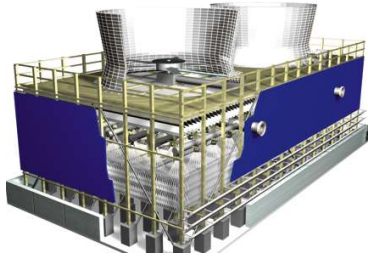


Adana Airport



Arçelik

Site-Erected Cooling Tower:



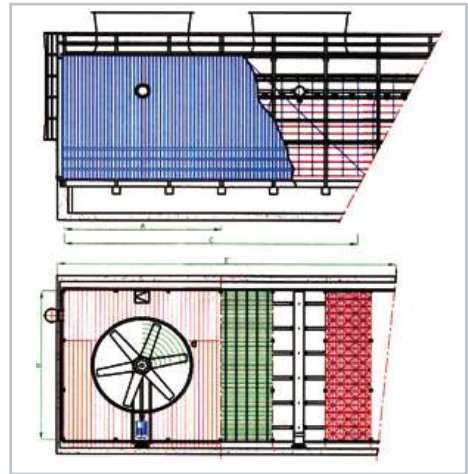
Site-erected cooling towers can be used in facilities with a water flow rate of 200m³/hr. Usually, however, these are used in large plants with higher level of water flow such as power plants,

petrochemicals plants, refineries and steel mills. These towers are erected as a structure of columns and beams on-site.

In choosing the material for the structure of the cooling tower one should take into account its desired economical life, investment cost and construction period. Impregnated wood, concrete or glass reinforced polyester (GRP) are commonly used materials for the carcass of site-erected cooling towers.

Other parts which are in direct contact with water such as drift eliminators, shell, spray nozzles, and filling systems are made of PVC, PP, GRP or stainless metal to prevent corrosion. The tower is placed on a cement structure which is also used as a cold water basin.

Site-erected cooling towers can consist of many cells, the number of which depends on the capacity of the plant, allowable access for maintenance, and the tolerance of the system to a temporary shutdown in one or more of the cells. The details of a site-erected cooling tower project are determined by obtaining information from our customers on their needs and operating conditions.



Advantages of site-erected type cooling towers:

- Most cost-effective choice in high water flow rates
- Custom-designed according to customer preferences and limitations
- Non-corrosive GRP tower shell



Erdemir, Turkey



Antbirlık, Antalya, Turkey



Çebi Energy, Tekirdağ, Turkey



Cargill, Poland



Akmaya, Kırklareli, Turkey



İsdemir, Turkey

References:

Yolyapi has over a thousand references of cooling towers of various size and model both in Turkey and worldwide. These cooling towers serve the needs of a range of sectors such as iron and steel, automotive, food, chemistry and petrochemicals, cement, textile, machinery, tourism, and others. Below is a sample list of Yolyapi's references. A complete list can be found at www.yolyapi.com.tr

Selected references - Turkey

Client	Flow Rate (m3/h)	Inlet T (°C)	Outlet T (°C)
Yeniköy Power Plant	2x33600	35	27
Türk Pirelli Tire Corp.	260	35,5	27,5
İstanbul Atatürk Airport THY Building	2x300	35	30
Ankara Esenboğa Airport	4x775	37	27
Procter & Gamble	390	43	28
Ford Automotive Corp.	80	34	27
Toyota Automotive Corp.	25	60	41
Bosch Industries	30	36	29
Colgate Palmolive	50	38	28
Erdemir Iron & Steel	5400	41	30
Hyundai Assan Automotive Corp	250	35	30

Selected references - International

Client	Flow Rate (m3/h)	Inlet T (°C)	Outlet T (°C)
Cargill, Poland	300	37	24
Cargill, Russia	1200	34	27
Cargill, Russia	1600	42,5	30
Lukoil, Russia	1200	48	28
Cons. Jordanian Iron & Steel, Jordan	1500	50	30
N.I.T. Corp., Egypt	2x687,5	33	29
Trakya Glass, Bulgaria	135	45	30
Hod Steel, Israel	500	40	33
Anadolu Glass, Russia	420	50	30



Yolyapi Cooling Towers Co.

İMES Sanayi Sitesi, A Kapısı, 101. Sokak, No:17, Yukarı Dudullu, Ümraniye 34775 İstanbul, Türkiye

Tel: +90 216 540 7990 Pbx.

Faks: +90 216 540 7998

www.yolyapi.com.tr

