

Smart Air Washers

Evaporative Cooling Units

EVAPCOOL Series



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Introduction

Double Skin Air Cooling Units

Sagar Air, being one of the prominent HVAC manufacturer since three decades. The company has a wide array of expertise in manufacturing quality Air Handlers since its inception.

The Double Skin construction usually consists of PUF insulation sandwiched between outer and inner panel. This construction results low thermal heat leakage, low noise and sturdy construction of the unit. Our Units are available in various orientations, sizes and selection suiting various critical and non-critical applications.

Various kinds of Air Cooling units offered by Sagar Air are listed below :

- Single Stage Air Cooling Units
- Two Stage Air Cooling Units
- Forced Draft Ventilators
- Indirect Evaporative Cooling Units



SALIENT FEATURES



Capable of delivering high airflows from 800CFM to 1,50,000 CFM



Can cater static pressures as high as 150 mm WC (1500 Pa)



The units are offered in wide range of construction options - Single Skin and Double Skin



100% Fresh Air units



Low Noise : The units are powered by AMCA certified blowers which are not only less noisy but also energy efficient



90% lesser operating costs than a conventional air conditioning system



Easy After-sales support and maintenance: As the units are manufactured in-house, we have all the spares in stock in case of any breakdowns.



Construction Features

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Casing

SAGAR AIR Air Handlers are of modular construction which utilises extruded aluminium Penta-post construction for superior rigidity.

All Panels are CNC Laser cut and are secured to the unit framework tightly with gaskets in place ensuring better air tight casing construction.

The Panels are double skin construction with either of the two insulations sandwiched :

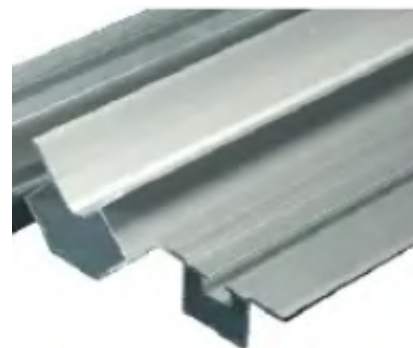
- a) PUF insulation : Poly-urethane foam insulation of 40kg/m³ density
- b) Glass Wool Insulation : High-density Glass Wool insulation

The double skin construction benefits in two major ways : Firstly, it provides high thermal insulation to the AHU. Secondly, This construction ensures that the insulation is not in contact with the air stream thus, improving IAQ of the conditioned space.

The Panels are offered in two thicknesses-25 mm and 50 mm chosen as per your requirement and the criticality of the application. The outer panel and inner panel of the double skin casing can be offered in a variety of materials and thicknesses - Galvanised Iron, Aluminium, Stainless Steel as per your requirement.

The outer panel are usually made of Pre-Painted GI sheet which has an excellent finish and is corrosion-free. The Inner panel is GI plain.

The base frames are made out of Galvanised steel sheets with heavy-duty steel joints. The joints are equipped with lifting holes for easy loading and unloading of the unit. Especially, for Larger units, parallel hot-dip galvanized channel frames can be offered.



Aluminium Sections



Corners



Aluminium Pentapost
construction

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AHU Casing Acoustics

Blower noise is the most dominant component of the unit which generates noise. The fans must be correctly sized and selected to operate at its peak efficiencies. undersized blowers shall result in higher noise levels due to increased tip-speed and higher velocities while over-sized blowers can generate higher sound levels than allowable due to its motor-drive set.

Essentially the casing of the unit acts as a sound reducer along with thermal insulation. Below listed are the sound reduction levels achieved from Glasswool and PUF for a 50mm panel

Sound Reduction (dB) for various materials : 50 mm panel, 1.0 mm inner and 1 mm outer

Octave Band	125	250	500	1000	2000	4000	8000	Hz
Glass Wool	9	20	25	30	34	36	41	dB
PUF	8	14	11	12	20	35	38	dB

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Safety Devices

The units are installed with various electrical and mechanical safety interlocks ensuring maintenance and electrical safety of the units. Here is the list of Safety devices in place :

- Fan mesh, Motor cover, and Pump cover
- Pump Dry Run Protection
- Phase Failure protection
- Door Limit Switches
- Safety Isolator Switches (optional)
- Motor Starter Panels (optional)
- View Glass to view status of motors,UV Chamber etc
- Nylon Caps to cover projected screws
- Air Flow Switch (Optional)



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Fan Section

The AHUs are powered by a variety of blowers depending upon the size, orientation, duty and application. Centrifugal Fans DWDI/SWSI,BC.FC.Radial,Axial Flow, Plug Fans, Mixed Flow Fans/ EC Fans etc. All the fans are AMCA certified. All the fan impellers are statically and dynamically balanced according to ISO 1940 and AMCA 204 G2.5 standards.

The fans are designed in accordance with AMCA standards. The Impellers for Forward- Curved fans are Galvanised Steel Sheets while Backward Inclined / Airfoil blade impellers are made of cold-rolled steel sheet with the polyester coat. The shafts are manufactured from C45 grade carbon steel and then coated with anti-corrosion after assembly.

The VFDs are selected for 150% of the maximum motor kilo-watt of the Blower. The V-belts are sturdy,anti-static, and oil resistant.

The selected bearings are either deep groove ball bearing type with adapter sleeves or else a spherical bearing type for various applications. Heavy-Duty bearings are available on request for continuous duty.

The Fan-motor assemblies are mounted on Extruded aluminum CBF (Common Base Frame) which is in turn mounted on spring vibration isolators

Flexible Connectors between the fan outlet and unit for vibration isolation are standard with the unit. Additionally, Fire retardant fabric is available as an option.



Plug Fan



Forward Curved
DIDW Fan



Backward Curved
DIDW Fan



EC Fan



VFDs for Speed
regulation



Common Base
Frame Assembly

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Motor and its accessories

All the electric motors encased in the units are branded and conform to IEC standards of operation. Usually, Squirrel Cage AC Induction motors with Class F insulation are used. Motors conform to IEC 34, IEC 72, BS3979, BS 5000 standards and CE marked.

A wide range of motor efficiencies are available starting from IE1 being standard, IE2 higher efficiency and IE3 being premium efficiency. Flameproof motors can also be offered as an option.

The motors can also be plugged into a Variable Frequency Drive to control its speed. Usually, speed must be varied within 40 % to 100 % of the total speed of the motor.

Please refer Motor Ratings and Cable Sizing at the end of the brochure.



Squirrel Cage TEFC AC induction Motors



VFDs for Speed regulation



Pad Section

These units consist of high quality and durable cellulose pads. These cellulose pads are made of cellulose wood fibres in paper form. They are saturated with water wetting it through pre-fixed channels.

The pads are eco-friendly, durable and high performing resulting in effective cooling at minimal costs. Efficiencies as high as 85% can be accomplished with these pads.



100% Fresh Air Cooling EVAPCOOL Series



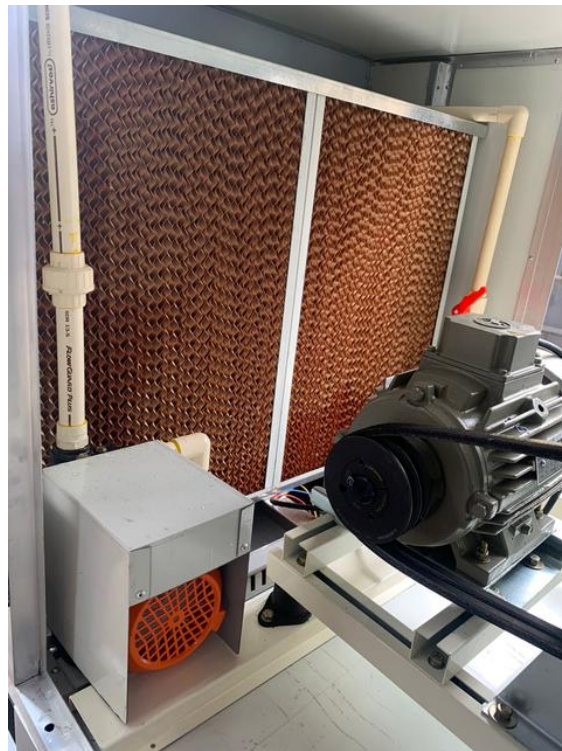
Water Re-Circulation System

The water re-circulation system consists of a monobloc pump self-priming which draws water out of the built-in tank and discharges into a CPVC distribution channel.

The manifold extends across the top of cell bank and distributes water through a series of uniform orifices onto the distribution pad which spreads water evenly over the top horizontal surface of the cellulose pad.

A strainer mesh is provided at the suction inlet of the pump to prevent any large grit from entering the pump.

A valve is provided on the other side to control the water quantity on the cellulose pad.



Mist Eliminator Section

Eliminators are located on the air-leaving end of the unit to remove entrained/carried over water droplets from the air.

The Eliminator blades are of 4 pass design and are equally spaced on 30 mm centres extending from below the water level of the tank to the top of the air washer unit. The blades are extruded PVC fixed on a GI / SS spacer.

The Casing of the eliminator is made out of Galvanised Steel of minimum of 18 G. Stainless Steel is optional.



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Water Tank

The tank provides the foundation for all the essential components of the unit. It is fabricated from a minimum 20G SS 304 grade construction with all joints seam welded with a minimum width of 12 inch.

Tank consists of Make-up Water, Drain, Overflow connections of suitable sizes welded to the tank on LHS/RHS as per site connections. A transparent flow indicator is provided for indicating the water level. A float valve is provided for replenishing the lost water to evaporation automatically.



Filters

A Variety of Filters can be equipped depending upon the application. Considering the requirements, the following are the kinds of filters/Filteration devices to be put to use :

- 1) Pre-Filters - Metallic / Synthetic
- 2) Fine Filters
- 3) UV-C Chambers
- 4) Ionisers



Pre-Filters

Washable Pre-Filters are used in industrial and kitchen ventilation applications. These Filters have excellent dust holding capacities with ultra low air leakages. These Pre-Filters can be Metallic or Synthetic.

In case of Metallic Filters, The frame is made of Al/GI/SS with media sandwiched under multiple flat metal mesh layers. The Filters are offered in various sizes.

In Case of Synthetic Filters, The frame is again either made of GI/Al or SS materials while media is of synthetic non-woven fabric completely sealed at the edges. These are cost-effective compared to Metallic Filters

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Metallic Pre-Filter

Specifications :

- Type : Box type
- Frame : GI/SS/Al
- Filter Media : Synthetic Non-Woven
- Sealed : Epoxy/Foam
- Eff : 90% down to 10 micron



Synthetic Pre-Filter

Specifications :

- Type : Flange Type
- Frame : GI/SS/Al
- Filter Media : Synthetic Non-Woven
- Sealed : Epoxy/Foam
- Eff : 90% down to 10 micron



Fine Filters

Fine-Filters differ from Pre-Filters in terms of arrestance efficiency i.e. Less than 10 microns arrestance. The media used in these filters is either HDPE or non-woven high temperature fabric. These filters are usually demanded in pharmaceutical and speciality applications. These are also called as Micro-Vee filters. Usually, These filters are preceded by Pre-Filters.

Specifications :

- Type : Flange Type
- Frame : GI/SS/Al Anodised
- Adhesive : Epoxy based adhesive
- Gasket : Sponge rubber / PU neoprene
- Media : 100% micro-glass fiber
- Eff for HEPA : 99.99% down to 0.3 micron
- Eff for ULPA : 99.9995% down to 0.12 micron

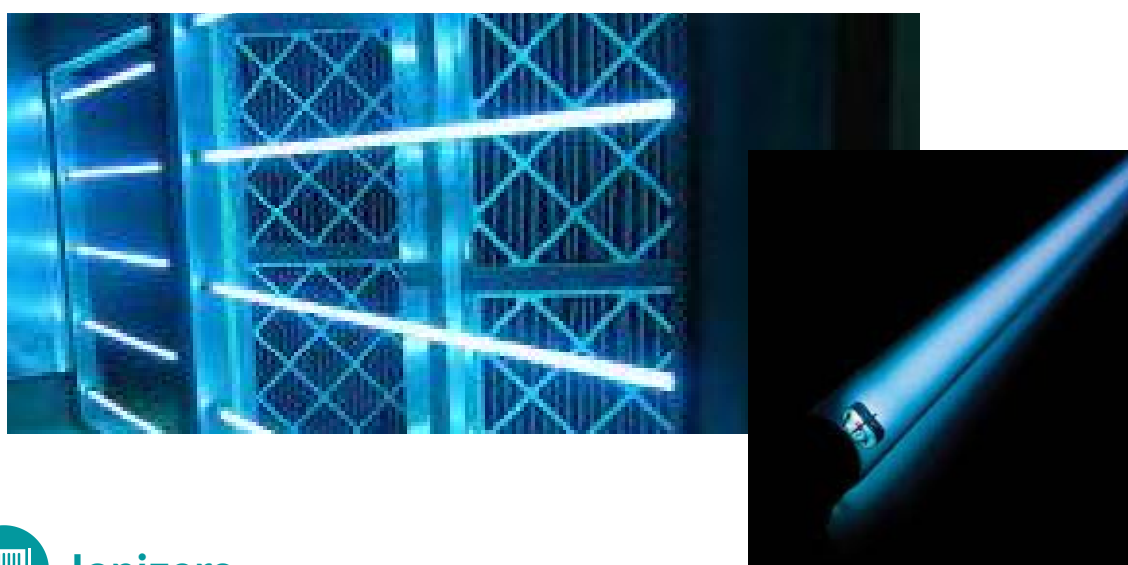


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UV-C Chambers

Ultraviolet Lights are pre-fitted in the AHUs at the factory itself. The chambers are pre-engineered and placed for maximum effectiveness at optimum face velocity. The installed UV lights neutralize various harmful contaminants such as mold, bacteria, viruses, and other biological allergens in the incoming air. Since Part of UV lamp energy is directed onto the Evaporator coil and drain pan, any microbial growth on these surfaces is eliminated. thus, helping in maintaining the IAQ of the supply air.



Ionizers

With the help of Needle Point Bipolar Ionisers, Clean air can be delivered into the conditioned space. These ionizers generate positively charged and negatively charged ions into the supply air which neutralize any VOCs, microbes, mold spores, viruses, odors, etc present in the air thus, maintaining top-notch IAQ of the room.

Features :

- Easy to Install
- Practically zero maintenance
- Highly effective against various harmful particles
- Energy efficient

Ionizers are available in various configurations and sizes. Their optimum selection depends on the corresponding airflow and criticality of the application used.



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MERV Rating Filter Table

MERV Rating	REMOVAL EFFICIENCY OF AVERAGE PARTICLE SIZE			Typical Particles	Filter Type
	0.3-1.0 micron	1.0-3.0 micron	3.0-10micron		
1	-	-	≤20%	> 10 microns (Dust Mites, Pollen, Lint)	Washable Metal Mesh Filter
2	-	-	≤20%		
3	-	-	≤20%		
4	-	-	≤20%		
5	-	-	20%-35%	3.0 - 10 microns (Cement Dust, Mold Spores, Respiratory Droplets)	Polyester Filter, Pleated Filter
6	-	-	35%-50%		
7	-	-	50%-70%		
8	-	-	>70%		
9	-	≤50%	>85%	1.0 - 3.0 microns (Smog, Bacteria, Droplet Nuclei, Aerosols)	Cartridge Filter, Pleated Filter
10	-	50%-65%	>85%		
11	-	65%-80%	>85%		
12	-	> 80%	>90%		
13	≤75%	>90%	>90%	0.3 to 1.0 micron (Tobacco, Kitchen Smoke, Soot, Bacteria, Air Dust)	Pleated Filter, H10-H12 HEPA
14	75%-85%	>90%	>90%		
15	85%-95%	>90%	>90%		
16	>95%	>95%	>95%		
17	-	>99.97%	-	<0.3 micron (Viruses, Superfine Dust)	H13-H14 HEPA, True HEPA, ULPA
18	-	>99.99%	-		
19	-	>99.999%	-		
20	-	>99.999%	-		

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Sound Attenuators

Sound Attenuators can be offered in the Unit in both supply and return air-flows to subside the noise generated by the blowers. A proper sound attenuator is designed by analyzing the airflow volume, the velocity of airflow through it, and the length of the attenuator.

Sound attenuators are either rectangular or square in shape with vertical noise-absorbing baffles fixed inside parallel to the airflow. usually, They are made of GI with GI baffles holding non-hygroscopic mineral/glass fibers media through a perforated sheet.



Length (mm)		900	1200	1500
Frequency (Hz)	63	7 dB	8 dB	9 dB
	125	10 dB	12 dB	15 dB
	250	15 dB	18 dB	23 dB
	500	20 dB	27 dB	32 dB
	1000	30 dB	40 dB	48 dB
	2000	25 dB	33 dB	39 dB
	4000	18 dB	20 dB	25 dB
	8000	13 dB	15 dB	19 dB



Standard Accesories

- **Service Doors**
 - Access doors are provided for ease of access to the blower, motor, and pump maintenance.
- **Marine Lamp**
 - High vision bulk-head lamps are provided for better visibility during servicing and maintenance.
- **View Glass**
 - Across the fan section and tank, a View glass is provided to check the Air Washer operation.
- **Door Limit Switches**
 - Quality limit switches are provided across all the access doors to ensure safety against moving parts or risk of shock in the unit



**Standard
Accesories**

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Optional Accessories

- **Ultraviolet Lamps**

- UV lamps are factory fitted in our AHUs which provide maximum neutralization of airborne contaminants such as mold, bacteria, fungi, spores, allergens etc. These lamps direct UV rays onto the heat exchanging coil and drain pan thereby eliminating algae, mold growth.
- These can be placed upstream or downstream of the heat exchanging cooling coil. We use high quality, branded UV lamps for longer durability and higher performance of the system.



UV lamp

- **Volume Control Dampers**

- Various kinds of VCDs are supplied by Sagar Air for various applications. Out of all kinds, Rectangular / Square type - Opposed Blade type VCDs are commonly used in Air Handlers.
- VCDs primarily function to control the airflow rate of the Air Handler by offering resistance to the flow.
- VCDs are offered in two kinds of construction -
 - GI Construction
 - Extruded Aluminium profile construction
 - Stainless Steel construction
 - Can be Motorised / Non-Motorised.



VCDs

- **Sand Trap Louvers**

- Sand Trap Louvers are provided for fresh air intake. These systems are usually employed in dusty environments where filters get clogged very easily, Sand Trap louvers can be constructed out of Aluminum Powder Coated, GI Powder Coated as well as Stainless Steel depending on client's requirement



Sand Trap Louvers

- **Air Grilles - Supply and Return**

- Sometimes, direct discharge AHUs can be provided with Supply Air Grilles which direct incoming supply air directly into the conditioned space.
- These are constructed out of extruded aluminum which is duly tested from any leakages.



Supply Grilles

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Cooling Pads

SAGAR AIR Evapcool Airwasher units are equipped with high-quality and branded Evaporative cooling pads which are of CELdek / Hu-Tek / Eco-Cool / UltraCool make*. The pad is made of a cellulose (pulp) sheet and bonded together in a 7 mm flute size of 45 deg X 45 deg angle. The cellulose pad is cross-corrugated and coated with anti-rot, rigidifying, and wetting resins.

Product Specifications







CELdek / Hu-Tek / Eco-Cool / UltraCool pads use a specific specialty-grade cellulose paper of high quality. A proprietary resin inhibits any bacterial growth and decay ensuring long service life. It is a very precise process in order to maintain a healthy operating environment.

The cooling pads are designed for maximizing the evaporation efficiency by creating more contact time between the passing air and water ensuring better evaporation and cooling effect.



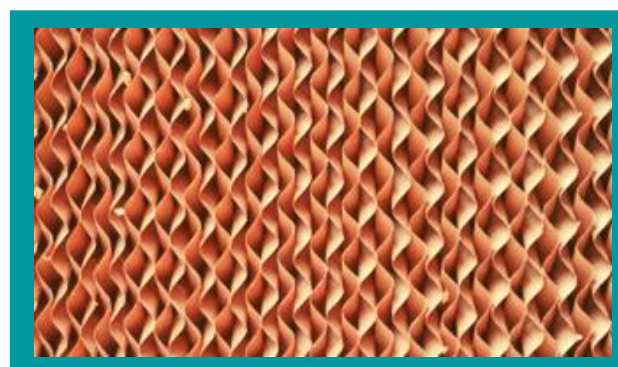
Cellulose Pad

Key benefits

-  High structural strength due to stiffening and rot-resisting agents
-  Highly durable. The anti-rot resisting agents prevent sagging, clogging assuring longer life
-  Quality glue. The glue doesn't peel even after staying in contact with water for years.
-  Low Operating Expenditure.
-  Reduced or eliminated odor
-  High Evaporation Efficiency

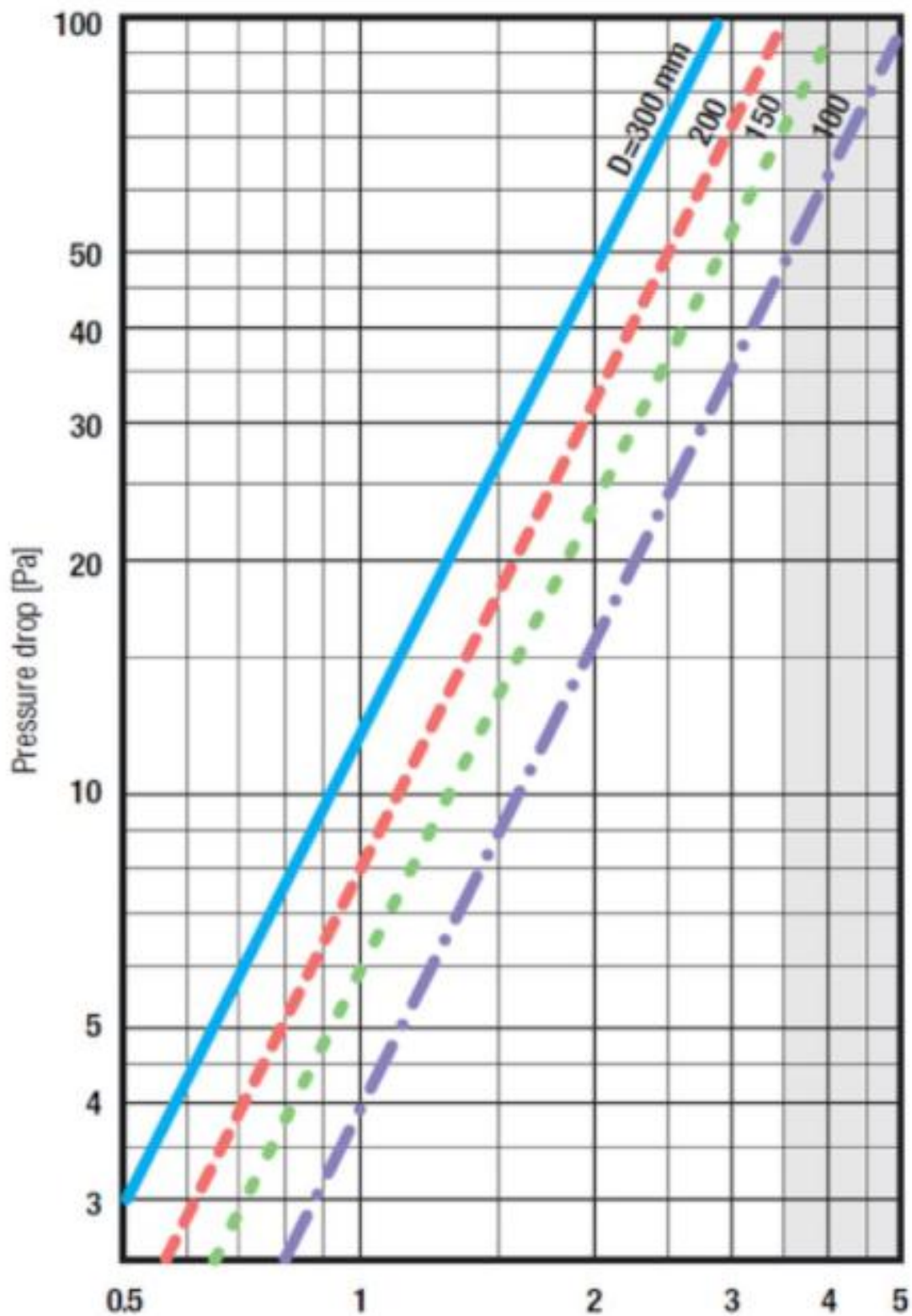
Standard Sizes of Cellulose Pads

Height (mm)	Width (mm)	Depth (mm)
1800	600	200 / 300
1200		
900		
600		



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Pressure Drop Curves

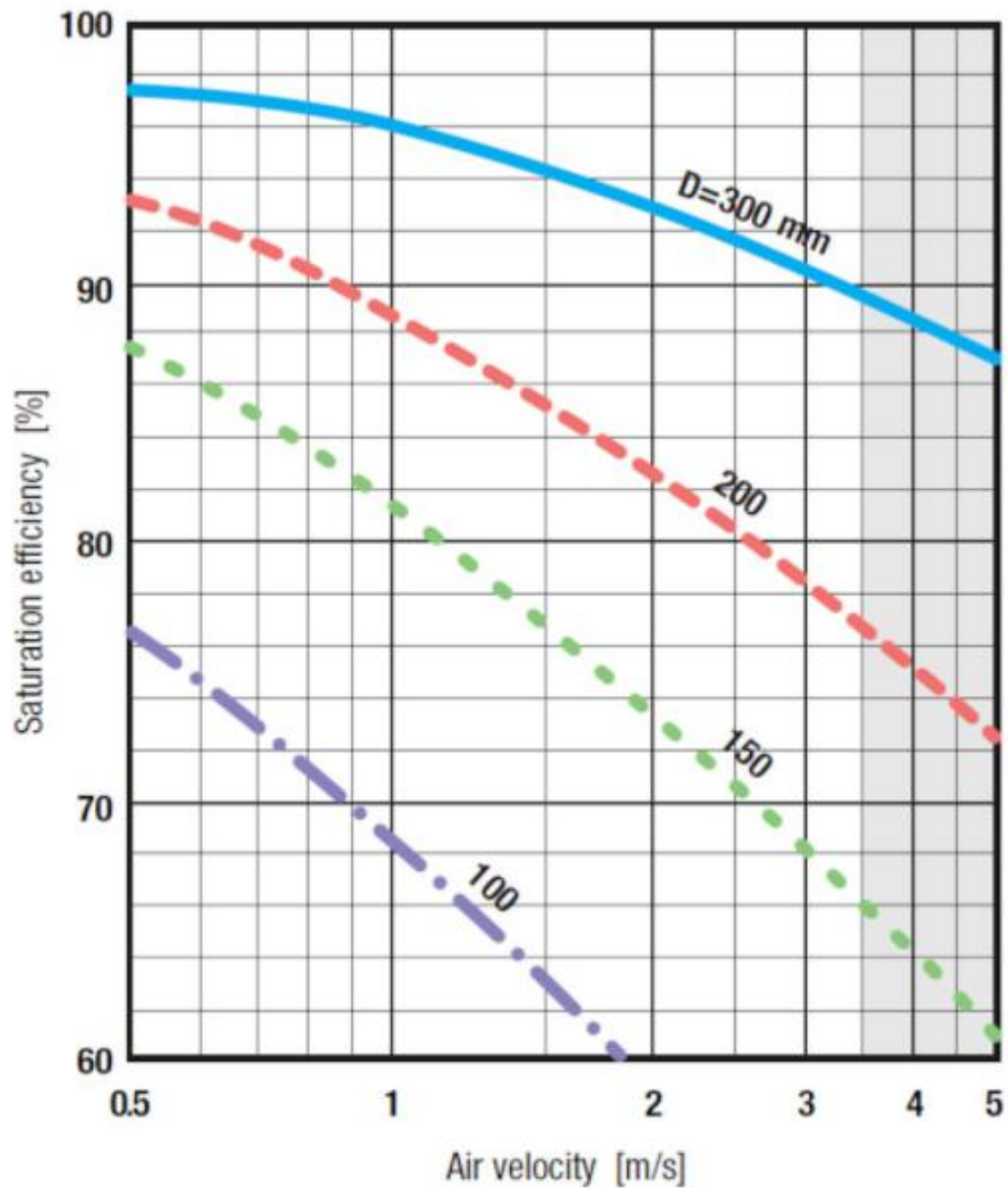


*CELdek Pad

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Saturation Efficiency Curves







*CELdek Pad



EVAPCOOL CONTROLLER

Sagar Air's Evapcool units can be equipped with an automatic electrical control panel with all the necessary safety interlocks and power protection systems.

Features & Benefits

-  Sturdy 16G Galvanised Iron panel construction
-  Fully automated with plug and play supply power
-  Illuminated indicators for easy visibility - SCHNEIDER
-  Branded Switchgear - SIEMENS / SCHNIEDER (UL RATED)

List of protections :

-  Phase Failure Protection - Neutral Failure
-  Pump Dry Run Protection with Water Level Indication
-  Blower Motor Failure protection
-  Motor Trip indications

Options :

- Remote Control Panel
- RITTAL IP67 Control Panel
- T+RH Sensors
- VFD Integration
- Auto PID Logic Controlling
- Fully Touch Integrated panel
- Auto Drain Tank Cycle feature
- EC Fan Control
- CFM Controlled Logic
- Filter Choke indicators



EVAPCOOL Controller

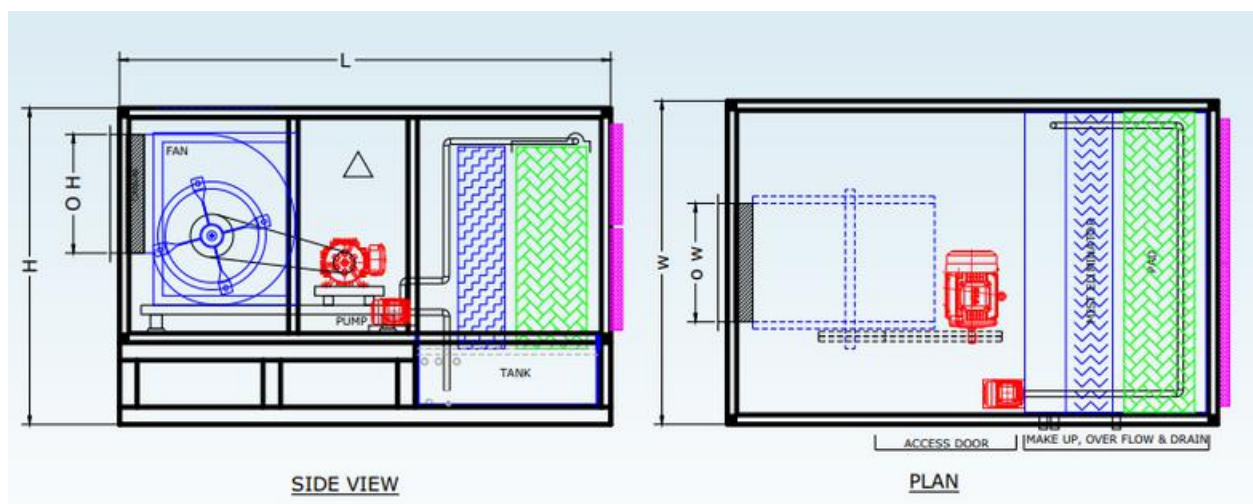
AUTOMATIC
CONTROL

Smart Air Washers

EVAPCOOL Series

Technical Specifications :

Evapkool Air Washer Units



Model SAACU	CFM	Fan	Fan Opening W X H (mm)	OV (m/s)	Pad Area sqm	Pad (mm)		OVR Dimensions (mm)			Motor kW		Pump kW
						W	H	L	W	H	50 mm SP	65 mm SP	
ACU-50	3000	FDA-315	404*404	8.7	0.56	915	610	1900	950	1200	1.5	1.5	0.37
ACU-70	4000	FDA-355	452*452	9.2	0.74	915	762	1950	1100	1250	1.5	2.2	0.37
ACU-85	5000	FDA-400	507*507	9.2	0.84	915	915	2000	1150	1350	2.2	3.7	0.37
ACU-100	6000	FDA-450	568*568	8.7	0.97	915	1067	2050	1200	1450	2.2	3.7	0.37
ACU-140	8000	FDA-500	638*638	9.3	1.48	1220	1220	2200	1400	1650	2.2	3.7	0.37
ACU-170	10000	FDA-560	714*714	9.2	1.86	1525	1220	2250	1600	1750	3.7	5.5	0.37
ACU-200	12000	FDA-630	800*800	8.8	2.23	1677	1220	2350	1800	1850	5.5	5.5	0.55
ACU-250	15000	FDA-710	898*898	8.8	2.79	1830	1525	2500	2000	2000	5.5	7.5	0.55
ACU-300	18000	FDA-800	1006*1006	8.4	3.35	1830	1830	2850	2200	2200	7.5	8.8	0.55
ACU-340	20000	FDA-800	1006*1006	8.5	3.71	2135	1830	2850	2400	2200	7.5	8.8	0.75
ACU-420	25000	FDA-900	1130*1103	9.2	4.65	2135	2135	3000	2600	2400	8.8	12	0.75
ACU-460	27000	FDA-1000	1263*1263	8.0	5.02	2440	2135	3100	2800	2500	8.8	13	0.75
ACU-500	30000	FDA-1000	1263*1263	8.8	5.61	2745	2135	3100	3000	2500	11	13	0.75

100% Fresh Air Units EVAPCOOL Series

Technical Specifications : Evapkool Air Washer Units - Double Blower



Model SAACU-D	CFM	Fan	Fan Opening X 2 W X H (mm)	OV (m/s)	Pad Area	Pad (mm)		OVR Dimensions (mm)			Motor kW		Pump kW
					sqm	W	H	L	W	H	50 mm SP	65 mm SP	
ACU-750	45000	FDA-800	800*800	10.5	8.4	4600	1830	2800	4700	2300	11	13	1.1
ACU-850	50000	FDA-900	898*898	9.2	9.3	4400	2135	3000	5000	2400	11	13	1.5
ACU-950	55000	FDA-900	1006*1006	10.2	10	5000	2135	3000	5300	2400	11	15	1.5
ACU-1000	60000	FDA-1000	1130*1130	8.8	11	5300	2135	3100	5600	2500	13	15	1.5
ACU-1100	65000	FDA-1000	1130*1130	9.6	12	5000	2440	3100	5600	2500	13	15	1.5
ACU-1200	70000	FDA-1000	1130*1130	10.3	13	5400	2440	3100	6000	2500	15	17	1.5
ACU-1300	75000	FDA-1000	1130*1130	11	14	5800	2440	3100	6000	2700	15	17	1.5
ACU-1350	80000	FDA-1000	1130*1130	11.8	15	6100	2440	3100	6200	2800	17	17	1.5

|| PIONEERS IN HVAC SINCE 30 YEARS

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