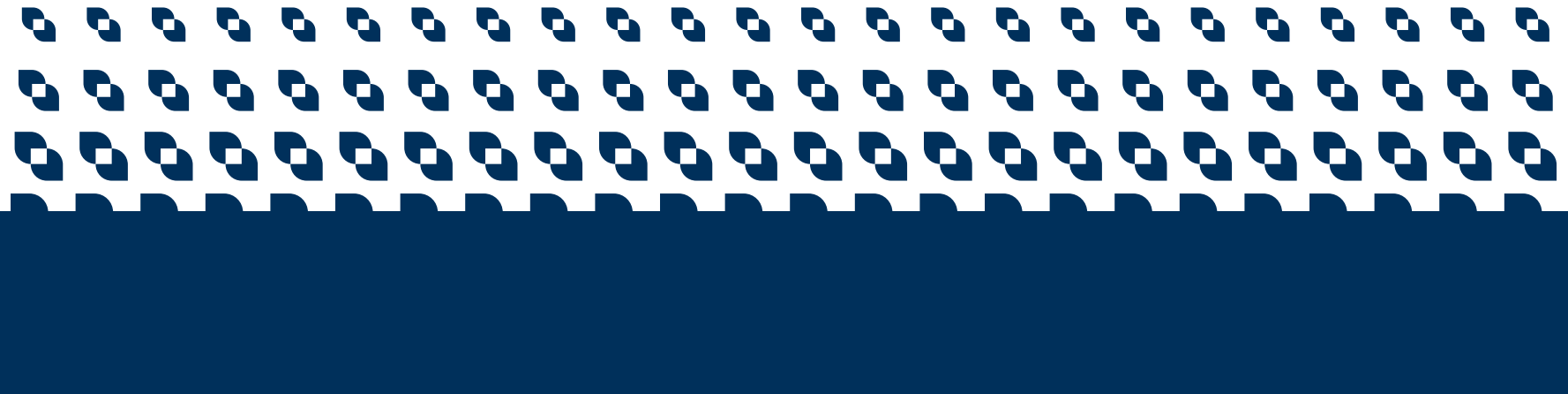




“KOOLANCEL” company was established in 2008 as the first manufacturer of cellulose pads in the Middle East. In 2010, “KOOLANCEL” Company joined as a member of ENERGY Holding.

The result of this partnership and cooperation has been the increasing development and becoming the largest manufacturer of cellulose pads in the Middle East.

In 2017, KOOLANCEL Company developed the brand “NADPOLYMER” to manufacture unsaturated polyester, phenolic and acrylic resins per the customers' needs.

KOOLANCEL's approach has always been to manufacture high-quality products in line with the customers' needs and provide a superior value proposition. KOOLANCEL is the pioneer of the evaporative cooling industry for various applications in Iran.

Geat weather, Great vibes ...

2005

01

business plan
development



2008

02

Obtaining the operating
license



2009

03

Expanding the scope
of activity to the HVAC
industry and
gas inlet air cooling



2016

06

Starting to export
cellulose pads



2012

05

Development of
the factory



2010

04

Membership in
ENERGY Holding



2017

07

Starting to manufacture
industrial resins with
"NADPOLYMER" brand



2020

08

Starting to export
cellulose pads to Europe



2022

09

Starting to export
cellulose pads
to the UAE



2023

10

Starting to manufacture
galvanized steel
and aluminium frames



Evaporative Cooling

Evaporative cooling is the easiest and most efficient way to create cooling. Our body rejects heat using the same method and through sweating (moisture evaporation from the skin). Evaporative coolers use different evaporative media to cool the air, of which the cellulose pad is one of the most efficient.

The cellulose pad consists of regular and wavy thin sheets with high wettability and water absorption properties and is saturated by chemical materials to increase strength and durability. The uniform and dense structure of the pad causes the air–water interface in the cellulose pad to be more significant compared to the aspen pad and the airspeed to be more uniform.

These factors increase the cooling rate and prevent the entry of water droplets, dust and harmful respiratory bacteria into the airflow.

Cellulose Pad In Cooling Systems

Evaporative cooling systems with cellulose pads are the most efficient (Figure 1). The performance of evaporative cooling systems depends on the efficiency of evaporation and the pressure drop of the evaporative media. High evaporation efficiency causes more cooling, and low-pressure drop causes the reduction of fan power consumption. Due to its dense and uniform structure the cellulose pad with a higher evaporative cooling efficiency than the aspen pad, has a low-pressure drop. Also, due to its high evaporation efficiency, the cellulose pad can create thermal comfort conditions on sweltering days of the year, while the aspen pad lacks this ability.



Figure 1: Cellulose pad in evaporative cooling system

Advantages of Cellulose Pad Compared to Aspen Pad

1. More cooling
2. Less Pressure drop
3. Longer service life
4. Preventing the entry of dust, insects, and suspended particles
5. Low scaling due to self-cleaning
6. Less fungus and algae growth and no transfer of harmful respiratory bacteria

The more extraordinary cooling of the cellulose pad compared to the aspen pad is due to the stable and rigid structure of the cellulose pad. The dense and wavy form of the cellulose pad increases the water-air interface, distributes water evenly through the cellulose pad, and increases water absorption. As a result, evaporation efficiency rises by an average of 30% during the season.

Our Customers



Advantages of KOOLANCEL's Cellulose Pads:

Long lifetime

KOOLANCEL is the only company manufacturing cellulose pads in Iran, which provides **Up to 48 month guarantee** against deformation and pulping. The service life of KOOLANCEL 's cellulose pad is **4 to 6** times of aspen pad.

More Cooling

- Higher cooling efficiency than other pads available in the market
- Providing engineering services to manufacture the optimal products

Export to Europe

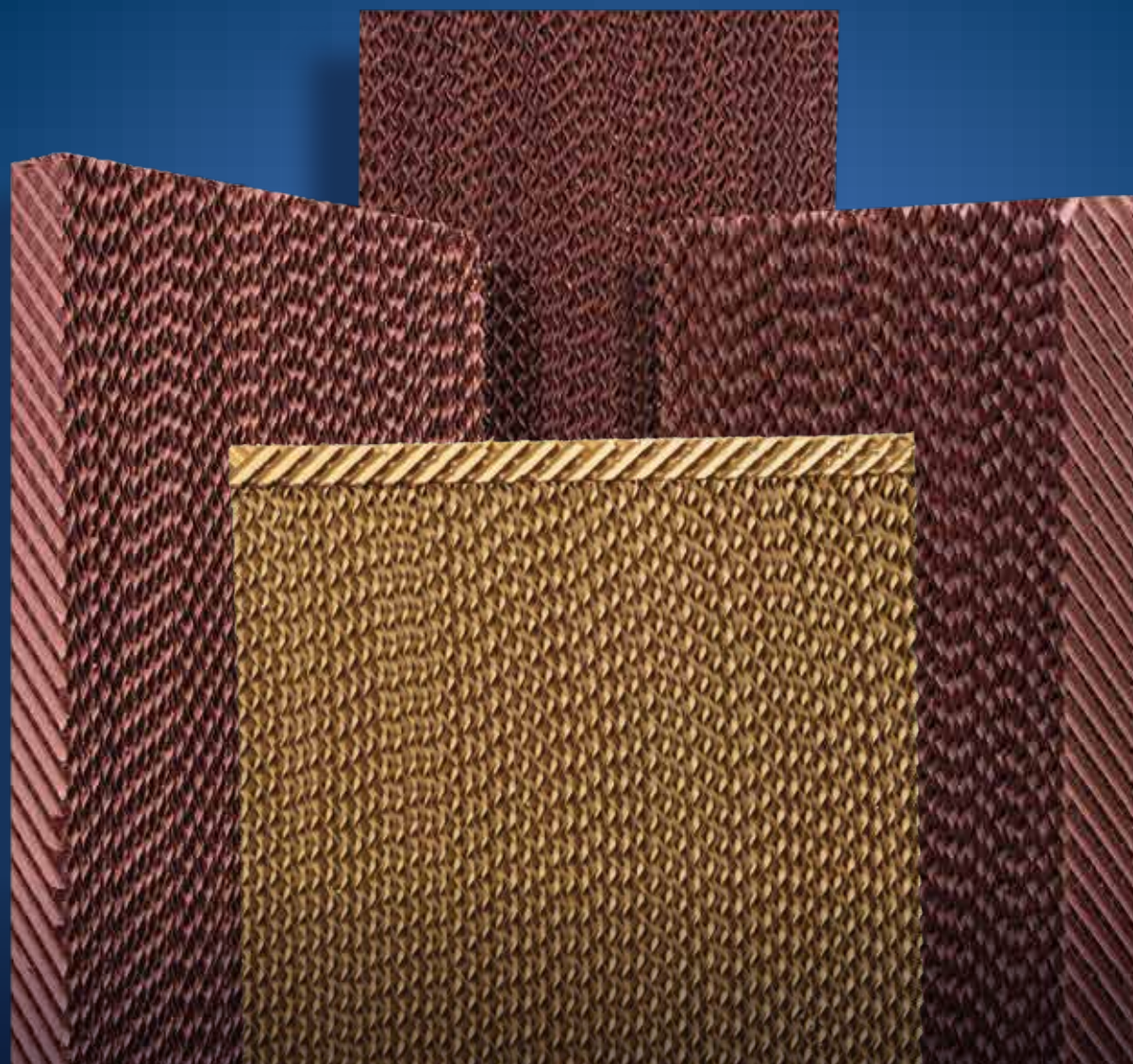
KOOLANCEL Company has exported its products to different countries due to its deep knowledge and manufacturing the products that meet global standards. It is also the only exporter of cellulose pads from Iran to Europe.

Scandinavian Virgin Paper

Papers used in KOOLANCEL's cellulose pads are directly imported from Northern European countries. Due to the better raw materials, KOOLANCEL's cellulose pads have higher wettability and water absorption properties.

The Only Professional Manufacturer of Cellulose Pad Resins in Iran

In recent years, KOOLANCEL Company, relying on the knowledge of Iranian experts, has taken steps towards the production of specialized resins for cellulose pad and has been able to supply top-quality products.



Testing the qualitative indices of the cellulose pads in accordance with the European Union standard.



Cellulose pads of KOOLANCEL were investigated to evaluate the qualitative indicators in one of the accredited laboratories of the European Union, and the following results were obtained.

- The amount of free phenol in 72 hours was less than one microgram per cubic meter.
- The amount of free formaldehyde has been determined by performing tests in different intervals, which has stabilized at less than 0.002 mg/m³.
- The amount of free phenol and formaldehyde in KOOLANCEL's cellulose pads was within the standard range and had the standards required in the European Union.

**KOOLANCEL is the first Iranian company
to receive this certificate successfully.**

Factors Influencing the Performance and Application of Cellulose Pads:

1. Flute Height:

Flute height is a key factor affecting both the saturation efficiency and pressure drop in cellulose pads. These two factors are considered the primary criteria for evaluating pad quality and performance.

For the naming system of KOOLANCEL pads, the first two digits indicate the flute height. For example:

KOOLANCEL 4090 Series Cellulose Pad: Flute height is 4 mm.



flute height of 5090 series



flute height of 8090 series

As the flute height increases in cellulose pads, the number of layers (sheets), and consequently the structural density, decreases. This reduction in density leads to a smaller contact area between the airflow and the wet surface of the pad, thereby reducing evaporative efficiency and cooling performance.

On the other hand, increasing the flute height creates wider air channels, which results in less resistance to airflow. This, in turn, leads to a lower system pressure drop.

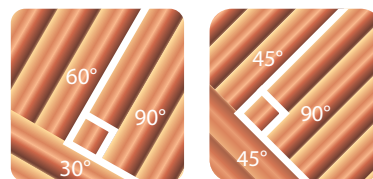
Therefore, the lower the flute height of the cellulose pad, the higher the cooling efficiency and the greater the pressure drop. Conversely, as the flute height increases, efficiency decreases and the pressure drop is reduced.

Note: The appropriate flute height should be selected as per system requirements (e.g., high cooling efficiency or low pressure drop) and operational conditions.

2. Corrugation Angle Configuration in KOOLANCEL Cellulose Pads:

In various series of KOOLANCEL cellulose pads, the angle between the corrugation directions of adjacent paper sheets differs. For example, in series 7090 or 7060, the corrugation directions of two adjacent sheets form angles of 90 and 60 degrees with each other, respectively. In the 90-degree corrugation configuration used in KOOLANCEL cellulose pads, there are two different structural arrangements:

- 1. 30/60 Configuration:** Alternating arrangement of sheets with corrugation angles of 30 and 60 degrees.
- 2. 45/45 Configuration:** Sequential arrangement of sheets, all with a corrugation angle of 45 degrees.



In the following section, we will examine the differences between each of these configurations:

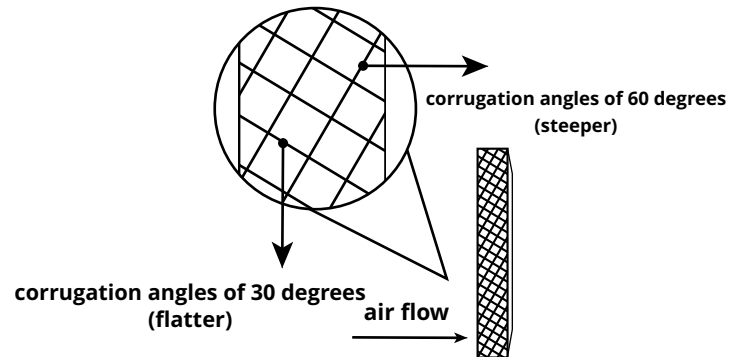
A. Air Flow Direction

Pad with 45/45 Configuration

The incoming airflow can enter from both sides of the pad.

Pad with 30/60 Configuration

To achieve optimal performance, the 60 degree angle should face the air intake side.



B. Water Droplet Carryover

Pad with 45/45 Configuration

Due to the symmetric 45-degree angle, the 45/45 pad tends to have higher carryover.

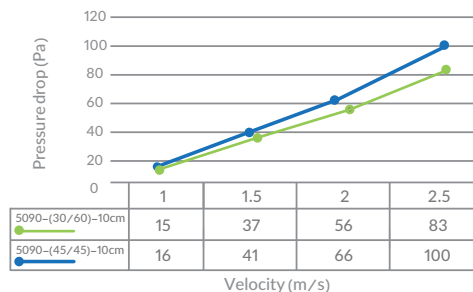
Pad with 30/60 Configuration

Due to the steeper 60-degree angle on one side of the pad, more water flows toward the air inlet. As a result, this configuration exhibits lower carryover.

C. Pressure Drop

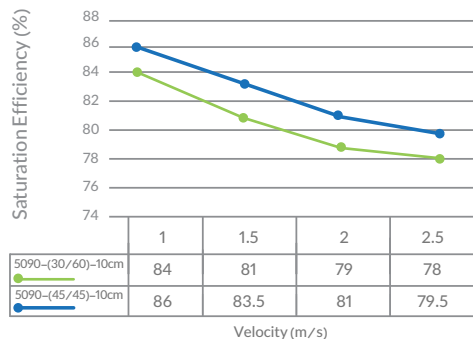
- The pressure drop across the pad with a 30/60 configuration is lower compared to the 45/45 configuration. This lower pressure drop is due to the reduced resistance to airflow created by the 30-degree wave angle.

Suitable for cooling systems capable of handling moderate pressure drop.



D. Saturation Efficiency

- The efficiency of the 45/45 pad is higher than that of the 30/60 configuration. The reason for this higher efficiency is the longer air passage channels in this type of pad. A longer channel increases both the contact time and surface area between the air and the water-saturated pad, thereby enhancing heat transfer and cooling performance.



E. Applications

Cellulose Pad with the configuration 45/45

(Maximum Cooling Efficiency and Moderate Pressure Drop)

- Provides the highest evaporation efficiency and therefore the greatest cooling capacity.
- Suitable for cooling systems capable of handling moderate pressure drop.

Cellulose Pad 30/60

(Adequate Cooling Efficiency and Minimal Pressure Drop)

- Suitable for applications with high air exchange rates or cooling systems with high volumetric airflow.
- No water droplet carry-over even at high air velocities.
- The 5090 pad with a 30/60 angle, due to its higher evaporation efficiency compared to the 7090 pad with a 45/45 angle and nearly equal pressure drop, can serve as a substitute in greenhouses, poultry farms, and also in portable evaporative coolers with axial fans.

3. Thickness of the Cellulose Pad:

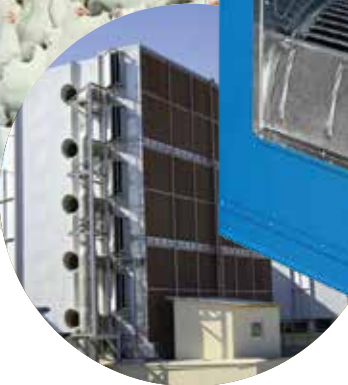
In various series of cellulose pads, as thickness increases, both efficiency and pressure drop increase. The rise in efficiency is due to the greater contact surface area between the passing air and the wet cellulose pad. The increased pressure drop, on the other hand, results from the longer airflow channels in thicker pads.

4. Paper Material:

Kraft paper is the primary raw material used in the production of cellulose pads, and undoubtedly the quality of this material directly impacts the quality of the final product. The quality of the kraft paper affects water absorption and capillarity, both of which play a crucial role in the efficiency of the final product.

5. Resin Quality:

Various types of resins are used both as a coating and as an adhesive in the production of cellulose pads. High-quality resins increase the durability and service life of the pads. KOOLANCELL cellulose pads are manufactured using high-grade NadPolymer-manufactured resins and are offered with **Up to 48 month guarantee** against deformation and pulping.



Koolancel Cellulose Pad Products Series

KOOLANCEL manufactures a variety of cellulose pads for various applications, including evaporative coolers, greenhouses, poultry houses, power plants and data centers. KOOLANCEL brand, due to superior-quality products, has gained a unique position in customers' mind.

The product series of KOOLANCEL's cellulose pads are presented in the table below.

Product Series	Configuration	Applications
4090	(45/45)	Evaporative coolers
5090	(45/45)	
6090	(45/45)	
7090	(45/45) (30/60)	Greenhouses Poultry houses Data centers
5090	(30/60)	
8090	(45/45)	
7060	(45/45)	
7060	(45/15)	Power Plants

“A Better Decision”
Choosing Cellulose Pads
with a technical Application

— Kool & Cel[®] —

app.koolancel.com



4090

Product Series

Specifications

than other products

Evaporation efficiency	Excellent
Pressure drop	high
Number of sheets in one meter of length	235
Price	high

In the 4090 series, wavy cellulose sheets with a flute height of 4 mm are placed on top of each other, and the corrugation direction of the two adjacent sheets constitutes an angle of 90 degrees (45/45) to each other (Figure 2).

Due to its high density, these series have the highest evaporation efficiency and pressure drop. It is recommended to use these series in cooling systems possessing limited space to install thick with high air face velocity through the cellulose pads. According to the customer's order and based on the required cooling capacity, these series can be provided in different sizes. 4090 Series have a water distributor so that the pad is evenly wet and maximum evaporation efficiency is achieved.

Evaporation Efficiency of 4090 Series for Different Thicknesses and Face Air Velocities

Face Air Velocity Thickness	1 m/s	1.5 m/s	2 m/s	2.5 m/s
50 mm	77	73.5	71	69
75 mm	86	83.5	81.5	80
100 mm	91	90	89	88
150 mm	94	93	92	91

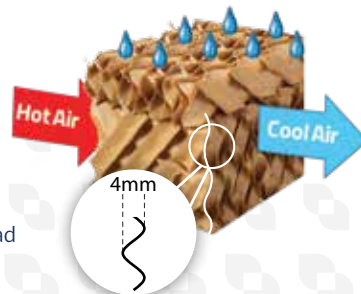
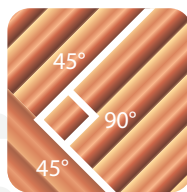


Figure 2: Specifications of 4090 pad

5090

Product Series

Specifications

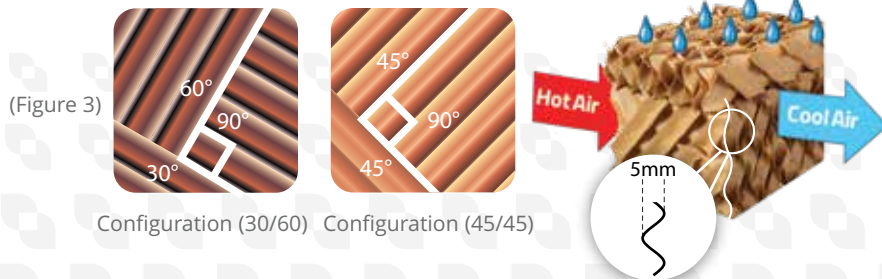
Configuration (45/45)
than other products

Evaporation efficiency	favorable
Pressure drop	medium
Number of sheets in one meter of length	190
Price	favorable

In the 5090 series, wavy cellulose sheets with a flute height of 5 mm are placed on top of each other, and the corrugation direction of the two adjacent sheets form an angle of 90 degrees (45/45) to each other (Figure 3). Due to its medium density, these series have established a balance between evaporation efficiency and pressure drop with a high evaporation efficiency; it still has an acceptable pressure drop. These series can be used in most cooling systems and is presented in different dimensions according to the customer's order and based on the required cooling capacity. 5090 Series have a water distributor to wet the pad uniformly and achieve maximum evaporation efficiency.

Evaporation Efficiency of 5090 Series with Configuration (45/45) for Different Thicknesses and Face Air Velocities

Face Air Velocity Thickness	1 m/s	1.5 m/s	2 m/s	2.5 m/s
50 mm	65.5	61	58	56
75 mm	76	73	70.5	68.5
100 mm	86	83.5	81	79.5
150 mm	91	90	89	88



6090

Product Series

Specifications

than other products

Evaporation efficiency	medium
Pressure drop	favorable
Number of sheets in one meter of length	164
Price	medium

In the 6090 series, wavy cellulose sheets with a flute height of 6 mm are placed on top of each other, and the corrugation direction of the two adjacent sheets forms an angle of 90 degrees (45/45) to each other (Figure 4). These series have a low-pressure drop due to its lower density compared to other series, but at the same time, its evaporation efficiency is acceptable. It is recommended to use these series in cooling systems whose fans cannot overcome high-pressure drops. These series can be offered in different sizes according to the customer's order and based on the required cooling capacity.

Evaporation Efficiency of 6090 Series for Different Thicknesses and Face Air Velocities

Face Air Velocity Thickness	1 m/s	1.5 m/s	2 m/s	2.5 m/s
50 mm	63	58.5	56	54
75 mm	75	71	68.5	67
100 mm	83	80	78	77
150 mm	89	88	87	86

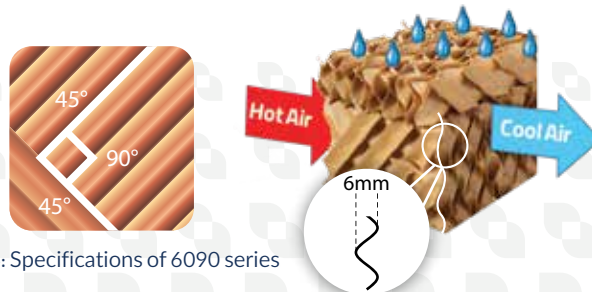


Figure 4: Specifications of 6090 series

7090

Product Series

Specifications

Configuration (45/45)
than other products

Evaporation efficiency	medium
Pressure drop	low
Number of sheets in one meter of length	143
Price	low

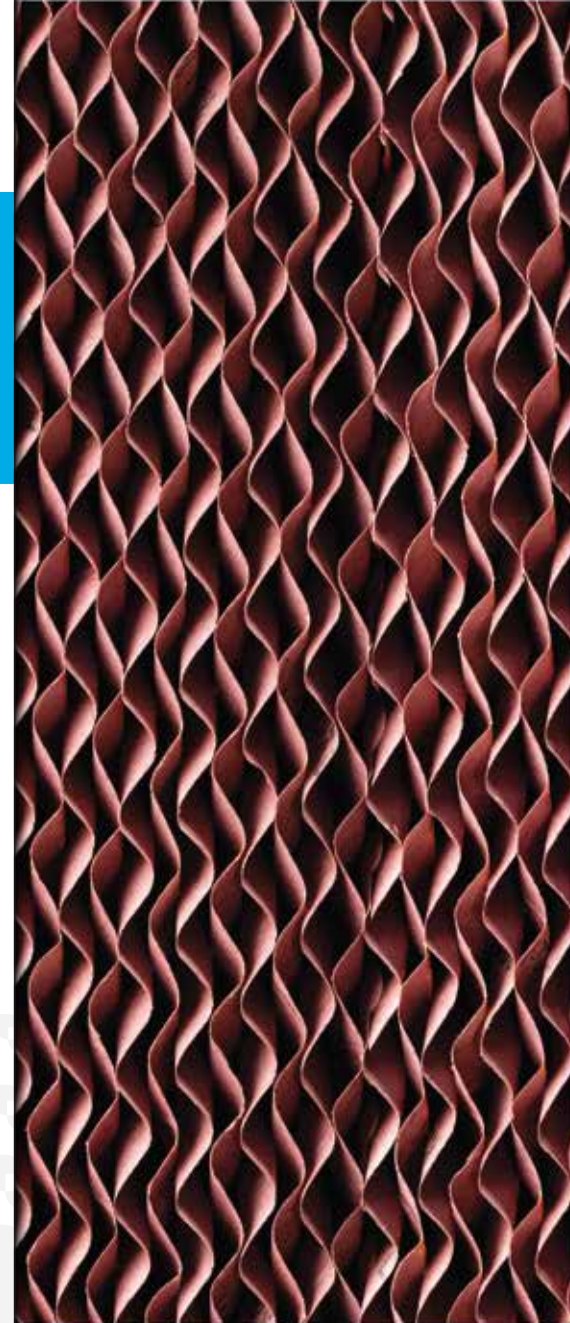
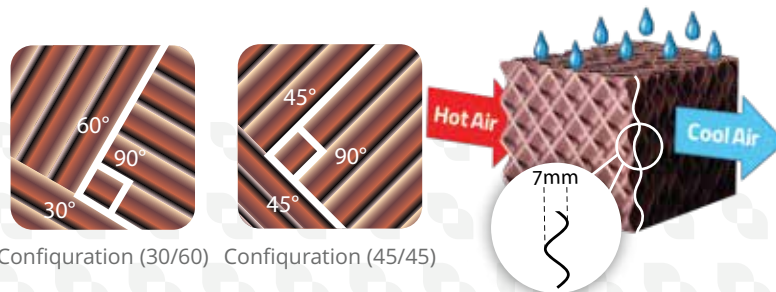
In the 7090 series, wavy cellulose sheets with a flute height of 7 mm are placed on top of each other, and the corrugation direction of the two adjacent sheets forms an angle of 90 degrees (45/45) to each other (Figure 5).

These series are specifically used in the walls of greenhouses and poultry farms along with the frame set, water supply system (tank, pump, and pipe) and fan. These series are offered in different dimensions according to the customer's order and based on the required cooling capacity. It is also possible to provide these series with a water distributor.

Evaporation Efficiency of 7090 Series with Configuration (45/45) for Different Thicknesses and Face Air Velocities

Face Air Velocity Thickness	1 m/s	1.5 m/s	2 m/s	2.5 m/s
50 mm	55	49	46	44
75 mm	61	56	52	50
100 mm	75	71	69	67
150 mm	86	83.5	81.5	79.5

(Figure 5)



8090

Product Series

Specifications
than other products

Evaporation efficiency	low
Pressure drop	lower
Number of sheets in one meter of length	125
Price	lower

In the 8090 series, wavy cellulose sheets with a flute height of 8 mm are placed on top of each other, and the corrugation direction of the two adjacent sheets constitutes an angle of 90 degrees (45/45) to each other (Figure 6).

These series are specifically used in the walls of greenhouses and poultry farms along with the frame set, water supply system (tank, pump, and pipe) and fan.

The elevated flute height of this model diminishes the likelihood of pad openings becoming blocked, making it a suitable option for regions with high water hardness and no available means to soften and purify the water. Given its lower saturation efficiency compared to the 8090 model, it is advisable to employ thicker pad when using this model.

These series are offered in different dimensions according to the customer's order and based on the required cooling capacity. It is also possible to provide these series with a water distributor.

Evaporation Efficiency of 8090 Series for Different Thicknesses and Face Air Velocities

Face Air Velocity Thickness	1 m/s	1.5 m/s	2 m/s	2.5 m/s
100 mm	63	58	55	53
150 mm	78	74	71.5	70

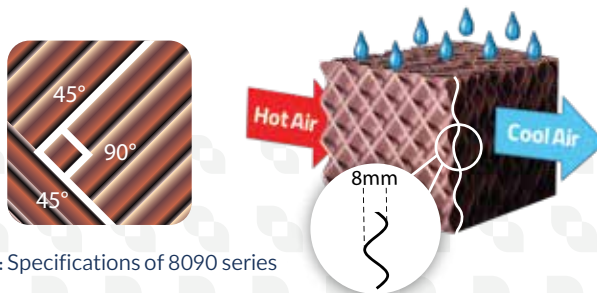


Figure 6: Specifications of 8090 series

7060

Product Series

Specifications

than other products

Evaporation efficiency	medium
Pressure drop	low
Number of sheets in one meter of length	143
Price	medium

In the 7060 series, wavy cellulose sheets with a flute height of 7 mm are placed on top of each other, and the corrugation direction of the two adjacent sheets constitutes an angle of 60 degrees (45/15) to each other (Figure 7).

Because of its minimal pressure drop, this model is well-suited for applications that involve a high ventilation rate or airflow through the pad, such as gas turbine inlet air cooling. Given the lower saturation efficiency of this model compared to the 7090 model, it is recommended to use thicker pad when employing this model.

These series are offered in different dimensions according to the customer's order and based on the required cooling capacity. It is also possible to provide these series with a water distributor.

Evaporation Efficiency of 7060 Series for Different Thicknesses and Face Air Velocities

Face Air Velocity Thickness	1 m/s	1.5 m/s	2 m/s	2.5 m/s
150 mm	82	79	77	75.5
300 mm	95	94	93	92

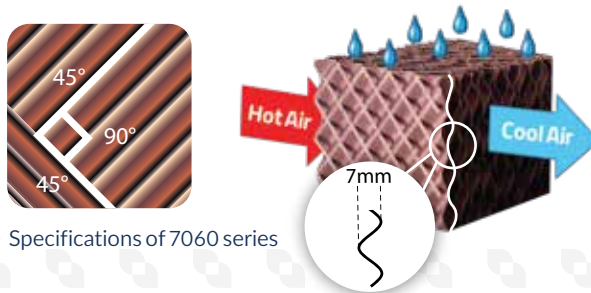


Figure 7: Specifications of 7060 series

KOOLANCEL Frame

The frame serves as the key complementary product for ensuring water supply and drainage to moisten the cellulose walls in evaporative cooling systems, which are predominantly utilized in greenhouses, poultry house, data centers, and some industrial cooling setups.

KOOLANCEL Company initiated frame production in 2023 to complement its product offerings, allowing customers to experience enhanced efficiency in evaporative cooling systems with KOOLANCEL frames.



Koolancel Frame Features

- State-of-the-art engineering design;
- Uniform water distribution;

Enhances efficiency and extends the service life of the pad.

- High water storage capacity;

The design of the lower gutter, results in a large water storage volume, reducing the number of water drains.

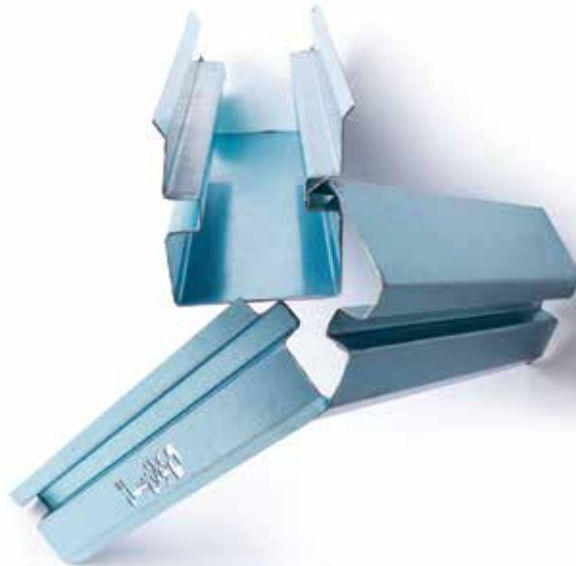
- Easy and precise installation;
 - Easy inspection and maintenance;
- The water distribution pipe is easily visible and accessible for inspection and maintenance.

- Highly robust with appropriate thickness.



Colored Galvanized Steel Frame Features

- Environment-friendly (non-absorbent by humans and the environment) Hot-dip galvanized;
- Eye-catching organic color coating;
- 3 to 5 times increased corrosion resistance in the Salt Spray Test compared to regular galvanization. The coating provides heightened corrosion resistance.



Aluminium Frame Features

- Anodized aluminium with a higher corrosion resistance;
- Highly robust and lightweight;
- Recyclable and environment-friendly.



Improving Energy Efficiency Rating

There are various ways to improve the energy efficiency of coolers, including increasing the efficiency of the electromotor, optimizing the fan, etc., but using cellulose pads with optimal evaporation efficiency is the most optimal choice to improve the energy efficiency rating of the cooler.

Generally, the cost of the pad in the prime cost of the cooler is about 10%, so it is possible to improve the energy efficiency of coolers significantly with a minor increase in price by using pads with a shorter flute height (such as 4090 series).

Sales Engineering Services

KOOLANCEL Company offers the following sales engineering services to its customers by collaborating with experts and eminent academics in the field of cooling and using modern equipment:



Increasing the energy efficiency of evaporative coolers by offering optimal cellulose pads



Providing cellulose pads according to the specifications (evaporation efficiency and pressure drop) requested by the customer



Designing an evaporative cooling system for greenhouses, poultry houses, etc.

To receive more information about sales engineering services (SES), you can contact the email ses@koolancel.com, the engineering service unit.



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ESHTEHARD Industrial Town, ESHTEHARD, Alborz Province

📍 **Central office:** No.18 ,Sahel 1St., Shahrak-e Darya
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