CACTOOS WATER MANAGEMENT

AquaVentor

A new AWG technology

ABOUT US

I am Hossein Akhavi, founder of the CACTOOS Company in Dubai.

Considering the current water scarcity crisis, I have dedicated the last 40 years to developing innovative and green solutions for water production and saving water with no harm to the environment. I have invented sustainable methods that prioritize environmental preservation. My commitment is not only to solve the water crisis but also to preserve water resources and protect nature, ensuring harmony between progress and the planet we call home.

The result of my research and studies have been officially registered as three patents, internationally and in USPTO, and the commercial name of this technology is **AquaVentor**, a new AWG technology (Atmospheric Water Generator).

AquaVentor can be used to:

I. Produce water for urban water systems

II. Produce water independently in industrial, residential and commercial complex and etc.

III. Decrease the water consumption in the cooling towers.

AQUAVENTOR

Humid air along with fog particles and water vapor enters the AquaVentor device horizontally and passes through the air guidance inlet louvers, then it is washed and cooled in cross flow situation by water with the right flow rate and the right temperature. At this time, the large particles of fog and water vapor will be bigger, separated from the air and will fall into the tank along with water. (Image 1). After passing through the next louvers, washed and cooled air enters the row of micron dehumidifier eliminators horizontally at a suitable speed. There, the remaining large particles of fog and water vapor are trapped, separated from the air and fall into the tank.

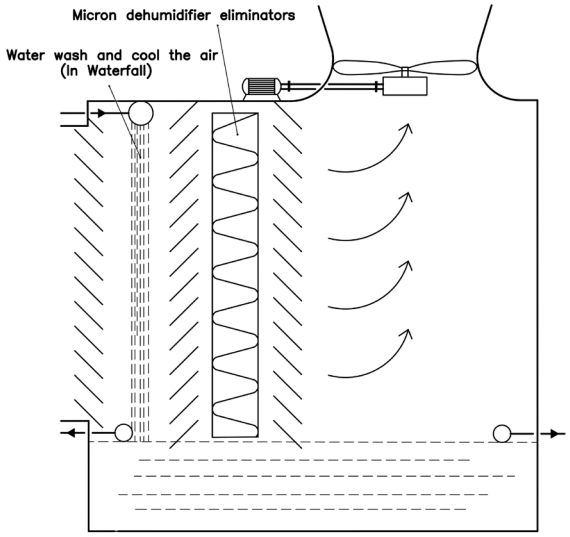


Image 1

This technology and device can be used for:

I, II) Water production by collecting moisture, fog, and water vapor in coastal areas and on the sea surface and then converting them into water.

III) Reducing water consumption in cooling towers and other evaporative processes.

WATER PRODUCTION

Condition I. Water production by collecting moisture, fog, and water vapor in coastal areas and on the sea surface and converting them into water (cooling the water of AquaVentor's tank by seawater):

The humidity ratio and relative humidity are very high in the air of coastal areas and on the sea surface. Therefore, the idea of doing this operation has already been researched, but the method that we have presented and done, and the equipment we use, are completely unique. (Image 2)

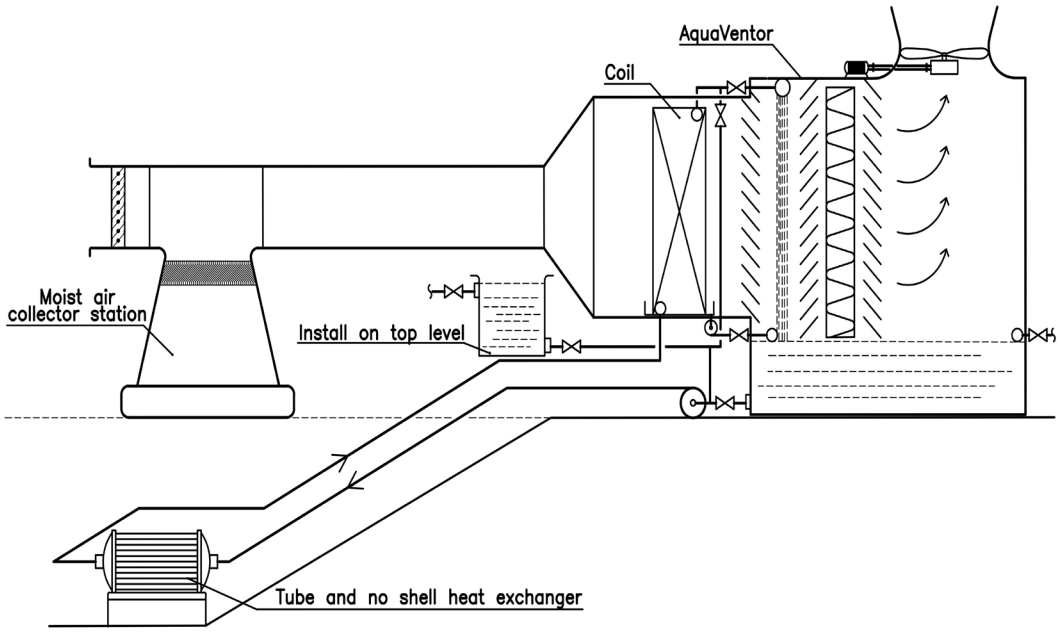


Image 2

When collecting moist air is intended only for the specified coast, there is no need for an air collection station, fog and vapor collector, float, and channel, because the coastal moist air directly enters the "AquaVentor". To improve the AquaVentor efficiency, water filling and system commissioning; a water-air coil has been added to AquaVentor. All equipment and piping routes must have check valves and drain valves, and each pipe and equipment must have an on-off valve for both inlet and outlet flow.

With this technology, there is no sewage, salt, etc., therefore, the water produced by this technology is environmentally friendly. And it is without any loss or damage to the region, the environment, people and living beings, the sea, and marine plants and animals.

This technology's energy and electricity consumption to produce each liter of pure water without salt and other impurities in summer is 0.044 KW.Hr and in winter is 0.032 KW.Hr.

The highest water production capacity with this technology and with one module (AquaVentor unit equipped with one fan, one electromotor, and one gearbox) in summer is 420,000 liters/day and 580,000 liters/day in winter.

For higher capacities, several modules should be used together.

Condition II. For inland areas, far from the sea: If we want the output water of the device not to be subsequently cooled by seawater, etc., in this case, a fog and vapor collection station, as well as tubes and no shell heat exchanger and coil, would be unnecessary.

In this condition (with 30% relative humidity and up), by AquaVentor, every residential, commercial, industrial complex and etc., in coastal areas, can be independent of any urban water system, supply their required water themselves.

To produce each liters of pure water without salt and other impurities, the total electrical power consumption of the device's electrical equipment, such as the fan's electric motor and electro pump, is according to the table 1.

Table 1

Model	Water production Lit/day	kWh/L	Dimensions (Meters)
Largest Model Condition I In Summer	420,000	0.044	16×13×13
Largest Model Condition I In Winter	580,000	0.032	16×13×13
Largest Model Condition II	350,000	0.053	15×13×13
Smallest Model Condition II	2,500	0.11	4×2.4×2

Note: All data in this table was recorded at an ambient temperature of 30°C, 80% RH.

AquaVentor, AV2500

TECHNICAL DATA TABLE:

Item	Description	Value
Physical Specification	Dimensions (meters) (L × W × H)	4 × 2.4 × 2
	Dry Weight	1500 Kg
Working Condition	Relative Humidity	>25-30% Relative Humidity
	Temperature	At any temperature
Production Capacity	At 30C°, 80% RH	2,500 liters per day
Noise Level	At 3m distance	75 dB
Electricity	Power Supply	3Phase, 380-400V, 50Hz
	Power Consumption	10.4 kW
	Ampere rating at rated condition	19.8 A
	Energy Efficiency	0.11 kWh/L

WATER SAVING IN COOLING TOWERS

III. Reducing water consumption in cooling towers and other evaporation processes

After installing the AquaVentor device in the tower and activating its technology (Images 5,6); the extremely humid air output, before the fan is washed and cooled with water from the basin with a right flow rate and a right temperature (in counter flow towers, the airflow path in the AquaVentor will be horizontal and the water flow from the basin will be vertical). The fog and vapor particles are trapped, separated from the air, adhere to the walls of the eliminators, and then fall into the basin. In the micron dehumidifier, the amount of moisture and the relative humidity of the air decrease.

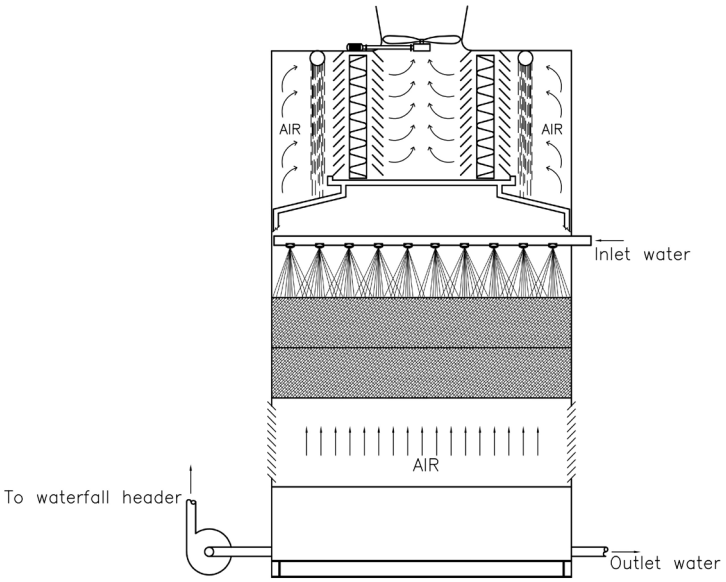


Image 5

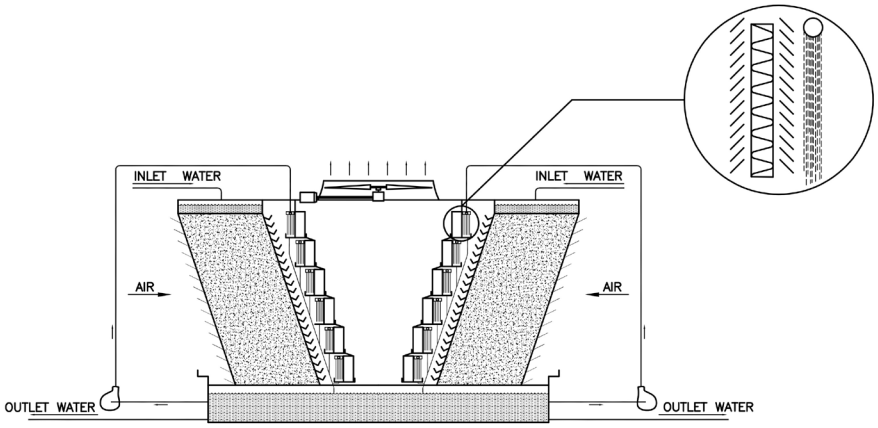
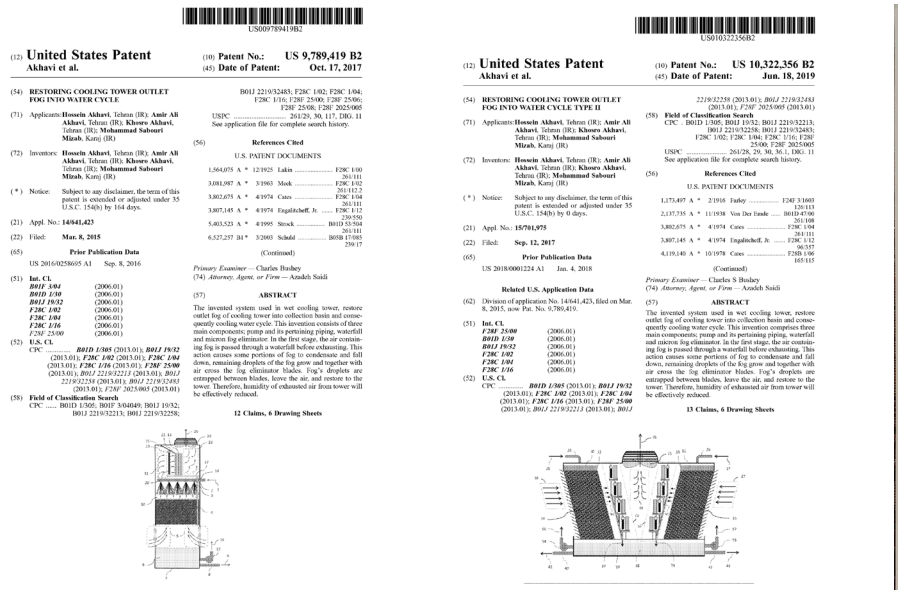


Image 6

Wet cooling towers in large industrial sites such as power plants, refineries, steel complex, petrochemicals, etc., which are large and built in several cells, consume a lot of water throughout the year. Installation of AquaVentor technology in these existing and working towers and also in the towers that will be designed and built in the future; can reduce the water consumption of cooling towers by 60% - 70% annually (up to 55% in summer and hot days of the year, and up to 95% in winter and cold days of the year).

When this technology exists in a tower; If only AquaVentor is turned off from the circuit in one cell of the tower, the capacity of this cell will be about 2 times more. Because in this cell, coolant surfaces and the capacity of the fan and electromotor have increased. In other words, the RELIABILITY and RESILIENCY of the tower will be increased.



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(12) **United States Patent**
Akhavi et al.

(10) **Patent No.: US 9,789,419 B2**
(45) **Date of Patent: Oct. 17, 2017**

(54) **RESTORING COOLING TOWER OUTLET FOG INTO WATER CYCLE**

(71) Applicants: **Hossein Akhavi**, Tehran (IR); **Amir Ali Akhavi**, Tehran (IR); **Khosro Akhavi**, Tehran (IR); **Mohammad Sabouri Mizab**, Karaj (IR)

(72) Inventors: **Hossein Akhavi**, Tehran (IR); **Amir Ali Akhavi**, Tehran (IR); **Khosro Akhavi**, Tehran (IR); **Mohammad Sabouri Mizab**, Karaj (IR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 164 days.

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F28C 1/16	(2006.01)
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(52) **U.S. Cl.**

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(58) **Field of Classification Search**

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See application file for complete search history.

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(57) **ABSTRACT**

The invented system used in wet cooling tower, restore outlet fog of cooling tower into collection basin and consequently cooling water cycle. This invention consists of three main components; pump and its pertaining piping, waterfall and micron fog eliminator. In the first stage, the air containing fog is passed through a waterfall before exhausting. This action causes some portions of fog to condensate and fall down, remaining droplets of the fog grow and together with air cross the fog eliminator blades. Fog's droplets are entrapped between blades, leave the air, and restore to the tower. Therefore, humidity of exhausted air from tower will be effectively reduced.

12 Claims, 6 Drawing Sheets

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(12) **United States Patent**
Akhavi et al.

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(45) **Date of Patent: Jun. 18, 2019**

(54) **RESTORING COOLING TOWER OUTLET FOG INTO WATER CYCLE TYPE II**

(71) Applicants: **Hossein Akhavi**, Tehran (IR); **Amir Ali Akhavi**, Tehran (IR); **Khosro Akhavi**, Tehran (IR); **Mohammad Sabouri Mizab**, Karaj (IR)

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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F28C 1/04	(2006.01)
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USPC ..... 261/29, 29, 30, 36.1, DIG. 11

See application file for complete search history.

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(57) **ABSTRACT**

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13 Claims, 6 Drawing Sheets

TECHNICAL PAPERS

TP25-04 – Collecting Moisture, Fog and Water Vapors then converting them into Water
Hossein Akhavi, Tajang Ultra Energy
2/03/25 – 9:00 AM

The crisis of water shortage and dehydration in the world shows itself more and more every day. Its consequences, such as land subsidence and the creation of sinkholes, have become dangerous and crisis-causing on their own and independent of the cause. There are also other economic, agricultural and social problems in this regard.

Currently, all countries in the world are looking for solutions that firstly do not cause other environmental problems, secondly, with the lowest amount of energy consumption, and thirdly, cost-effectiveness.

In order to supply water, most of the countries have tumed to desalination with different technologies to prepare and supply desalinated water from the sea. (In this article, the word "sea" refers to all oceans, seas, lakes, bays, etc. on the planet.)

Desalinations with any technology have their own defects and problems. For example, for every cubic meter of drinkable water, it produces nearly two cubic meters of hot, bitter, and salty wastewater, which is eventually returned to the same sea, and this causes environmental, social, and economical problems. Or excessive salt residue left behind can be difficult to dispose of, and many other issues for the region and locals are caused by desalinations.

Another one of these solutions that has attracted the attention of experts and specialists; "Collecting fog and vapors on the surface of seawater, then directing it to the shore and condensing facilities and equipment, and finally converting fog and vapor into desalinated water" that can be used by people and for agricultural and industrial consumptions.

This is HOSSEIN AKHAVI, CEO of TAJANG ULTRA ENERGY Co. in Tehran, Iran. A professional expert engineer with 37 years of experience in designing, manufacturing and developing cooling towers, hybrid & adiabatic cooling towers and other free cooling systems. We designed and fabricated more than 150 great industrial cooling towers.

PAPER NO: TP25-04
CATEGORY: WATER MANAGEMENT

COOLING TECHNOLOGY INSTITUTE

COLLECTING MOISTURE, FOG AND WATER VAPORS THEN CONVERTING THEM INTO WATER

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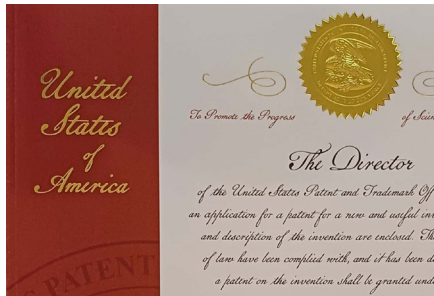
HEDIYEH AKHAVI
AMIRALI AKHAVI

TAJANG ULTRA ENERGY

COOLING TECHNOLOGY INSTITUTE

75th Anniversary



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