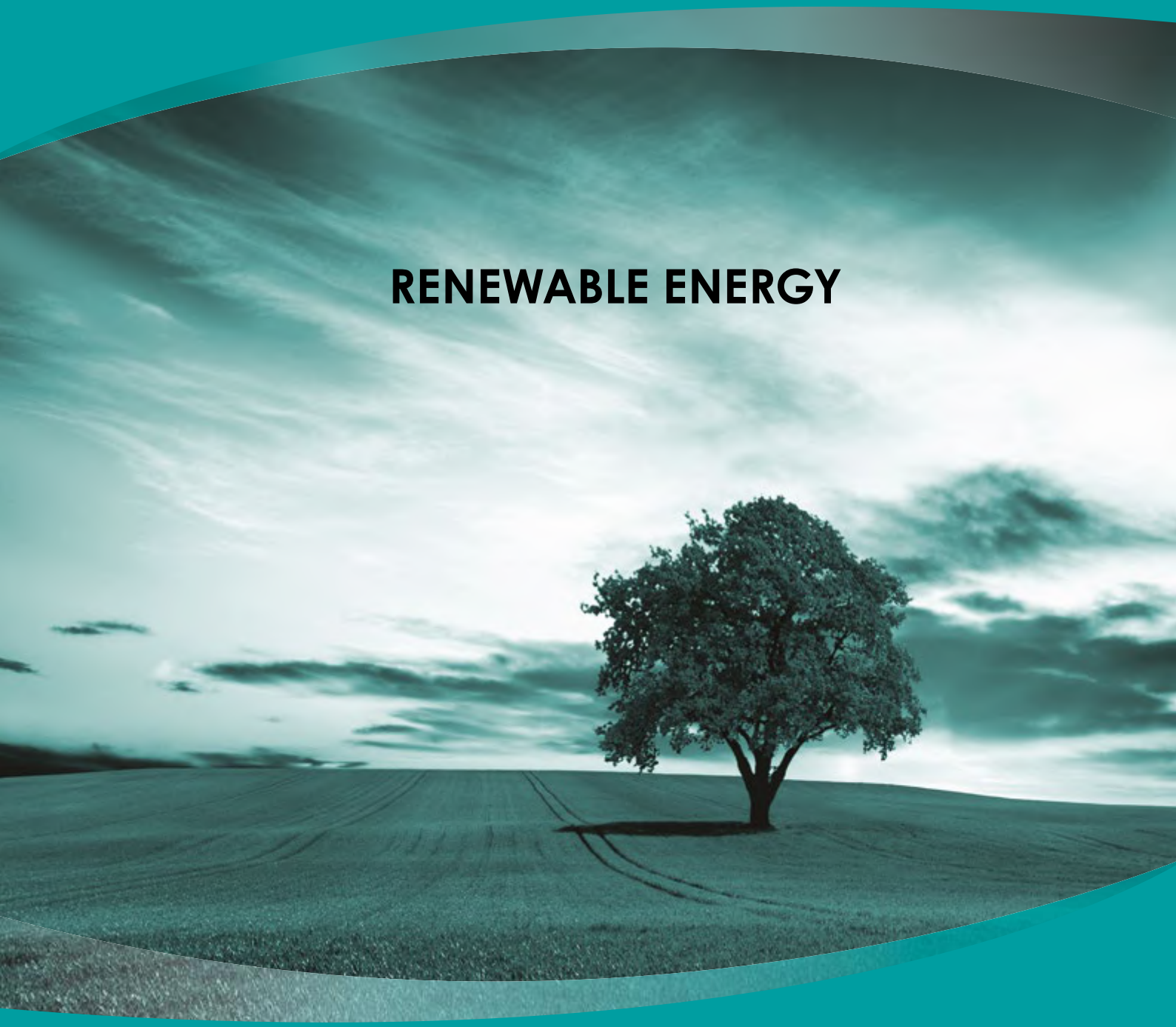
CANOVATE®

ENERJİ SİSTEMLERİ

INDUSTRIAL & RESIDENCE HEAT PUMPS WITH

HEATING **COOLING** **HOT WATER**



www.canovateenerji.com

CANOVATE® ENERJİ SİSTEMLERİ A.Ş.

Our company, abiding by innovation spirit expressed within its name (Can-inovate), has brought plenty of innovations in the fields of electronic, IT, communication, energy, construction etc. with our country since the year of 1965. In addition to having a lot of representation offices in many places of the world, it works as solution partner together with lots of companies as well.

Our company, performing production activities in an area of 40.000 m2 in Çekmeköy, develops innovative devices intended for heating, Coolant and hot water by using renewable energy. While this production activity makes contribution for the economy of our country to be independent from energy, it also enables consumers to keep their money in their pockets.
Starting its journey with German cult, our company has successfully completed a lot of R&D projects so as to make renewable energy more common, and submitted plenty of devices having unique properties and to be known as;

- Eco-friendly,
- The most highly efficient ever,

For the use of our customers in housing, Shopping Malls and in process technique.

To more ecological, climate friendly and cost-effective tomorrows with renewable energy...

FOR LIFE...
CANOVATE® HEAT PUMPS

SPLIT Air Source Heat Pumps
8-34kW (Compact)

Brine and Water Heat Pumps
100-500 kW

Water Source Industrial Heat Pumps
100-500 kW

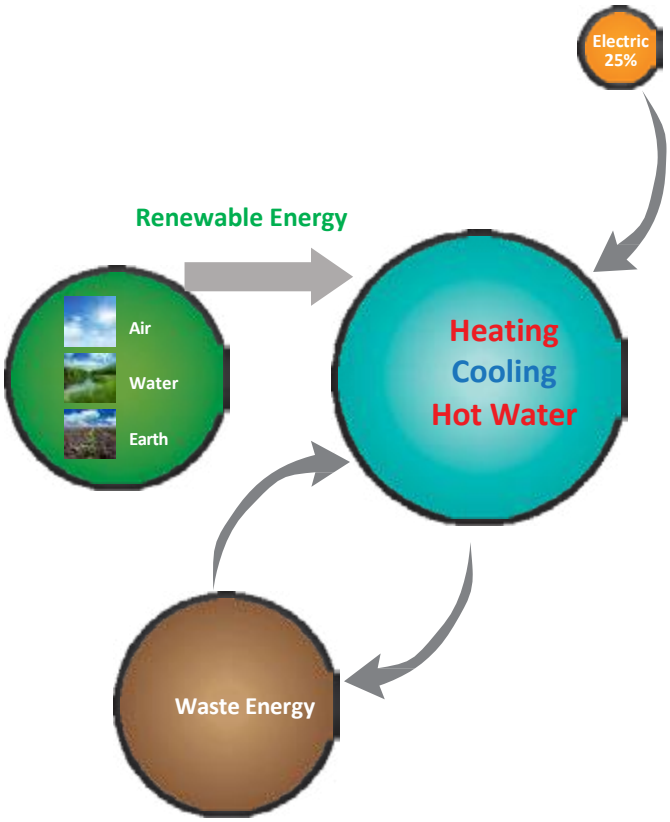
Earth & Water Source Retrofit Air Pumps
8-200 kW

Air & Industrial Source Heat Pumps
50-220 kW

ENERGY SOURCE
RENEWABLE ENERGY + WASTE HEAT

CANOVATE® Heating Systems operate with renewable energy sources (water, air, earth heat) without using fossil fuels (coal, gas and petroleum products). They are the most effective heat recovery systems that human being has ever developed through existing technology.

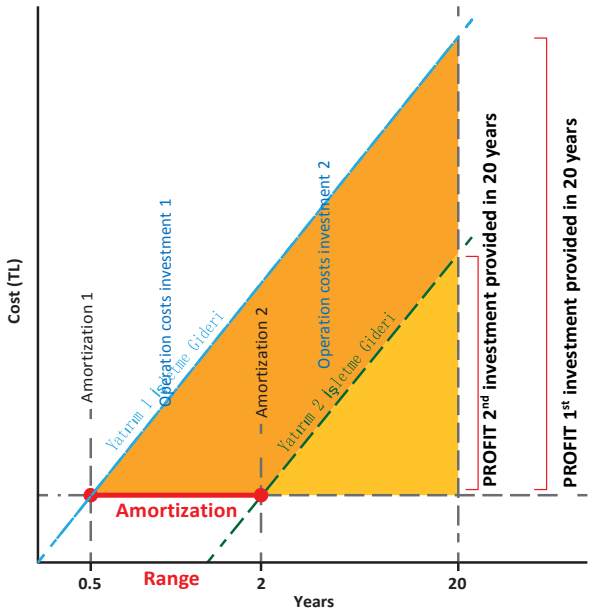
It provides additional saving by using waste heat as well as renewable energy source. Heat taken out in ventilation systems of residences, offices; heat taken out from kitchens, welding workshops through ventilation systems; heat of hot water going to drainage systems in process, washing plants; and heat in flue gas etc. are called as WASTE HEAT. CANOVATE® RIS (Retrofit Heating Cooling) innovative devices recover the said waste heat. It increases productivity (efficiency number) from ordinary values of 3-6 to 9-12



PERIOD OF REDEMPTION

First investment period of redemption of CANOVATE® Heat Pumps providing unique energy efficiency and cost-effectiveness in heating, cooling and hot water is very short as well. It is a very profitable investment redeeming itself in a short time.

CANOVATE® renewable energy systems redeem themselves within 0.5 and 2 years. They provide their users with profit in their technical lifetime, 20 years.



HEATING, COOLING, HOT WATER WITH RENEWABLE ENERGY

Split Type Compact Air Pumps

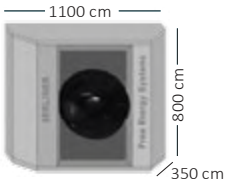
- It has been designed for regions, outside air temperature of which drops down to -20°C.
- It has no component that can lose heat in its outer unit. It operates as only energy source.
- When compared with other air pumps, it provides 30% additional saving with its EVI technology and heat recovery exchanger
- It prepares hot water in summers completely FREE through its plus heat value feature.
- It can perform all of, or the desired one of heating, cooling and hot running water. It takes 75% of the necessary heat for this from the air as FREE.
- It ideally operates with floor and wall heating systems. It provides for systems with radiators with installation output heat temperature of 65°C. Big radiators increases efficiency.
- It performs refreshment via wall and floor pipes, and, active cooling with fan coils.
- It does not need additional accessories due to its compact design (plug and start).
- It is suitable for any kind of living space.
- Turn on/off and temperature setting can be remotely performed.

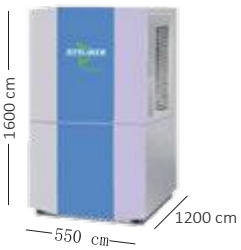
HEATING, COOLING, HOT WATER WITH RENEWABLE ENERGY

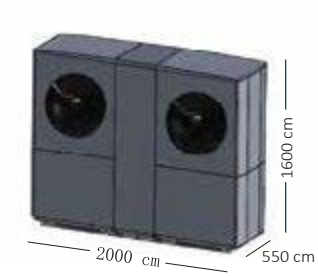
Split Type Compact Air Pumps

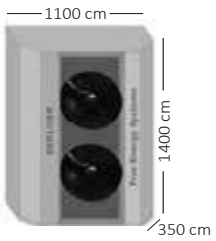
- It has been designed for regions, outside air temperature of which drops down to -5 °C.
- It is compact single unit.
- It prepares hot water in summers completely FREE through its plus heat value feature.
- It can perform all of, or the desired one of heating, cooling and hot running water.
- It takes 75% of the necessary heat for this from the air as FREE.
- It ideally operates with floor and wall heating systems. It provides for systems with radiators with installation output heat temperature of 65 oC. Big radiators increases efficiency.
- It performs refreshment via wall and floor pipes, and, active cooling with fan coils.
- It does not need additional accessories due to its compact design (plug and start).
- It is suitable for any kind of living space.
- Turning on, turning off and temperature setting can be remotely performed.

CANOVATE® Combiline



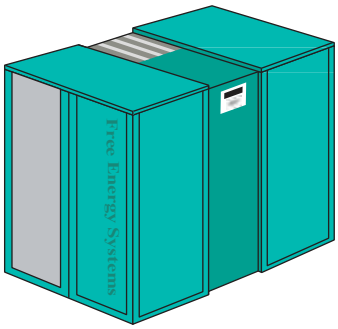


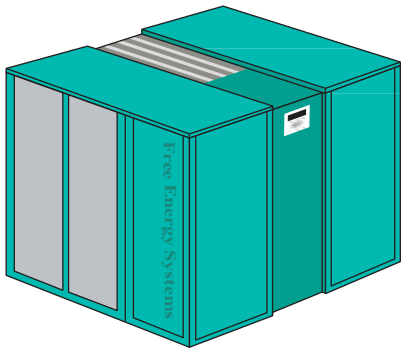




		Type	A/W-R+8	A/W-R+12	A/W-R+17	A/W-R+24	A/W-R+34
CAPACITY DATA (It is capacity value at the operation point of A7/W35x1 according to EN 255).			Compact-Single Stage			Modular-Compact-Double Stage	
HEAT POWER		kW	7.9	11.5	16.9	2.4	34.4
Performance number		(COP)	4.6	4.6	4.6	4.15	4.1
Power drawn from electric		kW	1.7	2.5	3.5	5.4	7.8
HOT WATER (10-45 °C)		lt/min.	7	10	13	20	26
COOLING	kW		6.2	9	14	18	28.2
	COP		3.5 (+5.8)*	3.6 (+5.8)*	3.6 (56)	3.5 (+5.8)	3.5 (+5.6)
	kW		8	11	17	22	34
	COP		5.6 (+6.50)*	3.6 (+5.63)	3.7 (+5.1)	5.6 (+6.63)	5.6 (+6.1)
INSTALLATION							
Circulation Pump			Wilo Top S 25/7			Wilo Top S 32/10	
Minimum volume x 3		Liter/h	1000	1600	2200	4000	5800
Maximum input temperature		°C	58	58	58	58	58
Maximum operating pressure		bar	3	3	3	3	3
Installation connections running water connections			1”	1”	1”	11/4”	11/4”
			“	“	“	“	“
INSTALLATION		IP 20	220/240 V - 1-50 Hz ve 3/N/PE 400 V ~ /50 Hz			3/N/PE 400 V ~ /50 Hz	
Time current		A	15	25	32	42	55
DIMENSION							
UNIVERSAL	HxWxD	mm	1600x1000x550			1600x200x55	
	Weight	Kg	156	176	186	175+200	180+210
SPLIT	HxWxD	mm	1200x1000x600			1200x1000x600	
	Weight	Kg	120	130	140	260	300
	HxWxD	mm	700x1000x350			1200x1100x350	
	Outer Unit	Kg	115			170	

AIR SOURCE RETROFIT HEAT PUMPS





BERLINER Retrofit Devices Operating at low temperatures (58 °C) – Air Sourced

Heating Output Temperature Maximum 58 °C/Cooling Output Temperature Minimum 7 °C/Running Water Temperature Maximum 55 °C

Models	Heating (kW)	Cooling (kW)	Electric Consumed (kW)	Hot water L/min. 10 °C/40 °C	Winter Heating COP	Summer Heating/ Cooling COP
BERLINER A-Ws/W 60 + RTL	60.2	64.2	13.6	1720	4.38	9.36
BERLINER A-Ws/W 90 + RTL	90.2	96.6	20.8	2500	4.36	9.34
BERLINER A-W /W 120 + RTL	120.1	128.8	27.5	3440	4.32	9.32

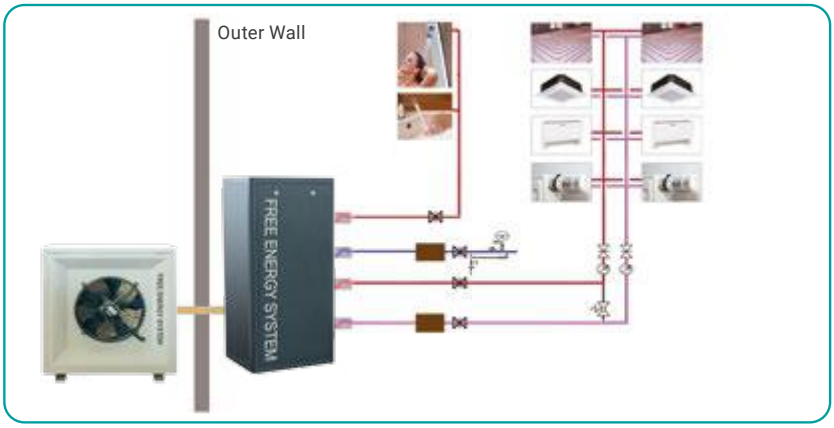
BERLINER Retrofit Devices Operating at high temperatures (65 °C) - Air Sourced

Heating Entry Temperature Maximum 65 °C/Cooling Entry Temperature Minimum 7 °C/Running Water Temperature 65 °C

Models	Heating (kW)	Cooling (kW)	Electric Consumed (kW)	Hot water L/min. 10 °C/40 °C	Winter Heating COP	Summer Heating/ Cooling COP
BERLINER A-Ws/W 50 + RTH	51.4	53	12.14	1470	4.23	9.01
BERLINER A-Ws/W 78 + RTH	77.7	79.5	18.6	2220	4.22	9.04
BERLINER A-Ws/W 104 + RTH	102.8	106	48.56	2900	4.20	9.02

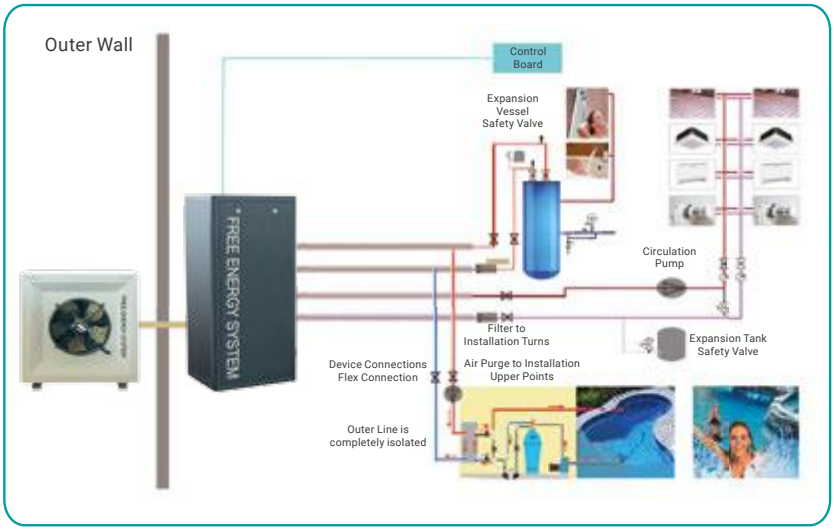
B: Primary Energy Source Air; **Ws:** Secondary Energy Source Installation Water; **W:** Water; **RT:** Retrofit; **RT-H:** Performance Values of Retrofit Operating in High Temperature (65 °C) Chiller in Summer Position Input/output (7 °C - 12 °C) Hot Water Input/output (45 °C - 40 °C) operating points are based. In winter heating norm value (W10/W35) is based.

Connection Scheme Samples According to System



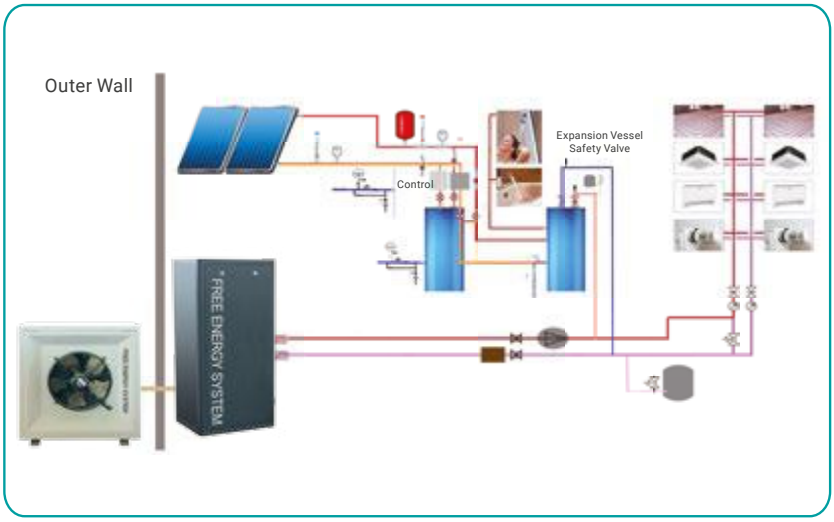
SYSTEM 1: HEATING/COOLING/ HOT WATER (Without boiler)

It is compact system that does not require pump, security systems, expansion vessel, installation equipment (boiler, accumulation etc.). It provides hot water that is enough for an ordinary apartment.



SYSTEM 2: HEATING/COOLING/ HOT WATER + POOL + BOILER

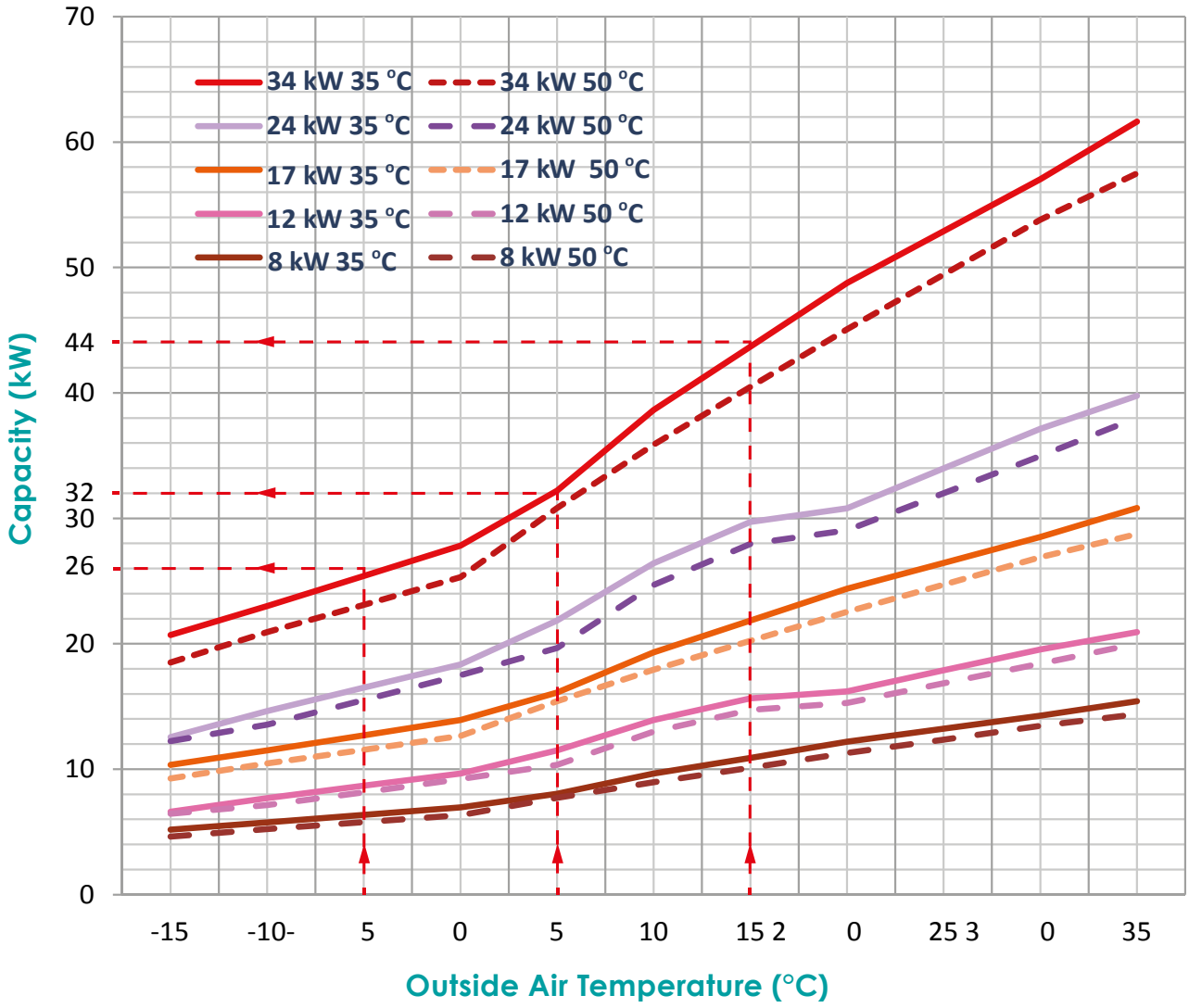
It is compact system that does not require pump, security systems, expansion vessel, installation equipment (boiler, accumulation etc.). Boiler is added for excessive hot water. When desired, it can perform pool heating as well.

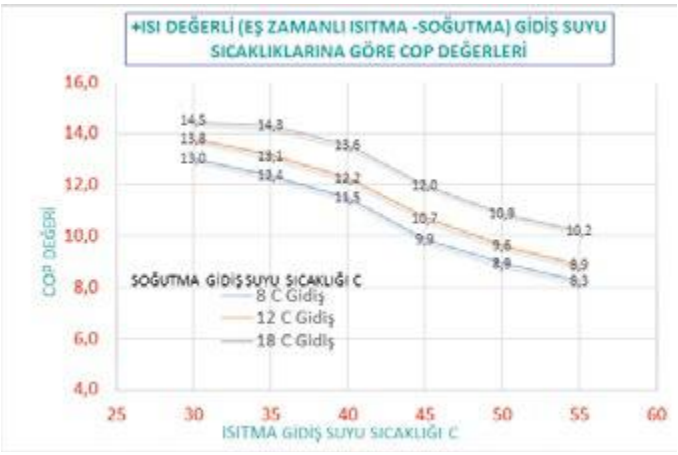


SYSTEM 3: HEATING/HOT WATER + SOLAR ENERGY

It is solar heat reinforced system. It uses the energy taken from the sun in hot water preparation and central heating systems in a maximum level. Provided that solar heat is enough, the device does not operate. It operates and provides necessary heat when the solar heat is not enough. It never make concession to comfort. It is ideal for places where excessive hot water is needed but not cooling at the same time. Note: Provided that the device is to operate mostly for cooling in summers, solar heat system is not required. It can produce hot water FREE in residences where cooling is performed without needing solar system.

COMBİLİNE A/W-R + 8,12,17,24,34 HEATING CAPACITY CHANGE GRAPHICS DEPENDING ON OUTSIDE WEATHER TEMPERATURE





Minimum outside weather temperature should be based in selection of the device. Device capacities are given according to norm values (according to 7 °C air temperature). For example; CANOVATE® A/W 34 device, norm capacity of which is 34 kW gives 26 kW in -5 °C and 44 kW in +5 °C outside weather temperature.

The device should be selected by basing design and outside air temperature, and, for cold regions, a second device or electrical heater that can operate as alternative should be used.

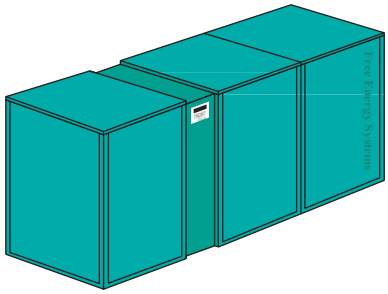
HEATING, COOLING, HOT WATER WITH RENEWABLE ENERGY

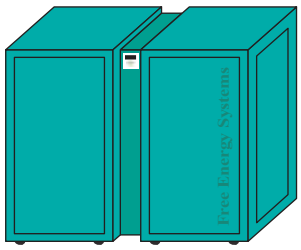
- It obtains heating, cooling and hot water with one single device.
- It takes 80% of the energy it uses from the earth as FREE.
- It provides maximum energy efficiency, and protects the environment and climate.
- Through its plus heat value feature, produces hot water completely FREE; and performs cooling 80-85% cheaper in summers when compared with air-conditioners, VRV or other systems.
- It performs all of, or only the desired on of heating, cooling and hot water.
- It operates ideally together with floor and wall heating systems, and performs cooling (refreshment) with the same system, and performs very active cooling together with fan coil on demand.
- It provides installation output water temperature of 65 °C for the systems with radiators. Selection of big radiators increases efficiency.
- It has a compact structure. It does not need pump, expansion tank, safety valves, boiler etc.
- It is the most suitable device for any kind of living space and natural life.

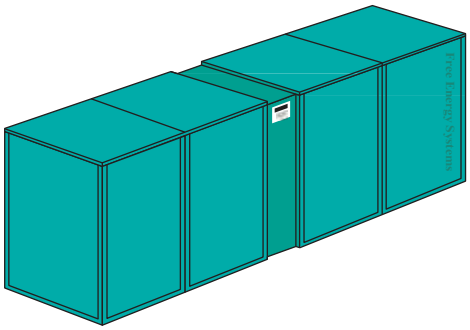
CANOVATE® Combiline

Earth Source Air Pumps with Plus Heat Value							
Model		B/W-R+12	B/W-R+16	B/W-R+20	B/W-R+24	B/W-R+32	B/W-R+40
CAPACITY DATA (It is capacity value at the operating point of B0/W35x1 according to EN 255.).		Compact-Single Stage			Modular-Compact-Double Stage		
HEAT POWER	kW	11.9	16.2	20.20	24	32	40
Power Drawn from electric x 2	kW	2.80	3.6	4.80	5.6	6.78	8
Performance Coefficient	(COP)	4.5	4.52	4.50	4.5	4.6	4.6
Electrical Additional Heating	kW	3/6	3/6	3/6	3/6	3/6	3/6
Hot Water	Liter/minute	18	22.2	28.2	30	38	46
COOLING							
Capacity (kW)/COP	B20/W8	11.4/6.6	15.2/6.1	18.2/6.1	25.5/6.2	18.2/6.1	40.2/6.3
Capacity (kW)/COP	B20/W18	14.4/8.3	21.5/7.6	25.6/6.9	28.9/6.8	44.6/7.2	48.6/7.2
Capacity (kW)/COP	B10/W8	11.6/6.7	18.1/8.5	21.8/8.6	26/8.5	21/8.6	30/8.6
Capacity (kW)/COP	B10/W18	12.1/8.5	14/9.5	17.7/9.4	20.7/9.2	25.7/9.4	35.6/9.4
PRIMARY CIRCUIT							
Circulation Pump	Type	Wilo Top S 25/7			Wilo Top S 32/4		
Minimum Volume x 3	Liter/h	3000	3900	5300	5600	7000	8500
Permitted Maximum Pressure Loss	mbar	90	90	100	130	60	100
Maximum Input Temperature	°C	25	25	25	25	25	25
Minimum Input Temperature	°C	-5	-5	-5	-5	-5	-5
Maximum Operating Pressure	bar	3	3	3	3	3	3
Installation Connections		1”	1”	1”	1 1/2”	2”	2”
SECONDARY (Central Heating) CIRCUIT							
Circulation Pump	Ty	Wilo Top S 25/7			Wilo Top S 30/7		
Minimum Volume x 3	Liter/h	1000	1400	1850	2200	2600	3200
Permitted Maximum Pressure Loss	mbar	55	65	60	31	110	160
Maximum Input Temperature	°C	58	58	58	58	58	58
Maximum Operating Pressure	bar	3	3	3	3	3	3
Installation Connections		1”	1”	1”	11/4”	11/4”	11/4”
ELECTRICAL CONNECTIONS							
Nominal Voltage	220/50 Hz	3/N/PE 400 V ~ /50 Hz					
Protection Class	IP 20						
DIMENSIONS HxWxD	mm	1050x 750x650	1050x 750x650	1050x 750x650	1050x 1050x650	1050x 1050x650	1050x 1050x650
Weight	Kg	130	136	142	130+90	136+100	142+110

EARTH AND WATER SOURCES CANOVATE® RETROFIT HEAT PUMPS







BERLINER Retrofit Devices Operating at low temperatures (58 °C) - Earth Sourced

Heating Output Temperature Maximum 58 °C/Cooling Output Temperature Minimum 7 °C/Running Water Temperature Maximum 55 °C

Models	Heating (kW)	Cooling (kW)	Electric Consumed (kW)	Hot water L/min. 10 °C/40 °C	Winter Heating COP	Summer Heating/ Cooling COP
BERLINER B-Ws/W 62 + RTL	61	66.6	12.76	1749	4.50	9.57
BERLINER B-Ws/W 78 + RTL	76	84.6	17.42	2179	4.47	9.48
BERLINER B-Ws/W 117 + RTL	117	126.9	26.20	3354	4.44	9.46
BERLINER B-Ws/W 150 + RTL	156	169.2	34.80	4472	4.38	9.47
BERLINER B-Ws/W 190 + RTL	184	194.8	39.32	5275	4.34	9.17
BERLINER B-Ws/W 250 + RTL	244	257.6	51.60	6995	4.35	9.15

BERLINER Retrofit Devices Operating at high temperatures (65 °C) - Earth Sourced

Heating Entry Temperature Maximum 65 °C/Cooling Entry Temperature Minimum 7 °C/Running Water Temperature 65 °C

Models	Heating (kW)	Cooling (kW)	Electric Consumed (kW)	Hot water L/min. 10 °C/40 °C	Winter Heating COP	Summer Heating/ Cooling COP
BERLINER Wp-Ws/W 53 + RTH	50.4	54.8	11.20	1445	4.30	9.13
BERLINER Wp-Ws/W 80 + RTH	79.5	82.2	16.77	2279	4.32	9.12
BERLINER Wp-Ws/W 100 + RTH	94.8	98.7	20.88	2718	4.27	9.45
BERLINER Wp-Ws/W 130 + RTH	126.1	131.6	27.84	3615	4.32	9.42
BERLINER Wp-Ws/W 160 + RTH	162.4	174.4	35.84	4655	4.29	9.01
BERLINER Wp-Ws/W 200 + RTH	201.6	216	44.80	5779	4.26	8.97

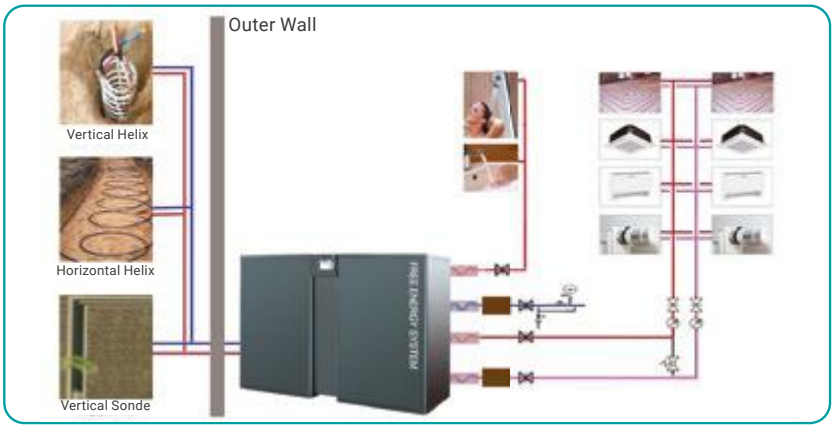
B: Primary Energy Source Earth; **Ws:** Secondary Energy Source Installation Water; **W:** Water; **RT:** Retrofit; **RT-H:** Performance Values of Retrofit Operating in High Temperature (65 °C) Chiller in Summer Position Input/output (7 °C - 12 °C) Hot Water Input/output (45 °C - 40 °C) operating points are based. In winter heating norm value (W10/W35) is based.

How does FREE energy occur?

Retrofit Heating and Cooling Devices are specially designed smart systems developed for hotels and factories, and simultaneously using a lot of energy sources, and using energy extremely efficiently. They try to cool the place where they take the energy, for example, the earth. However, the earth does not get cold since it continuously takes heat from the sun and the earth's core. CANOVATE® heats living spaces by directing the heat that it takes from there. Your energy costs corresponding 100 units reduce to 20 units. In other words, your fuel expenditures decrease at a rate of 80%. Temperature under the earth does not change much in summers and winters. It remains at an average temperature of 10-15 °C.

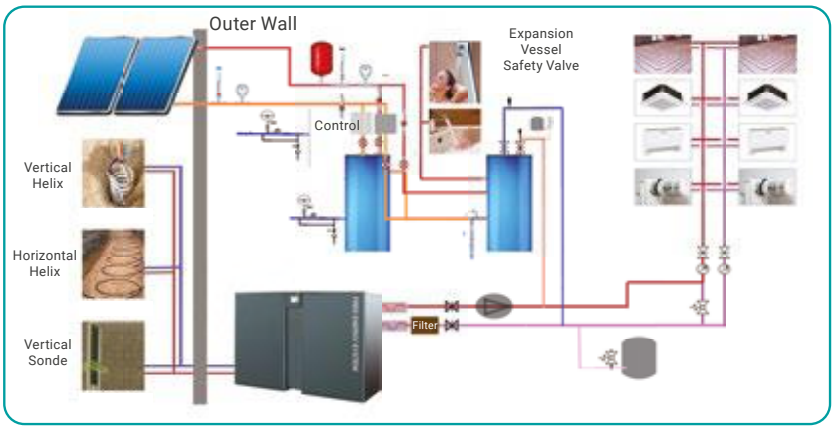
Heat is taken from the earth through PE pipes horizontal or vertically buried under the soil. Provided that the construction is newly being made and fore posts are to be used by force of its static structure, energy can be obtained there. Since Fore posts are placed due to static structure of building, they do not require an additional investment for heating. Therefore, it becomes the system, first investment cost of which is the most suitable one to get heat from the earth. The Device is connected to the installation like a boiler. It complies with cascade systems. It can parallel or alternatively operate with existing boiler system. You can get further information from our expert engineers or website; www.canovateenerji.com

Connection Scheme Samples According to System



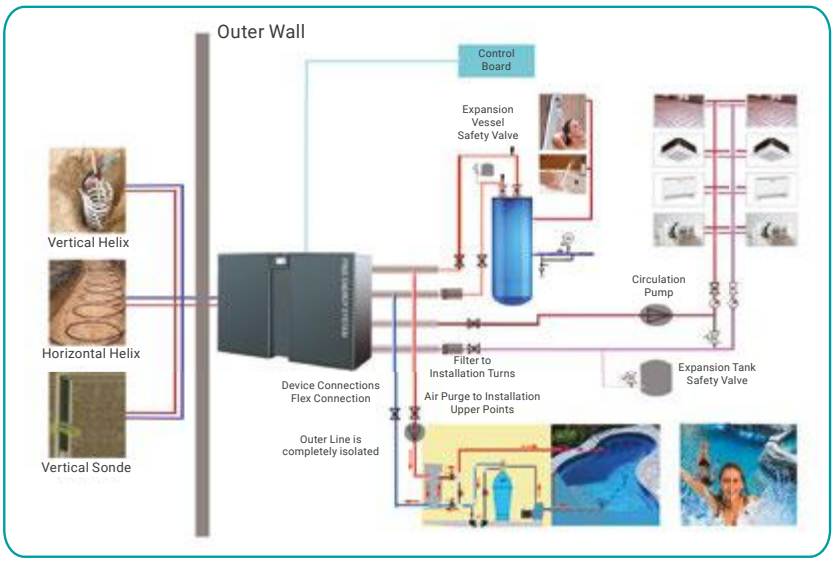
SYSTEM 1: HEATING/COOLING/ HOT WATER (Without boiler)

It is compact system that does not require pump, security systems, expansion vessel, installation equipment (boiler, accumulation etc.). It provides hot water that is enough for an ordinary apartment.



SYSTEM 2: HEATING/COOLING/ HOT WATER + POOL + BOILER

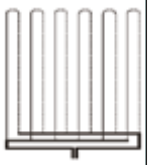
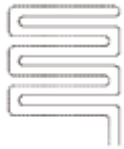
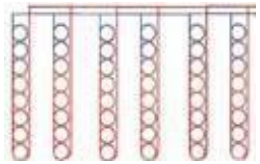
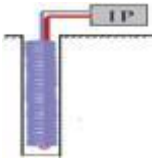
It is compact system that does not require pump, security systems, expansion vessel, installation equipment (boiler, accumulation etc.). Boiler is added for excessive hot water. When desired, it can perform pool heating as well.



SYSTEM 3: HEATING/HOT WATER + SOLAR ENERGY

It is solar heat reinforced system. It uses the energy taken from the sun in hot water preparation and central heating systems in a maximum level. Provided that solar heat is enough, the device does not operate. It operates and provides necessary heat when the solar heat is not enough. It never make concession to comfort. It is ideal for places where excessive hot water is needed but not cooling at the same time. Note: Provided that the device is to operate mostly for cooling in summers, solar heat system is not required. It can produce hot water FREE in residences where cooling is performed without needing solar system.

Techniques Of Taking Energy From The Earth

	Horizontal Systems				Vertical Systems		
Name of the Application	Tichelmann	Snail	U Modulation	Spiral	U-Sonde	Spiral Sonde	Fore Energy Posts
Type of Application							
Required Earth Space	More= nearly twice as much as m² of residence				Little	Medium	Absent
Application Depth	1.2 m			1.2 m	50 – 300 m	1.5 – 4.5 m	15 – 60 m
Amount of Excavation	More			Medium	16 cmx150 m boring	Drilling 40 cmx3 m boring	Diameter 80 cm-2 m
Legal Permission	Not necessary				Maybe necessary	Not necessary	Necessary
Application Costs	Low			Lower	High	Medium	Very Low
Later Application	Yes				Yes	Yes	No
Modul	DN25-50 cm, DN32-64 cm, DN40-80 cm			5 m at least	Boring distance 5-10 m	3 m at least	5 m at least
Total Dev. Fluid Hot	-3 to 5°C				0 to 3°C	-3 to 5°C	2 to 2°C
Total Specific Heat (*) - Bad	10 W/m²			50 W/m- Helix	25 W/m	100-400 W/Spiral	25 W/m
Total Specific Heat (*) - Medium	20-30 W/m²			100 W/ m-Helix	50 W/m	400-600 W/Spiral	50 W/m
Total Specific Heat (*) - Good	40 W/m²			200 W/m- Helix	80 W/m	600-700 W/Spiral	80 W/m
Average values used for 100 kW > System	25 W/m²			100 W/m- Helix	50 W/m- Well	500 W/Spiral	50 W/m-Post

Sample: *A building needing 48 kW heating will be heated via BERLINER B/W48 R+ earth source heat pump (COP=4.8). Calculation of primer (earth heat) circuits according to*

Heat taken from the earth (Watt)

$$\frac{\text{Heating need [W]} \times [\text{COP}-1]}{\text{COP}} = \frac{48.000\,[\text{W}] \times (4.8-1)}{4.8} = 38.000\,\text{Watt}$$

earth energy is needed

Heat to be taken from the earth 38 kW

Heat to be taken from the earth 38 kW

Heat to be taken from the earth 38 kW

Heat taken from the earth (Watt)

$$\frac{\text{Heat taken from the earth [W]} \quad 38.000\,[\text{W}]}{\text{Specific Heat of the Earth [W/m}^2\text{]} \quad 25\,[\text{W/m}^2]} = 1520\,\text{m}^2$$

earth space is needed.

Pipe amount required for energy circuit (m)

$$\frac{\text{Space [m}^2\text{]}}{\text{Modul}} = \frac{1520\ \text{m2}}{0.64\ (\text{DN } 32)} = 2375\ \text{m} = 24 \times 100\ \text{m pipe}$$

$$\text{Helix[m]} = \frac{\text{Earth Heat [w]}}{\text{Earth Specific Heat [w/m]-Helix}} = \frac{38.000\,[\text{w}]}{100\,[\text{w/m}]} = 380\,\text{m-Helix is needed.}$$

A helix in 30 mx1 m diameter occurs from 200 m of tube coil.
Item of helix=Length f Helix /30
=380/30 =13 helix in 30 m
Pipe (m)= Item x [5 x Hel. Lenght+50]
=13x[5x30+50] =2600 m DN32

$$\text{Boring [m]} = \frac{\text{Earth Heat [W]}}{\text{Earth Specific Heat [w/m]}} = \frac{38.000/50}{750\ \text{m}}$$

Boring=750/150
=5 holes in 150 m

$$\text{Spiral [ad]} = \frac{\text{Earth Heat [W]}}{\text{Earth Specific Heat [W/m]}} = \frac{38.000/500\ \text{W Spiral}}{75\ \text{item of Spiral}}$$

Boring=75x3=225 m

$$\text{Post[m]} = \frac{\text{Earth Heat [W]}}{\text{Earth Specific Heat [w/m]}} = \frac{38.000/50}{750\,\text{m Post}}$$

750/25m-Post =30 posts in 25 m

Modul= Distance between pipes in horizontal system, twice as much as pipe diameter in unit of cm. For example; DN32 Modul=2x32=64 cm=0,64 m
Modul in Helix System =Distance between Spires
Modul in vertical system =Distance between holes (m)

(*)Earth Specific Heat: It is the energy that local earth can produce in unit of or m². It depends on the type of the earth.
For further information: www.canovate.com

CANOVATE® SPECIAL DESIGN HEAT PUMPS FOR HOT WATER

Installation connections of CANOVATE® hot water heat pumps, operating from air to water, are made through two pipes. The system consists of two sections.

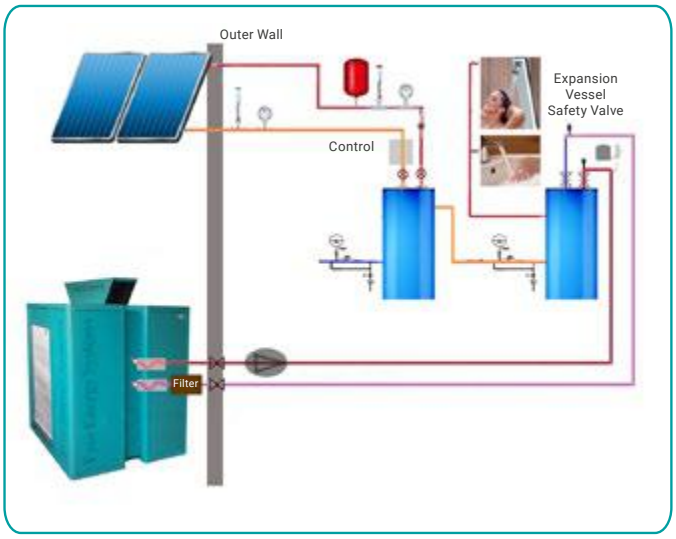
The first section of the system consists of heat pump. Heat pump should be placed on a place such as garden, Auto Park, roof or terrace where air circulation in the atmosphere is free. Connections should be flexible and filters should be placed into water inlets.

Since there exists no gas connection (cooling fluid) into building, physical damages, appearance pollution and poisoning risk that are caused by split/VRF type air-conditioner systems in buildings cannot be seen in heat pump systems.

The second part of the system is formed by hot water. Surface of boiler exchanger to be used for hot water should be twice at least as much as the one used in boiler systems. Dual parallel connected boiler groups should be firstly formed in multi boiler connections, and these groups should be serially connected one another.

Here, the biggest advantage is that it can operate in parallel with solar energy. It utilizes the energy coming from the sun to the last drop, and it completes reaching the set hotness by itself.

With its heating capacity of 70 °C, it does not let Legionella live. It is the most cost-effective device that can be used in hot water systems. Its efficiency exceeds COP>10. It has been exclusively designed for hot water.



- **70 °C heating,**
- **In the capacities of 16, 34, 60 and 120 kW ,**
- **No CO2 emission, eco-friendly,**
- **No Legionella,**
- **Its energy consumption is very low.**
- **Its maintenance requirement is lower.**
- **It is more reliable and comfortable.**
- **It is the device that most cost-effectively prepares hot water.**

HEATING, COOLING, HOT WATER WITH RENEWABLE ENERGY

CANOVATE® enables your residences, by using the water in the nature;

- **To be heated,**
- **To be cooled,**
- **and Hot water for them...**

CANOVATE® WATER SOURCE HEAT PUMPS WITH HIGH EFFICIENCY + PLUS HEAT VALUE

» It takes 85% of the energy from water necessary for heating, cooling and hot water as FREE.

» It protects the environment and climate.

» Sources of the energy are the sea, lake, river, well water etc. around you.

» Budget normally allocated for fuel remains with you as profit.

» It is the most cost-effective solution to heat and cool anywhere from apartments, villas, hospitals, schools, hotels to shopping malls through CANOVATE® Heat Pumps.

In Resort Hotels

CANOVATE® Air-Water Sources RIS Devices prepare simultaneous cooling and hot water, and increase its efficiency to (COP 9-12); and provides unique energy saving. They take necessary heat from water or air in winters. They provide 80% of necessary heating energy completely FREE.

Application

- In places where any kind of heating, cooling and hot water are simultaneously or at different times desired,
- Alone, or together with sun heat or boiler system to supply hot water,
- For pool heating and cooling,
- It is compatible with waste water (heat taken out from the ambient while cooling, heat taken out in steam-operated systems in laundries) recycling systems.

CANOVATE® air source systems provide hot water at any temperature whereas their equivalents do so till 20 °C air temperature.

UNIQUE CANOVATE® RETROFIT HEATING, COOLING (RIS) DEVICES minimizing your energy costs by using waste energy in your system as well as earth, water and air...

CANOVATE® Combiline

Water Source Air Pumps with Plus Heat Value

It is designed as compact, including expansion vessel, circulation pump, safety valve, accumulation tank etc. Only installation connections should be made. It simultaneously prepare cooling and hot water.

Model		W/W-R+17	W/W-R+22	W/W-R+28	W/W-R+34	W/W-R+44	W/W-R+57
CAPACITY DATA (It is capacity value at the operating point of B0/W35x1 according to EN 255.)		Compact-Single Stage			Modular-Compact-Double Stage		
HEAT POWER	kW	16.8	21.8	28.4	33.6	44	57
Power Drawn from Electric x 2	kW	3	3.8	5	6	7.2	9.6
Performance Coefficient	(COP)	5.58	5.75	5.71	5.76	6.1	5.9
Hot Water (Liter/minute)	10/45 °C	8.2	10.5	13.5	16	20	22
COOLING							
Capacity (kW)/COP	W20/W8	11.4/6.6	17.2/6.3	18.2/6.1	25.5/6.2	18.2/6.1	40.2/6.3
Capacity (kW)/COP	W20/W18	14.4/8.3	21.5/7.6	25.6/6.9	28.9/6.8	44.6/7.2	48.6/7.2
Capacity (kW)/COP	W10/W8	11.6/6.7	18.1/8.5	21.8/8.6	26/8.5	21/8.6	30/8.6
Capacity (kW)/COP	W10/W18	12.1/8.5	14/9.5	17.7/9.4	20.7/9.2	25.7/9.4	35.6/9.4
PRIMARY CIRCUIT							
Circulation Pump	Ty	Wilo Top S 25/7			Wilo Top S 32/4		
Minimum Volume x 3	Liter/h	3200	4250	5400	7000	7900	9500
Maximum Pressure Loss	mbar	90	90	100	130	60	100
Maximum Input Temperature	°C	25	25	25	25	25	25
Minimum Input Temperature	°C	5	5	5	5	5	5
Maximum Operating Pressure	bar	3	3	3	3	3	3
Installation Connections		1"	1"	1 1/4"	1 1/2"	2"	2"
SECONDARY (Central Heating) CIRCUIT							
Circulation Pump	Ty	Wilo Top S 25/7			Wilo Top S 30/7		
Minimum Volume x 3	Liter/h	1150	1470	2000	2300	3000	3800
Maximum Pressure Loss	mba	55	65	60	31	110	160
Maximum Input Temperature	°C	58	58	58	58	58	58
Maximum Operating Pressure	bar	3	3	3	3	3	3
Installation Connections		1"	1"	1 1/4"	1 1/4"	2"	2"
ELECTRICAL CONNECTIONS							
Nominal Voltage	220/50 Hz	3/N/PE 400 V ~ /50 Hz					
Protection Class	IP 20						
DIMENSIONS HxWxD	mm	120x60x 100	120x60x 100	120x60x 100	120x60x 120	120x60x 120	120x60x 120
Weight	Kg	130	136	142	130+90	136+100	142+110

RETROFIT SYSTEMS

Application with Water Source

How is energy taken from water?

From sea, lake, river, underground etc. waters;

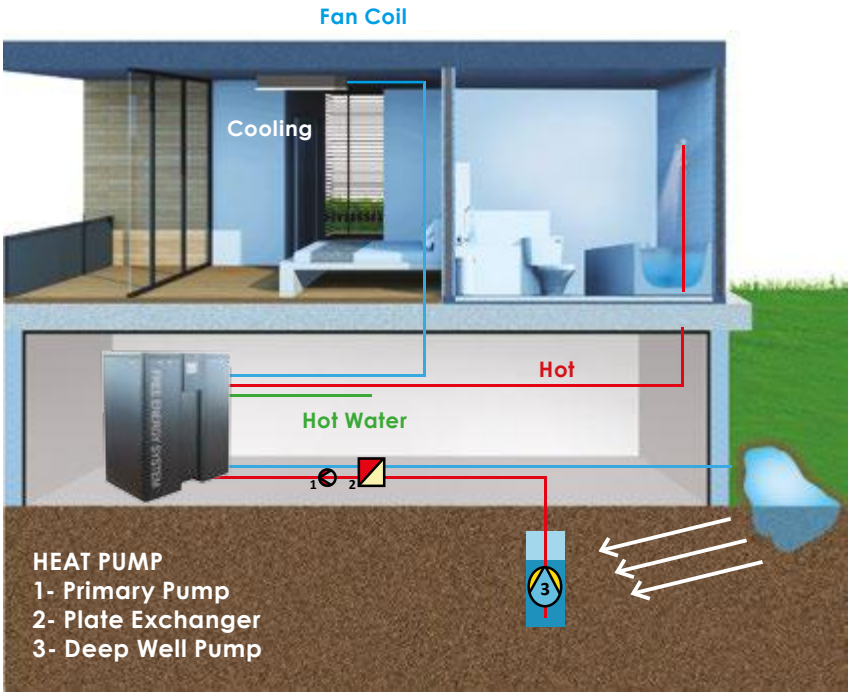
A. Water taken by a pump is sent to exchanger. Water, heat of which is taken in exchanger (3-5 oC) is sent to its source again. This process is called as open circuit system heat taking.

Or,

B. It is taken via exchangers put inside water. This system, defined as closed circuit, is more advantageous in terms of both energy and maintenance. Compared with open system, much smaller circulators are used. Since the same water circulates in the closed system, furring and pollution is so low that they are beyond comparison.

These systems have unbelievably decreased energy costs concerning both cooling and heating in hotels by a water- well, river or sea by using water as energy source. The reference letter below is an indicator of this.

To take heat from water via Open Circuit System



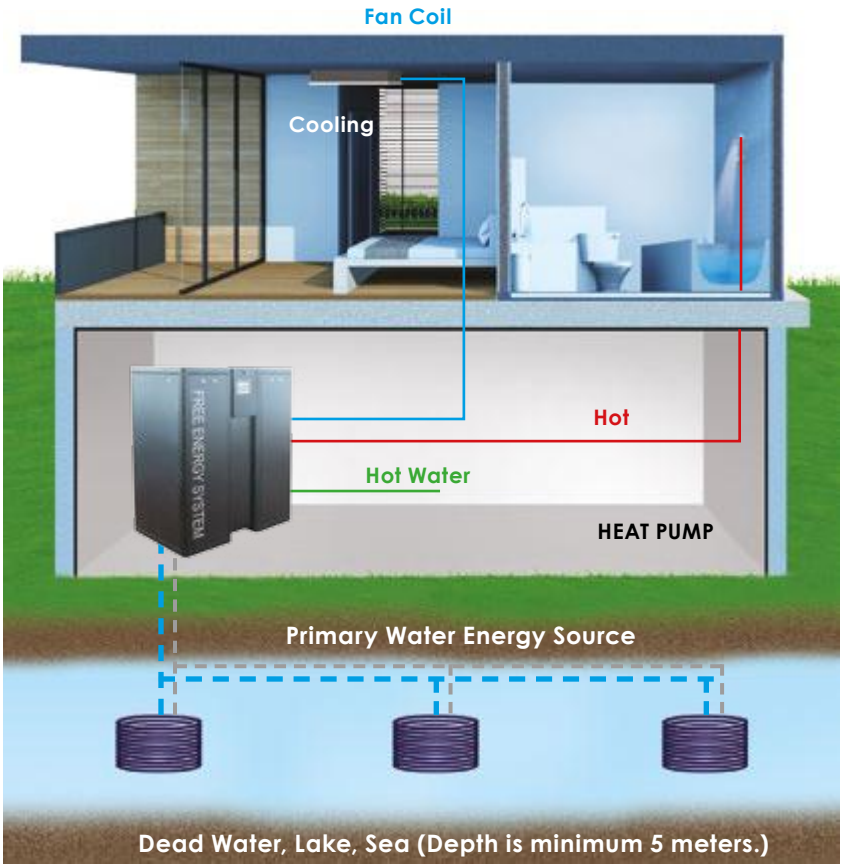
Sample: İnnova Resort Hotel Belek

Well water has been used as energy source via closed circuit system. Retrofit device decreased energy cost at a rate of 80% in summer season, and decreased heating cost at a rate of 65% in winter season.

The system has amortized itself in a time less than one year.

To Take Energy from Closed Circuit Water

- Efficiency (C.O.P) is a higher.
- Energy circuit pumps are small,
- Pollution and corrosion are scarcely any in installation,
- The most efficient (up to 85%) energy saving.



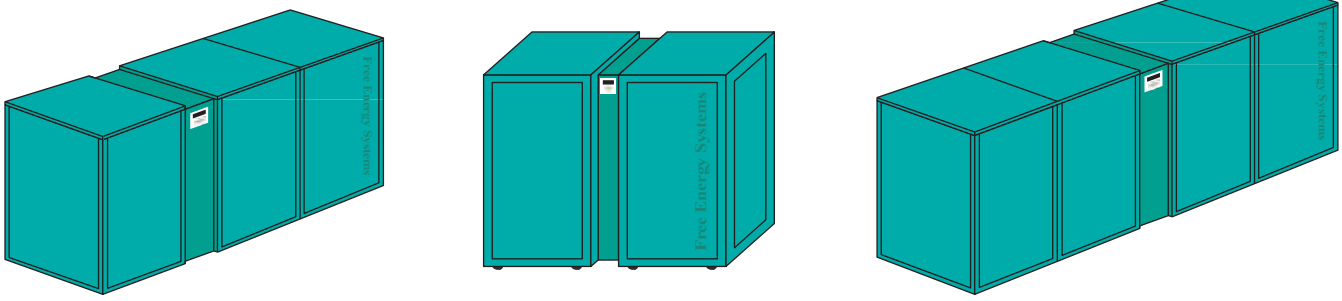
Sample: Gökova Sailing Club Plants

We prepared and applied the project to take energy from sea water to reduce heating, cooling and hot water costs of Gökova Sailing Club, which makes effort to endear seafaring and sailing to children, and to popularize them in Marmaris/Gökova.

Classrooms, play rooms, bungalow child houses, attendants' houses, sickroom and hotel departments are provided with heating, cooling and hot water through energy obtained from the sea. Fuel costs having been 120.000 TL decreased to 18.500 TL. **Thus, FREE energy at a rate of 85% was provided from the sea.**

This project was the first in Turkey to take energy from the sea water through closed circuit system.

WATER SOURCE RETROFIT HEAT PUMPS



BERLINER Retrofit Devices Operating at low temperatures (58 °C) – Water Sourced

Heating Output Temperature Maximum 58 °C/Cooling Output Temperature Minimum 7 °C/Running Water Temperature Maximum 55 °C

Models	Heating (kW)	Cooling (kW)	Electric Consumed (kW)	Hot water L/min. 10 °C/40 °C	Winter Heating COP	Summer Heating/ Cooling COP
BERLINER Wp-Ws/W 64 + RTL	64	52.60	9.88	1835	6.44	10.40
BERLINER Wp-Ws/W 86 + RTL	85.6	67.20	13.01	2454	6.52	10.51
BERLINER Wp-Ws/W 110 + RTL	110	88.20	16.76	3150	6.56	10.45
BERLINER Wp-Ws/W 165 + RTL	165	132.3	27.11	4730	6.36	10.35
BERLINER Wp-Ws/W 220 + RTL	220	176.4	33.50	6300	6.48	10.24

BERLINER Retrofit Devices Operating at high temperatures (65 °C) - Water Sourced

Heating Entry Temperature Maximum 65 °C/Cooling Entry Temperature Minimum 7 °C/Running Water Temperature 65 °C

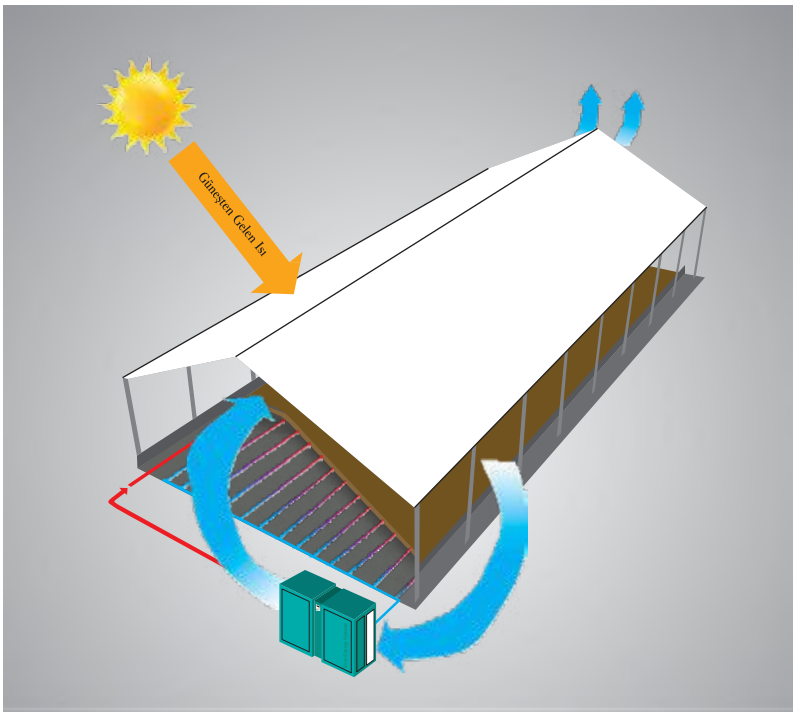
Models	Heating (kW)	Cooling (kW)	Electric Consumed (kW)	Hot water L/min. 10 °C/40 °C	Winter Heating COP	Summer Heating/ Cooling COP
BERLINER Wp-Ws/W 60 + RTH	58.6	46.8	9.18	1680	6.38	10.20
BERLINER Wp-Ws/W 70 + RTH	70.6	56.8	11.36	2024	6.21	9.95
BERLINER Wp-Ws/W 106 + RTH	105.5	85.2	17.04	3024	6.18	9.92
BERLINER Wp-Ws/W 140 + RTH	141.2	113.6	22.72	1680	6.21	9.94
BERLINER Wp-Ws/W 225 + RTH	225.8	180.2	36.80	2024	6.14	9.85

B: Primary Energy Source Water; **Ws:** Secondary Energy Source Installation Water; **W:** Water; **RT:** Retrofit; **RT-H:** Performance Values of Retrofit Operating in High Temperature (65 °C) Chiller in Summer Position Input/output (7 °C - 12 °C) Hot Water Input/output (45 °C - 40 °C) operating points are based. In winter heating norm value (W10/W35) is based.

DRYING WITH RENEWABLE ENERGY

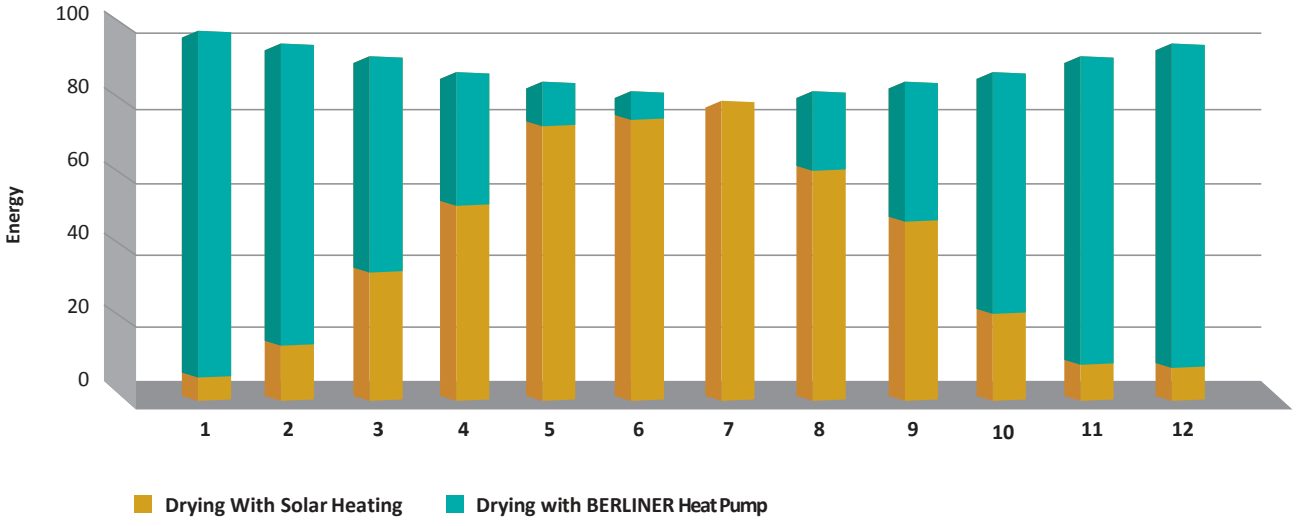
CANOVATE® Drying Systems, in very special design, and used in sludge as well as vegetable and fruit drying, operates bi-directionally. In drying process, either air, humid of which is taken (cold) is channeled to the place where the product desired to be dried is or moist is vaporized and discharged from the room by heating the room

Drying sludge coming from aerobic treatment plants is performed inside greenhouse. Heat occurring due to greenhouse effect takes the moist of sludge. Humid air is discharged out trough fans or chimneys. In the event of absence, or insufficiency of the sun at nights and winter days, it is essential that heat be taken from a source in order to take the moist of sludge. In this case, boilers with fossil fuel can be used. However, energy consumption becomes nearly 8 times as much as CANOVATE® Drying Heat Pumps. Besides, drying time gets 3 times longer.



CANOVATE® Drying Heat Pumps operates with double effect. It enables moist pass into the air by heating the sludge from bottom. The second effect is that it sends the dehumidified air onto the sludge. Dehumidified dry air quickly takes the moist of sludge and provides drying with very low energy. Its capability to become integrated with solar energy makes the system completely successful and cost effective. In the following graphic, shares of the sun and heat pump in total drying energy according to months are indicated:

Contributions of Sun and Heat Pump in Sludge Drying

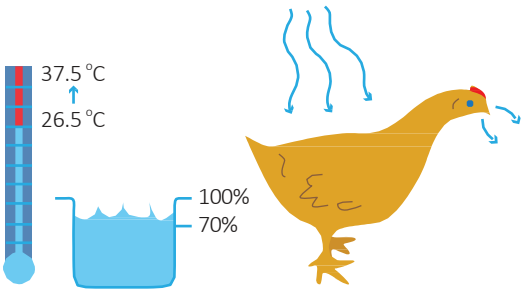


COOP HEAT PUMPS

It is essential that performance of coops be good so as to utilize the morphogenetic potential best in terms of broiler and turkey raising in white meat production establishments

For a good coop performance, heating, cooling and ventilation must be given importance at least as much as feed and water. Only when an air-conditioner that can enable animal health and comfort is formed, can optimum and uniform growing be achieved, and can quality meat be obtained.

Humidity, heat, CO2, CO, NH3 should always be under control in animals' living spaces (in coops) through air-conditioning in accordance with the following table:



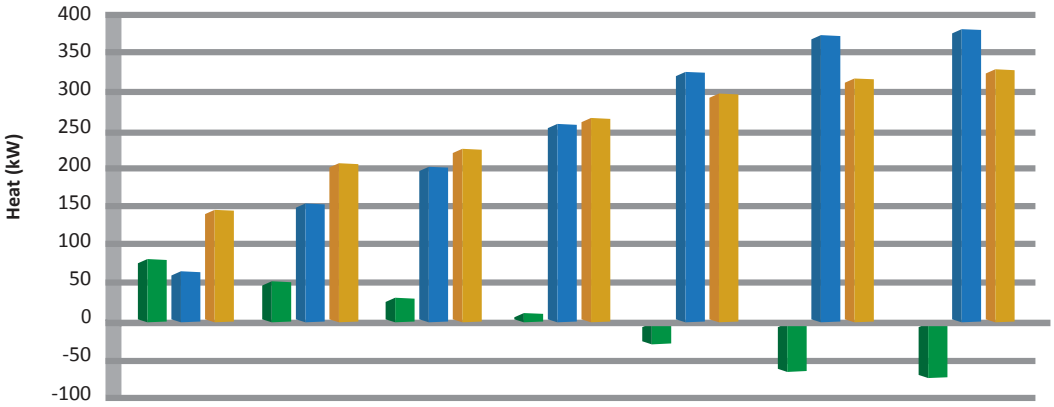
Animals get stressed and do not grow up provided that temperature and humidity are not suitable in poultry living spaces.
Humidity + temperature >106 = Stress

Controlled Parameters	Values	Remarks
Humidity	45-65%	Humidity should always be taken from coops so that animal base can remain dry.
CO_2	< 0.3%	**CO_2 forming due to respiration should be discharged.**
CO	< 10 ppm	
NH_3	< 10 ppm	Ammoniac forming due to feces should be discharged from coops. Otherwise, it destroys hair in respiration tracts of young animals and causes bacteria enter their bodies, and thus, diseases and deaths.
O_2	> 19,6%	Ventilation should be performed for fresh air in every season.
Heat	20- 35 °C	Temperature starts with 35 °C and decreases inversely proportional to growing.

As ventilation heat loss increases, concealed heat that poultry produce equalizes building heat loss as of the 4th week. Here, total heat loss of 7 weeks is 302.688 kwh/7 weeks, and its cost corresponds to 29.100 TL.

CANOVATE® takes the heat of discharged air through special design **Coop Heat Pump** it has developed, and gives it to fresh air, and thus, provides high rate of energy saving. For a period of 7 weeks, costs of energy **decreases to 5.341 TL. A profit corresponding to 24.000 TL** can be obtained in a period.

Coop Heat Need kW

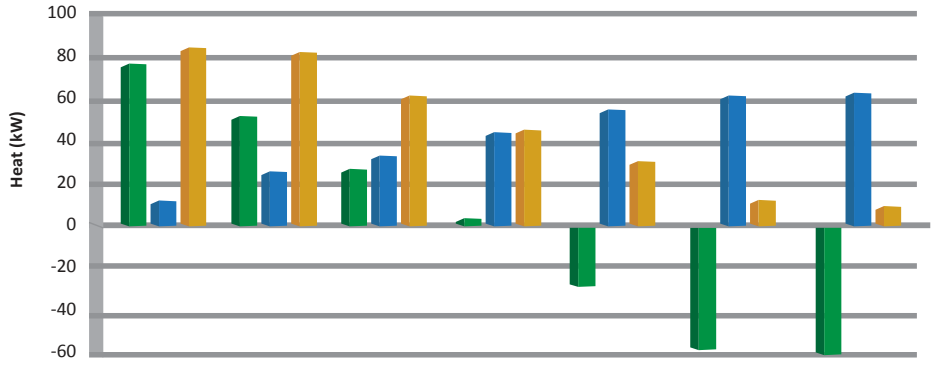


	1	2	3	4	5	6	7
Heating	78	55	28	1	-26	-53	-57
Air Heating kW	65	154	203	269	325	373	387
Total kW	142	209	231	270	299	320	330

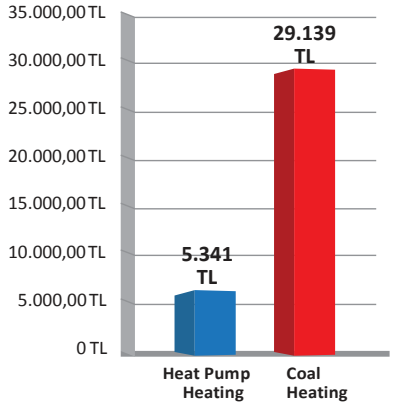
Dirty hot air and cold fresh air channels change, and cold air is not taken inside. After air is conditioned, hot air is given to coops at desired values. By this means, ambient conditions anywhere inside coops homogeneously provided. Dead spaces, air currents, cold points or hot points that reduce coop performance are eliminated, and thus, deaths are prevented.

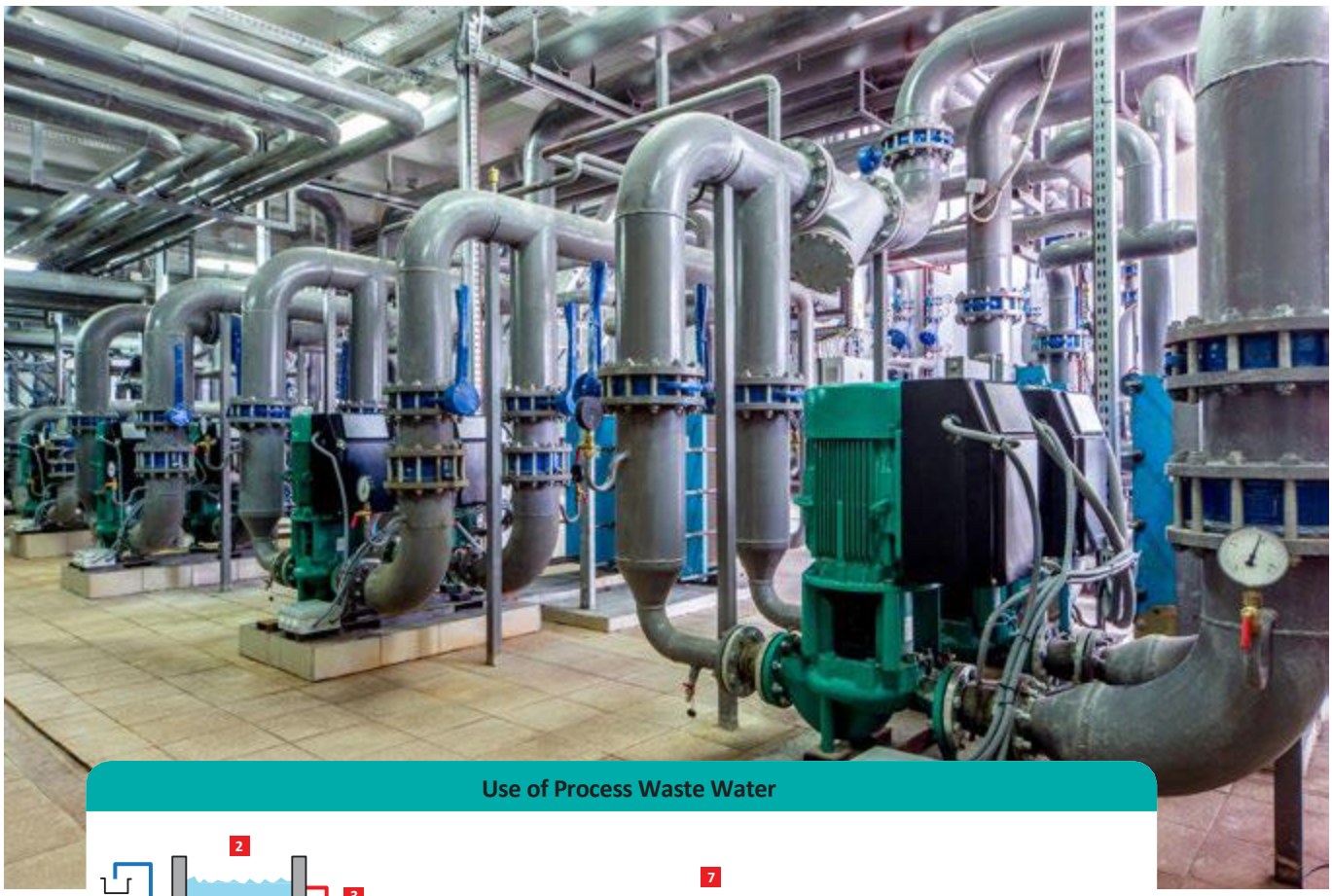
It provides appropriate living conditions by making use of cooling feature in summers, and minimizes energy costs.

Coop Heat Need – Heat Pump kW

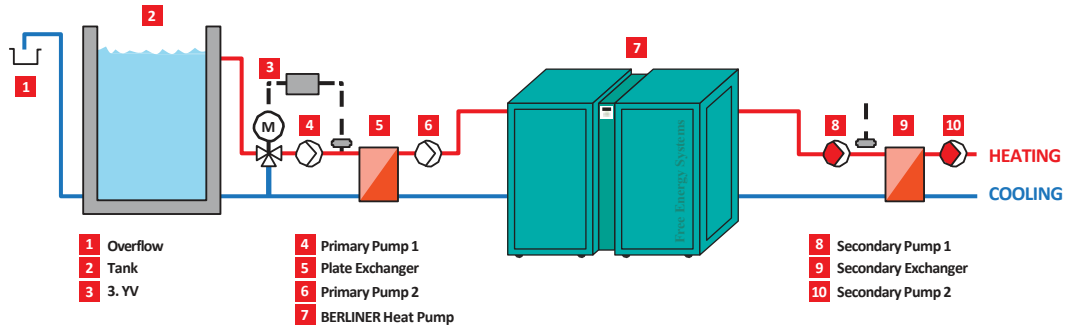


	1	2	3	4	5	6	7
Heating	78	55	28	1	-26	-53	-57
Air Heating kW	11	27	35	47	56	63	65
Total kW	89	82	64	48	30	10	7





Use of Process Waste Water



Waste heat exists any place where manufacture is performed and this valuable energy is discharged without being used.

- **No matter which condition it is commenced for your company, CANOVATE® Heat Pumps amortize themselves from 6 months to 2 years. They provide you with profit with its low operating expenses during its total lifetime (20 years).**
- **It is the best instrument so as to reduce CO2 emission.**
- **It helps the target of EU to increase renewable energy usage up to 20% by 2020 to be achieved.**
- **It is the device, energy consumption of which is the lowest. (COP-values can be 4-11).**
- **It decreases vapor and water expense up to 50%.**
- **It produces hot water from waste heat up to 80 oC.**
- **It submits installation opportunities by means of grant support and cheap long term credits.**

Application Samples

- **To provide hot water from waste water for washing, drying etc. processes decreases vapor and water consumption up to 50% in every establishment, especially in the textile sector, having a steam boiler.**
- **It operates with very high performance (COP=9-11) in food sector, especially in establishments such as dairy products, take-home foods, packing plants, slaughterhouses, chocolate factories where heating and cooling are simultaneously required.**
- **It provides very productive and cost-effective production by operating together with solar energy in the plants of drying processes, fruit drying, waste sludge drying etc.**
- **It is suitable for any place where heating and cooling are desired separately or together.**

High prices of energy, the biggest complaint, is a serious problem in industrial establishments. Yet, they are not aware of the dimension of energy they waste, and they do not make effort to recycle it, either. On the other hand, the market value of energy not used and discharged in Turkey is 15 billion Euros/year.

According to researches of scientists, a huge part of energy (two thirds) used for process disperses around due to machine radiating and smoking from the chimneys of gas-fired motors, furnaces and boilers, and with water discharged from processes such as washing and dyeing.

It is necessary to focus on recovering process heat instead of discharging it without using, and to minimize energy costs in establishments. For this reason, heat pumps should be applied. **CANOVATE® Heat Pumps provides energy saving from 30% to 60%** depending on the condition of your establishment.

Heat pumps have very large practice fields in industrial processes and they minimize establishment costs. However, they provide very high performances especially in two utilization areas;

» In processes where retrofit heat pumps are used and heating and cooling simultaneously exist (in preparation of take home foods, meat products processes, diary processing plants, chocolate production etc.)

» Its performance is high in fabric washing, drying plants and feed water preparation processes in the textile sector.

Food Sector

In most industrial processes, simultaneous or separate high cooling and heating capacity is needed. This is particularly seen in food technology. For example; it appears in slaughterhouses or frozen food production. I n this cases, while one pole of retrofit heat pump cools, it also forms process water in desired hotness with waste heat it takes from there. It doubles efficiency by two-way working.

Dairy Processing Establishments

“While milk is kept in vessels as cold, heat is consumed from a separate source (from steam boiler) for pasteurization. Instead of this, the system with retrofit heat pump that takes the waste heat in cooling and brings it to the necessary temperature for pasteurization should be used because **it amortizes itself within 1,5 years.**” (Robert Wiseman Dairies, England, 2006.)

To use energy efficiently and cost-effectively in establishments working with steam systems are examined in two categories:

- **A.** Improvement required to be performed in processes where hot water is used,
- **B.** Improvement required to be performed in processes where steam is used,

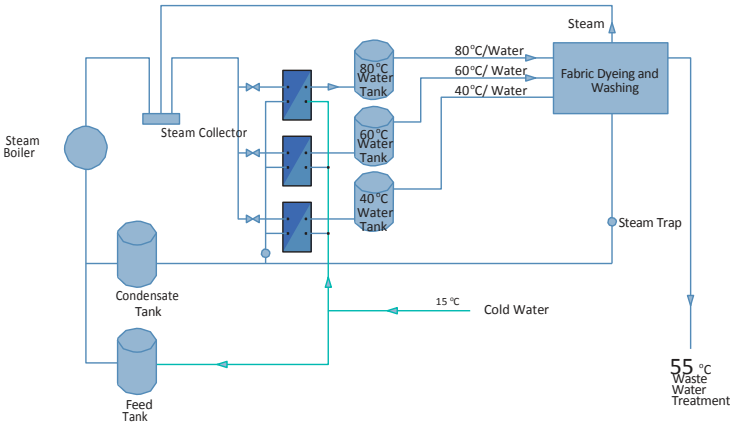
Hot water is necessary for fabric dyeing and washing and boiler feed water etc. Water taken from tanks in 15 °C by using steam is treated. Afterwards, chemicals are added and goes for usage. Before entering steam boiler, it is increased to 80 °C in boiler feed tanks. Some of cold water is sent to fabric washing units to be used at the temperatures of 40, 60, 80 °C. Heating process is performed here by using steam in the same way as well. For example; it is possible to increase the applications given below.

Milk brought by isolated vehicles is found to be at temperatures of 4 and 5 °C. It is pumped to the cold vessels in material entrance and stored at 2 °C degree. Later, the milk is pasteurized, in other words, it is heated up to 74 °C in a short time and at once cooled 2 °C again. In production process, by mounting simple but efficiently working heat recovery exchanger, it can be enabled that milk leaving pasteurization heats cold milk and brings it up to 65 °C. The rest of heat is completed by heat water heated by steam coming from steam boiler. Pasteurized milk entering exchanger increases up to 11 °C and cooled 2 °C. 32 °C heat comes out during cooling processes in milk entry and pasteurization.

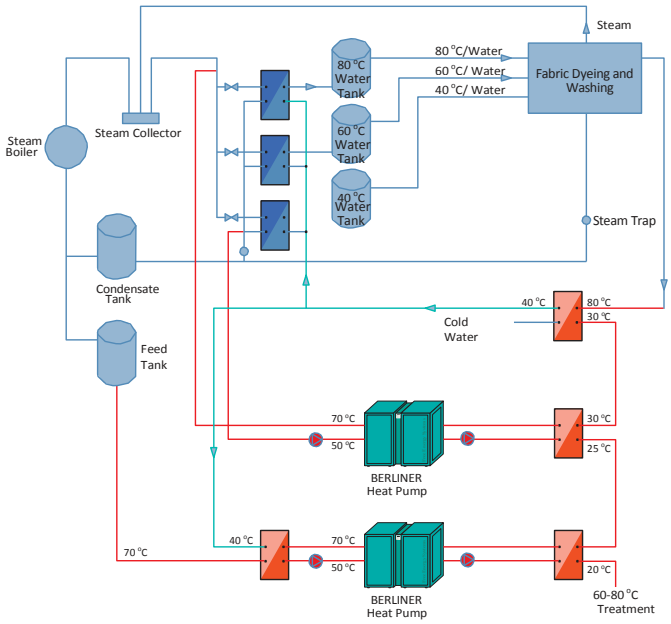
Heat pump increases temperature of 32 °C, coming out in cooling and not being sufficient for pasteurization, up to 76 °C, and deactivates steam boiler. **This principle makes the system 6 times more efficient.** Heat pump consumes 20 kW/h electric for 100 kW/h heat. This amount includes energy consumed in cooling and heating, circulators etc. On the other hand, steam boiler with fossil gas fuel uses 125 kW/h energy. That is to say, it consumes six times more energy.
It is possible to use it in other parts of dairy processing establishments, for example, any stage from whey heat to provision of washing hot water.
That the energy costs are reduced six times is not the only profit here. It also eliminates usage of fresh water necessary for steam and waste water by deactivating steam boiler as well as prevention of CO_2 emission.

Textile

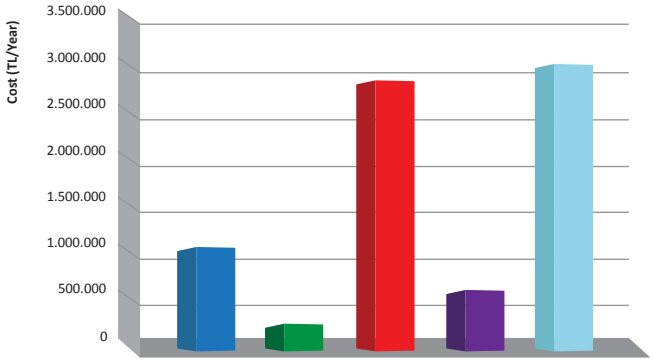
One of the biggest expense item of textile sector is energy and it is extremely inefficiently used.
Steam is used to bring washing, drying and boiler feed water to usage temperature. Steam is an enery source having the most expensive output. In addition to use of fossil fuel (gas, coal), clean water to which past chemicals are added is spent in continuous t reatment processes. It is an extremely expensive method. Therefore, steam should only be used where it is necessary.



Used hot water goes to treatment plants at 30- 40 °C degrees. If there exists wet flue gas filtration, the temperature of waste water can reach up to 60 °C degree. Costs are decreased at a rate of 80% by using this waste heat through heat exchangers and CANOVATE® Heat Pump in a way that is similar to the one indicated in the scheme below.

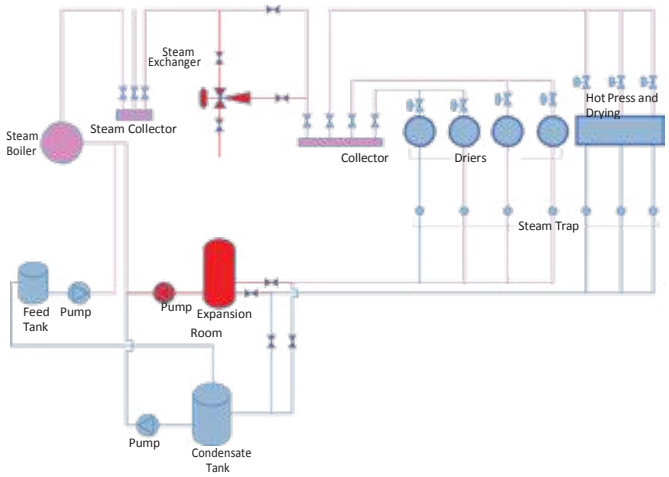


80% Saving in Cost of Energy Consumption



Steam Feed Water	1.018.865 TL
Cost of Feed Water with BERLINER Heat Exchanger	225.662 TL
Cost of Washing Water Preparation with Steam + New Condition	2.848.643 TL
Cost of Washing Water Preparation with BERLINER + Heat Exchanger	630.929 TL
Total Profit	3.010.917 TL

The graphic above indicates efficiency in CANOVATE® system applied in an establishment.



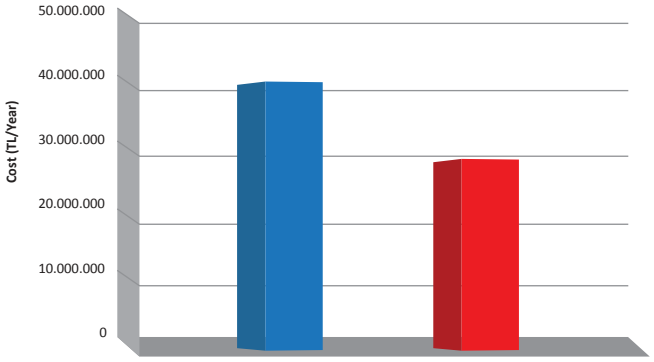
Profit obtained with steam injector, a simple application sample of which is given above is indicated in the following graphic:

Steam Saving at a Rate of 33% in Steam Processes

Steam, a very expensive energy source, should only be used in processes. **We can recover steam in an amount from 20% to 30% through our special accessory that can prevent process loss and leakage.** In ordinary s ystem controls, in put and ou tput pr essu res of unit are c hecked with motor valves, and temperature adjustments are carried out. Since the valves are turned down in this adjustment method, losses are caused and steam deliquesces. This is steam loss. Similarly, steam in steam-water mixture leaving the unit is also a loss.

Steam injectors working in venturi principle, and adjusted to the desired temperatures are connected to the input-output lines of the unit, and loss steam is recovered and given to the process. In addition that leakages are prevented, there will be no need for boiler to operate in high pressure in vain.

33% Saving in Steam Costs



Current Steam Cost	40.855.720 TL
Steam Cost in New System	28.777.857 TL

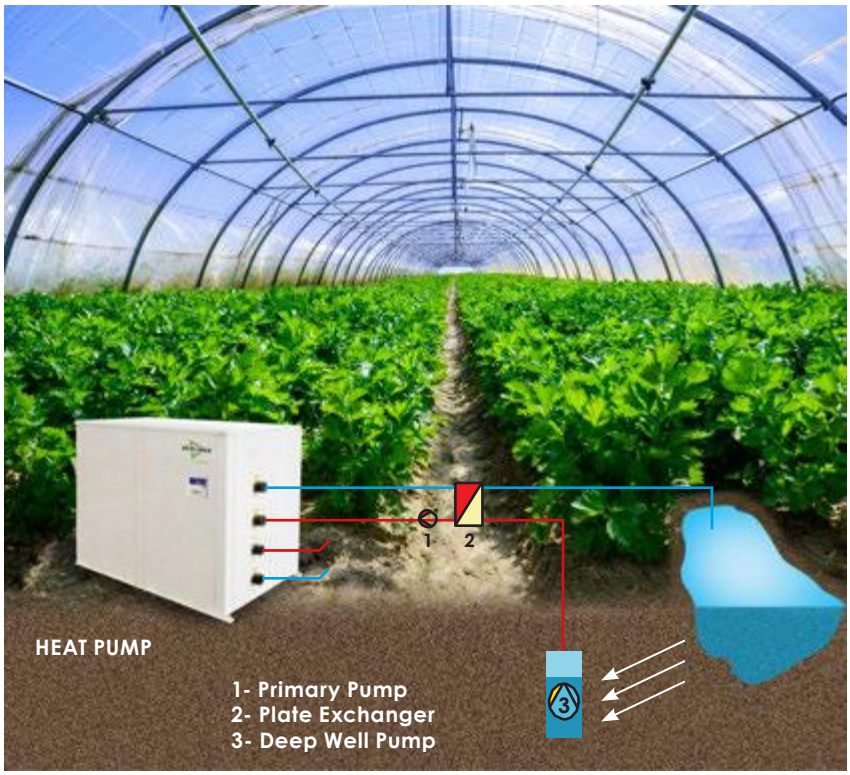
GREENHOUSE HEAT PUMPS

Greenhouses are places in which growing is performed by enabling the most appropriate conditions for plant development. It is essential that they be heated especially in cold seasons. However, costliness of fuels such as wood, coal, liquid and gas used to heat greenhouses (because the biggest rate of expense item of greenhouses is heating with a ratio reaching 80%) directs farmers to perform growing without carrying out heating.

Farmers perform heating only to protect plants from freezing instead of carrying out a regular heating process. This causes yield decrease, restriction in growing diversity and slow growth of plants. And desire to prevent the said case by using hormone and pesticides brings a range of troubles with it and decreases profit.

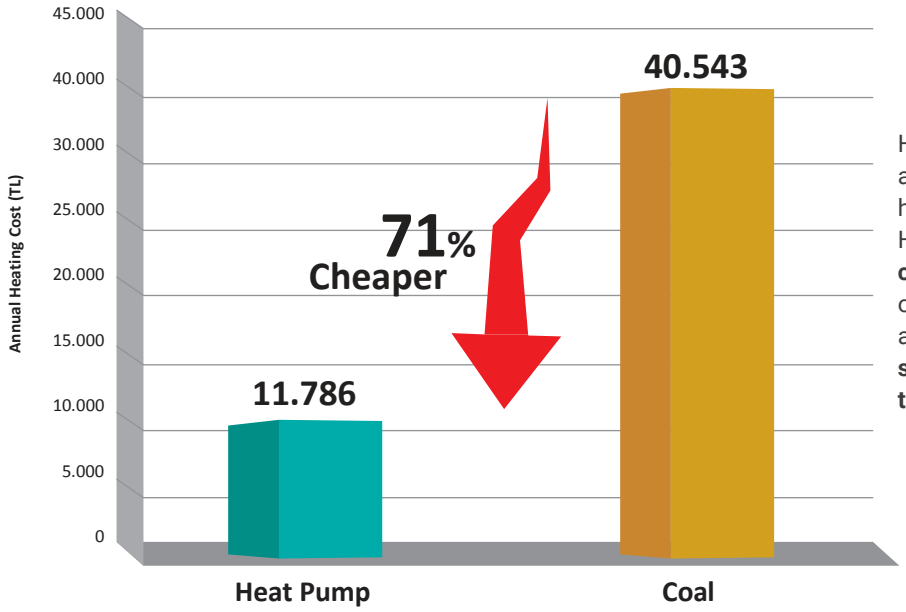
It is necessary that renewable **energy sources and common use of waste energy** be given importance and encouraged in greenhouses so as to minimize heating expenses and usage of fossil energy sources that are gradually depleting and effectively prevent environmental issues originating from applications of such fuels.

Main renewable energy sources that can effectively be made use of in agriculture sector are solar energy, surface geothermal (water, earth and air) and deep geothermal. As to the waste energy, it is discharged at considerable amounts in cogeneration, thermic and nuclear power plants and in some industrial plants where electricity is produced. This heat is generally under 30-40 °C and it is injected to the earth again without being used. **CANOVATE® Greenhouse Heat Pumps can easily utilize free waste heat,** discharged from, and not used by these plants, and compensate temperature fluctuations originating from distance and geothermal sources, use water temperature from 40 °C to 5 °C as energy source, and perform extremely effective heating processes in a value adjusted between 30 °C and 70 °C.



- **It enables any kind of plant to be grown every season.**
- **It keeps greenhouse interior temperature at desired adjustment (like 10 °C or 20 °C).**
- **It consumes 70% less energy, compared with coal.**
- **It performs effective heating and cooling.**
- **It protects environment and climate.**

Comparison of Coal and Heat in Greenhouses, 1000 m2, in terms of Heating Costs



Heating cost with coal and heat pump of a greenhouse, having 1 de-care 150 w/m2 heat loss is indicated in the side graphic. Heating via heat pumps is nearly **71% cheaper**. Coal bunker, staff necessary for operation, coal freight, ash discharge etc. are not included in this calculation. **The system amortizes itself in a period less than 2 years.**

Model	Heating (kW)	Cooling (kW)	Output Temperature in heating (°C)	Output Temperature in cooling (°C)
BERLINER W/W 100	100	100	20-70 °C	7-18 °C
BERLINER W/W 150	150	150	20-70 °C	7-18 °C
BERLINER W/W 200	200	200	20-70 °C	7-18 °C
BERLINER W/W 300	300	300	20-70 °C	7-18 °C
BERLINER W/W 500	500	500	20-70 °C	7-18 °C

CANOVATE®
Greenhouse Heat Pump

CANOVATE®

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Canovate® Indirect Adiabatic Cooler Systems

Technological endpoint from cooling Systems
Soğutma Mühendisliğinin geldiği son nokta

The Most efficient way to Cooling IT Rooms and OFFICE
Bilgi işlem Odalarının ve OFİS lerin En Verimli Şekilde Soğutulması

CAN-IAC® SERIES

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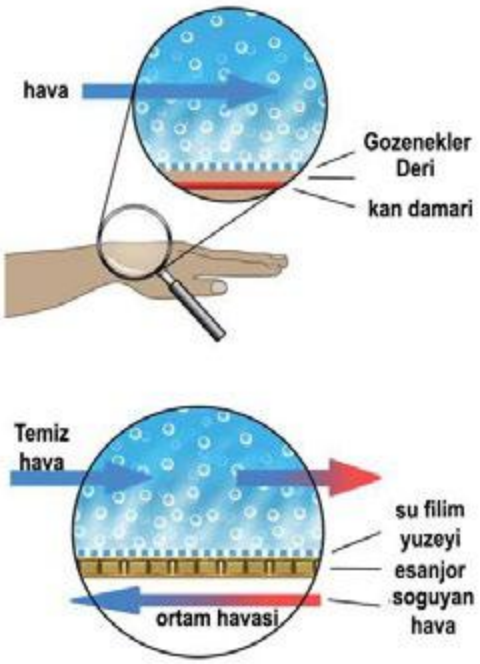
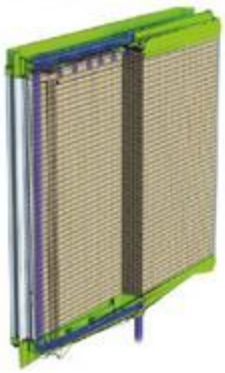
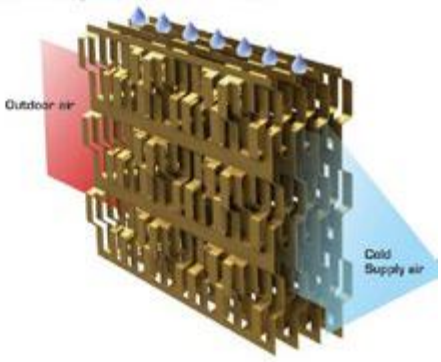






Overview

- Netherlands-Germany and Turkey were designed with the collaboration of the company
- Intelligent technology permanently low operating costs = Efficient cooling using of renewable energies and natural resources
- Energy-saving EC fans
- Tuned very high power density with the highest energy efficiency (EER) and ESEER values
- Hybritsystem.Indirect two-stage adiabatic cooling (efficiency % 115) , compression refrigeration system (as Redudans) and free cooling optimally to the respective application
- All kinds of after-sale support,negligible CO2-footprint
- IT and where the cooling load, such as high fidelity the SHOPPING MALL and OFİCE
- 50, 100, 200 kw capacities
- Optional internal or external media device as manufacturing.
- Very compact design integrated control and regulation
- Intensive testing before delivery is delivered ready for connection
- Intelligente bypass airflow
- Compressor cooler to cover peak load or full redundancy

Genel Bakış

- Hollanda- Almanya ve Türkiye fırmalarının ortak çalışması ile dizayn edildi
- En Yüksek enerji verimliliğine (EER) sahip,
- Enerji gideri az EC-Fanlar
- Doğal ve yenilenebilir enerji kullanıarak Minimum işletme gideri sağlar,
- Yok denecek kadar az CO 2- Ayak izi
- IT ve AVM gibi soğutma yükü yüksek olan yerlerde uygunluk
- İndirekt adyabatik soğutma, doğal soğutma ve (Redudans olarak) klasik soğutma kombinasyonu
- İntensiv testlerde uygunluk sağlandıktan sonra teslimat
- İki kademeli adiabatik soğutma ile verim %115
- 50, 100, 200 kw kapasitelerde
- İç veya dış ortam cihazı olarak opsiyonlu imalat,
- Estetik ve standartlar üstü bir konstrüksiyon

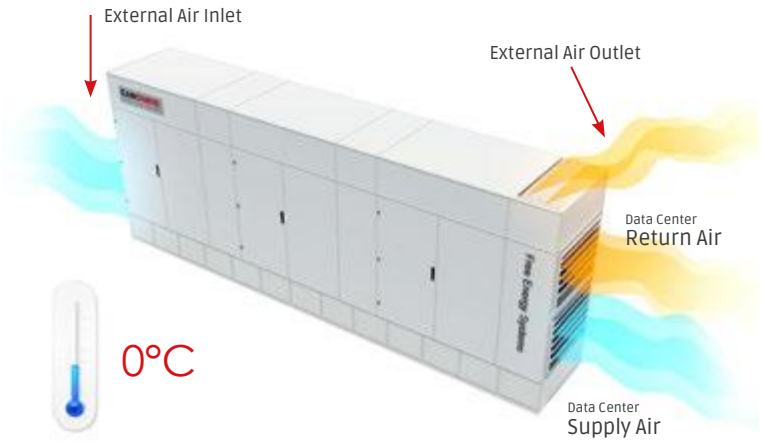
This Next Generation CAN - IAC® Unit has three operating modes, all designed to reduce operating costs year-round:

Free Cooling

Winter operation (Air economizer)

The outside temperature is less than space temprature, the outside air load free cooling.

The high efficiency heat exchanger device covers 100% of the cooling load in the data center. Maximizing the operating hours in the Economizer mode also contributes to the water saving advantages of the unit.



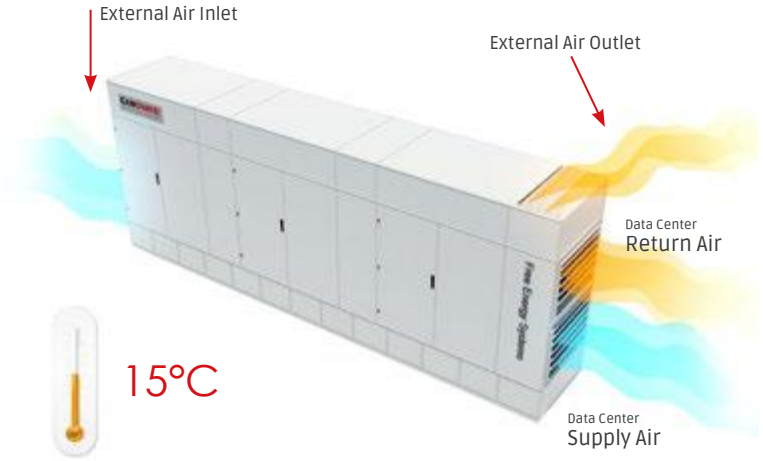
Adiabatic Cooling (Reduce Energy Cost by up to %80)

Summer operation (Evaporative Cooling)

As the ambient temperature begins to increase, the heat exchanger requires more airflow to deliver the required cooling, the ambient fans ramp up accordingly.

Moisture is added to the hot outdoor air which has the effect of lowering the dry bulb temperature. The IAC is operating, providing free cooling due to water evaporation in the IAC. This mode provides the most operating cost savings in locations where outdoor conditions allow.

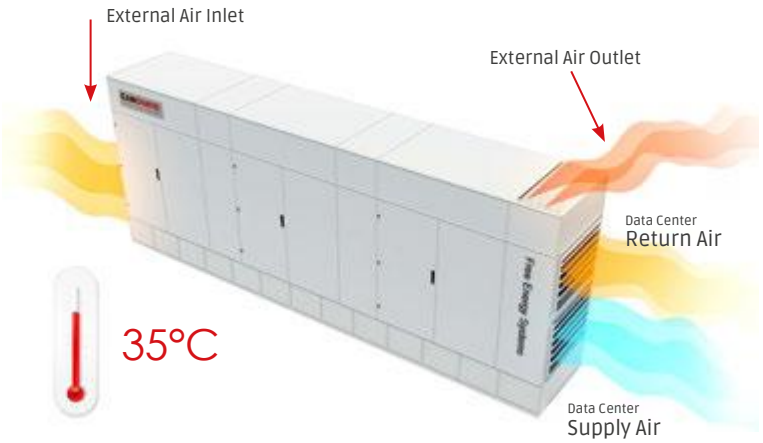
This is done by use of natural free cooling in combination with the indirect adiabatic humidification, depending on the climate zone without the use of compression refrigeration.



Adiabatic Cooling + Mechanical Cooling

Extreme conditions (Evaporative Cooling + DX)

During extreme hot and humidity hours of the year, it may be necessarily to top up the cooling capacity with a partial DX supplimentary cooling section. The unit provides trim mechanical cooling to meet the data center's supply air temperature requirement. Due to its high wet-bulb efficiency, the CANIAC® unit minimizes the mechanical cooling hours required to cool a data center in many locations and minimizes the size of the DX equipment required for extreme conditions, thereby saving even more operating costs. The ultra-efficient water system of the unit optimizes water consumption—a growing concern of data centers located in areas where water is restricted or expensive to use.



The high sensible effectiveness of the heat exchanger used in this CANIAC® unit results in less hours of water evaporation and a substantial reduction in overall water consumption. As a result of less water usage, operating cost savings come from extended wetted media life and reduced water system maintenance requirements.

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Canovate® Indirect Adiabatic Cooler Systems

CAN IAC® Series Data Center Air Handling Solutions

Canovate IAC® series Indirect Adiabatic Cooling Systems has reduced energy consumption, eliminates high ambient problems and serve as an energy efficient cooling solution for Data Centers.

- **Reduced Running Cost**
- **Reduced Maintenance**
- **Improved Reliability**
- **Increased Capacity**
- **Self Cleaning Filter**
- **Longer Compressor Life**

Controls

- **BMS compatibility**
- **Supply air temperature control**
- **Air flow and pressure monitoring**
- **Dual power supply (ATS)**

Data Center Cooling Technologies Comparison

The electrical cost for cooling 1 MW @ 0,08 € kWh/h

System	EER (Energy Efficiency Ratio)	Needed Electrical power for cooling 1 MW [kW]	Energy costs (Year) [€]
DX (CRAC)	3	333	€ 233.600
CW (CHILLER +CRAC)	5	200	€ 140.160
CW+FREE COOLING	10	100	€ 70.080
INDIRECT ADIABATIC	30	33	€ 23.360

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