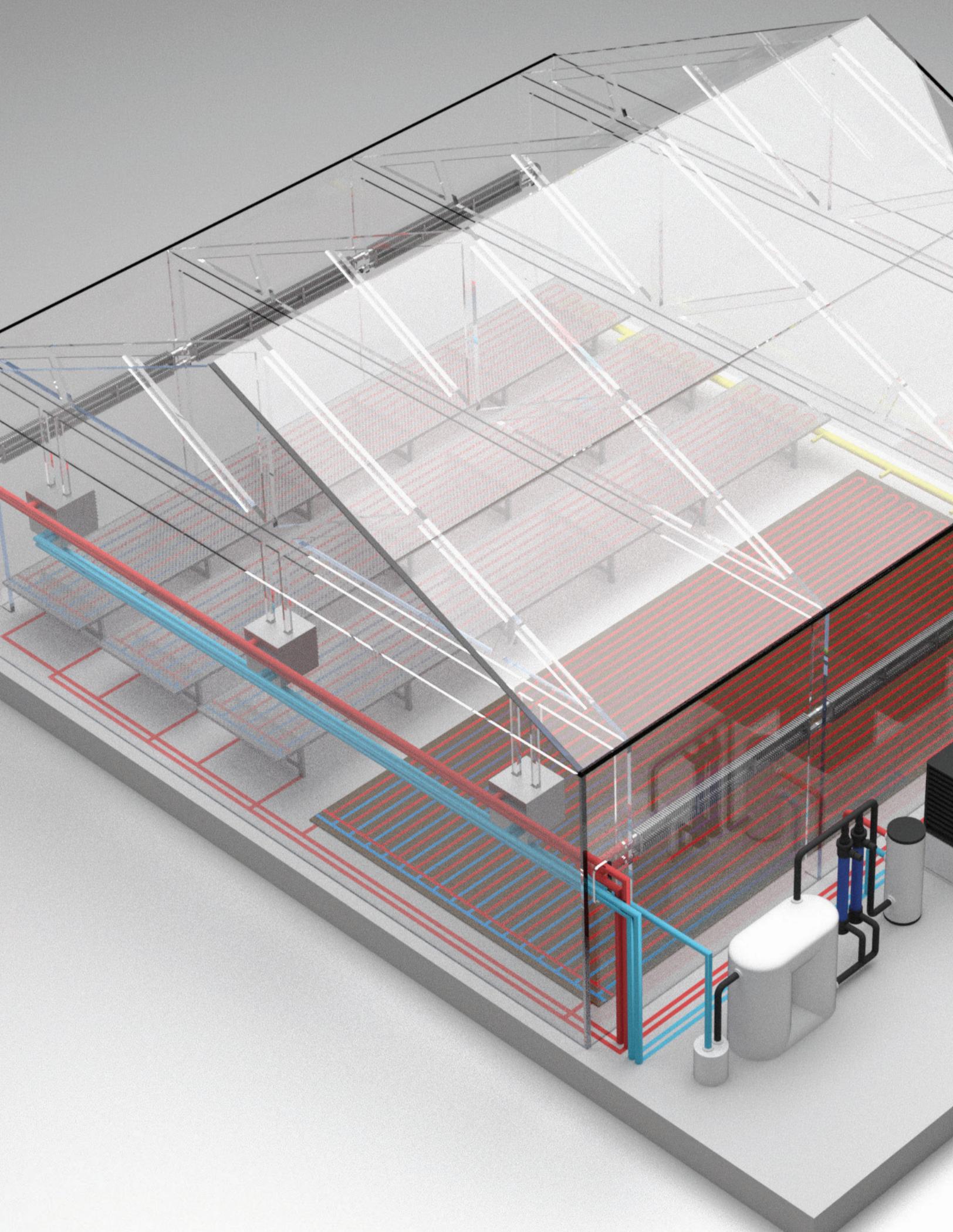




BioTherm
CULTIVATION CLIMATE
TECHNOLOGIES

▲
4-PIPE AIR HANDLING
SYSTEM

OPTIMIZED AIR





CULTIVATION CLIMATE TECHNOLOGIES



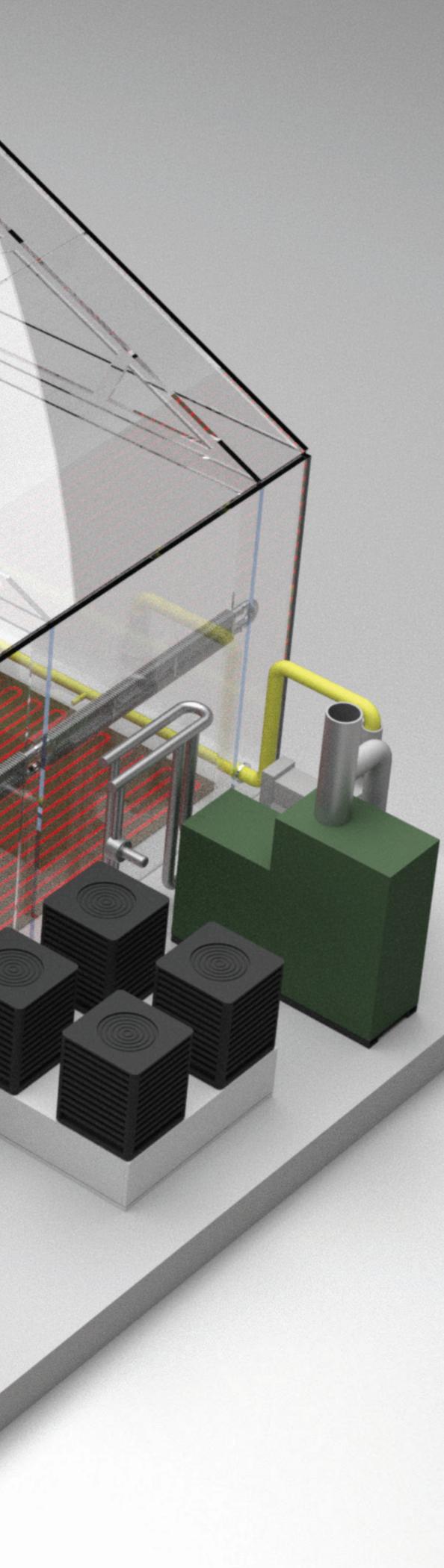
When the environment outside is not ideal for the crop you are growing, the air in your cultivation facility needs to be adjusted. Sometimes it's as simple as adding heat, but more growers are requiring "active" cooling inside their cultivation facility during the rugged summer months. For certain crops, the air must be dried or dehumidified as well.

BioTherm has proven systems designed to optimize the air inside your facility and ENHANCE your growing conditions so that even crops not normally grown in your region can flourish. We can take the temperature and humidity down just a touch, or we can close down the access to outside air and bring those factors way down. It is all in the design, and our experienced team knows how to engineer and deliver systems made specifically for RUGGED cultivation environments using special air handlers or standalone dehumidifiers made of stainless steel.

Many plants require a dose of CO₂ to maximize growth, for this, BioTherm delivers systems that harvest CO₂ from the products of combustion from our high-efficiency boiler equipment, condition and dry it, and then deliver it to the growing zones.

Your production plans require predictable, high-quality harvests year 'round – if the weather doesn't cooperate, you need not worry if you have a robust BioTherm Optimized Air system on your side!

OPTIMIZED AIR SOLUTIONS





OPTIMIZED AIR SOLUTIONS

AC/DEHU SYSTEMS CENTRALIZED 4-PIPE SYSTEMS

BioTherm understands the demands of indoor gardening and greenhouse crops. A major issue is moisture control & humidity management. We know that high humidity levels can be devastating to your crop so that's why we have developed a line of pragmatic dehumidification and air temperature control solutions for agricultural applications without compromising performance. To control proper air temperature & humidity, BioTherm provided an advanced "4-pipe" system of air handlers. While many growers are familiar with traditional air conditioners and dehumidifiers, most don't understand the more advanced 4-pipe systems.



Air handling units with a bypass at Compassionate Cultivation, a medicinal cannabis facility in Bastrop, TX.



Air handling units at Daybreak Cannabis in St. Louis, MO.

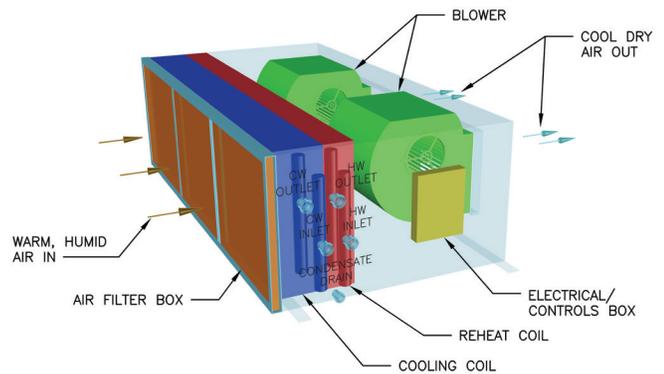
HOW 4-PIPE SYSTEMS WORK:

Humidity-laden air enters the air handlers.

Pipes 1 & 2 – The air flows over coil #1, which is flowing with chilled water. The cold coil condenses the moisture from the air and the water is sent to drain or to be treated for re-use.

Pipes 3 & 4 – The second coil has warm water coursing through it & brings the air that is now dry & cold back up to the proper temperatures for what is called "neutral discharge."

The systems run off hydronic circuits connected to pumps & high efficiency Raypak boilers and chillers- all located remotely.



Typical BioTherm 4-pipe air handler



◀ COOLED AIR BEING DELIVERED TO PLANTS VIA POLYTUBES



OPTIMIZED AIR SOLUTIONS

DEHUMIDIFICATION SYSTEMS SPLIT & PACKAGED DEHUMIDIFIERS

The SDH model connects to a Remote Condensing Unit (RCU) to allow for reheating the air back to the space or rejecting the heat to the outside and cooling the indoor environment. On board controls automatically switch from dehumidification to cooling mode based on inputs from the space sensors.

When using the SDH configuration, the remote condensing unit allows for the heat absorbed during the dehumidification process to be rejected outside, rather than back into the space, and provide cooling. This offsets the heat from lighting systems, solar heat and other equipment heat gains. Indoor grow facilities with high intensity lighting require cooling even in the winter. In order to maintain the sealed indoor environment, special low ambient cooling equipment is needed.

The BioTherm RCU (Remote Condensing Unit) is designed to provide cooling even in the coldest environments with low ambient capability down to -22°F (-30°C).

Whereas split dehumidifiers are overall more efficient for a grow space, they're not always necessary. Packaged dehumidifiers (PDH) provide the same dehumidification capability and are more economically priced.



BioTherm Split Dehumidifiers cool the inside of the growing space and discards the heat outside the greenhouse, keeping optimal temperature in the growing area.



Remote Condensing Units (RCU) mounted outside. Also available as PDH (packaged) units without RCU.

BIOTHERM SPLIT & PACKAGED DEHUMIDIFIERS ARE AVAILABLE IN THE FOLLOWING SIZES BASED ON PERFORMANCE AT 80°F / 60% RH

5-ton	10-ton	15-ton	20-ton
639 PPD	1474 PPD	1830 PPD	4680 PPD



OPTIMIZED AIR SOLUTIONS

DEHUMIDIFICATION SYSTEMS STANDALONE DEHUMIDIFIERS

The BT-530 Dehumidifier has been meticulously designed with today's indoor grow environmental challenges squarely as its foundation.

Independent laboratory testing has proved the BT-530 airflow rate is superior to its closest rivals in tests performed at the industry standard conditions of 80°F/ 60%RH. This industry leading performance results in potentially requiring less units to cover a grow area than comparable units.

At 530PPD the BT-530 is the perfect size not only to compliment an existing system but to be utilized as the main unit in smaller grows.



SPECIFICATIONS	
Dehumidifying Capacity (80°F/60%RH)	530 PPD (without filter)
Air Volume	1,884 CFM
Coverage Area	3,770 FT.
Operating Temp.	41-110°F
Operating Humidity	20-95 RH
Voltage Input	208-240/1/60
Power Input	2900 W
Running Current	13.3 (208-240V)
Refrigerant R410A Charge	106 OZ.
Sound Level	75 dB(A)
Control Type	Wall mounted controller
Defrost	Auto
Drainage	Continuous drain
Unit Dimensions	49-3" W/ 16x31-1" D / 2x31-78" H
Net Weight	302 LBS.

Independent Lab Comparison Report				
	BT-530 Testing Result		Leading Competitor	
	Lab Tested w/Filter		Rated Performance	Lab Tested w/Filter
Condition	80° F / 60% RH		80° F / 60% RH	80° F / 60% RH
Power Supply (V/Hz)	220V / 60Hz			
Air Flow (CFM)	1884		1350	
Current (A)	12.25		11	11.1
Power (W)	2777		2700	2515
Dehumidification (pint/day)	477.46		506	431.8
Efficiency (pints/kwh)	7.2		7.8	7.2
Wats per PPD	5.82		8.07	5.82



OPTIMIZED AIR SOLUTIONS

AIR FLOW FANS HORIZONTAL & VERTICAL FANS



BAF-14, 20

Horizontal air flow fans provide enhanced air circulation throughout a growing space to aid plant health by uniformly distributing air, humidity and Co2. By enhancing air flow, growers can stamp out stagnant air pockets and utilize their dehumidifiers, Co2 systems and other climate control equipment more effectively. Given their aerodynamic design, growers can use these HAF fans more economically compared to basket-style HAF or oscillating fans.

Model No.	~	Voltage (VAC)	Frequency (Hz)	Air Flow (CFM)	PSF (in. wg.)	Current (A)	Input Power (W)	Speed (RPM)	CFM/Watt (CFM/W)	Working Temp. (min/max F)	Weight (kg)
BAF-14	1	220	60	2185	0	1.22	163	1700	13.4	-4/+140	5.2
BAF-20	1	220	60	5866	0	4.12	666	1560	8.8	-4/+140	12.5



BRV-220V

BioTherm's vertical airflow fans provide an excellent solution to air circulation from underneath the canopy. Easy to mount and install, these fans provide a circulatory air flow that pushes air outward along the roof and walls of your grow space and then pulls said air upward through the canopy in one contiguous pattern to uniformly mix your local atmosphere to your plant's liking.

Model No.	Voltage (VAC)	Frequency (Hz)	Speed (RPM)	Input Power (W)	Current (A)	Air Flow (CFM)	Sound Level dB(A)
BRV-220	220	60	1800	310	1.42	2400	68

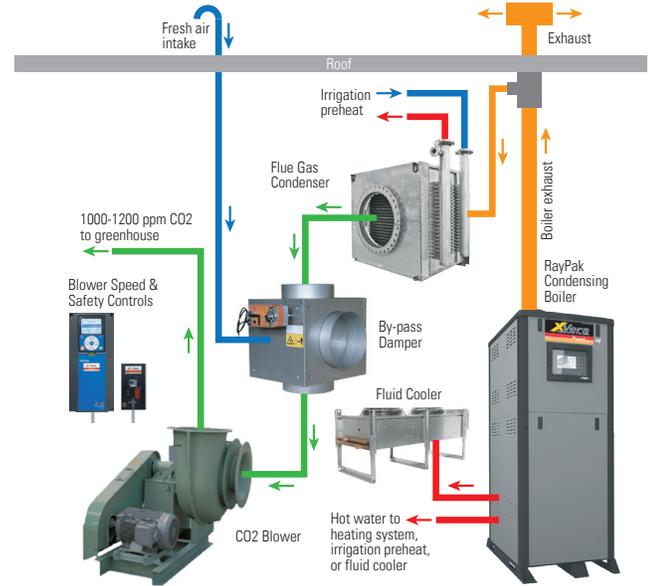
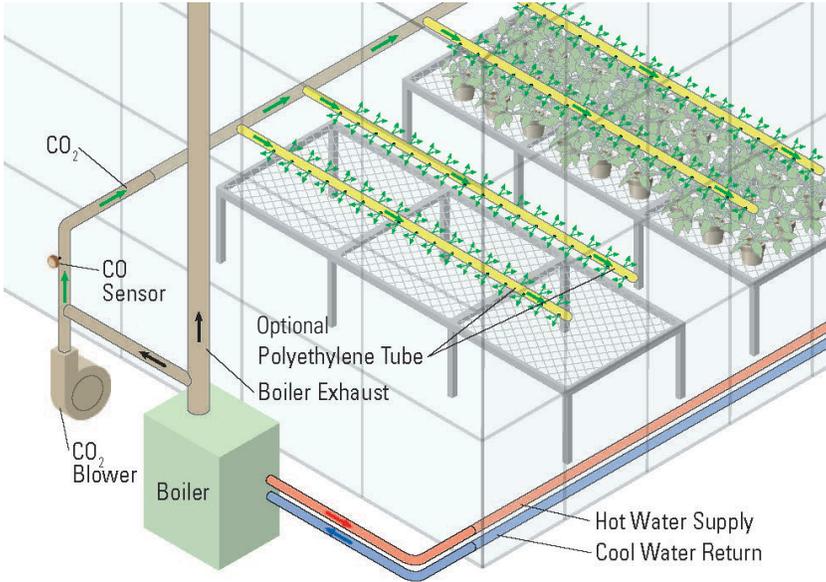
**THE FIRST HAF/VAF FANS WITH EC MOTOR TECH THAT OFFERS
MORE PRECISE CONTROL AND SAVES YOU ENERGY!**

DIRECTLY INTEGRATES WITH YOUR CLIMATE CONTROL COMPUTER. NO SEPARATE INTERFACE REQUIRED.

OPTIMIZED AIR SOLUTIONS

CO2 ENRICHMENT SYSTEMS

With the right condensing boiler system in place, a BioTherm CO2 System can easily be integrated to achieve elevated CO2 levels in the greenhouse environment. Our CO2 Enrichment Systems deliver clean, safe, and dry CO2 to your growing environment.



SCHEMATIC OF BIOTHERM CO2 ENRICHMENT SYSTEM



CENTRALIZED CO2 DISTRIBUTION

CO2 levels are naturally low in a greenhouse environment as plants use available CO2 as part of the photosynthetic process. Increasing CO2 levels above ambient conditions promotes increased plant growth and health.

BioTherm's system pulls CO2 directly from the boiler's exhaust gases and distribute it uniformly into the growing environment. With a BioTherm CO2 System, there is no need for large bulk tanks or individual CO2 burners. These systems can be used in indoor and greenhouse operations.

CO2 Fuel Savings after BioTherm CO2 Enrichment Installation for lettuce production facility (135,250k sq.ft.)

	2021	2022
	962,207 lbs.	131,446 lbs.
\$581,532 reduction in cost of CO2 since system installation.		

ROI Calculations from a large multi-state cannabis operator.

Facility Sq/ft	BTUH	Co2 Hrs p/day	Total BTUH p/day	Therms	\$ p/therm	Gas Cost p/day	Gas cost p/year
88,395	2,512,500	12	30,150,000	302	0.6	\$180.90	\$66,028.50
						Cost for Co2 Tank Operation	\$156,234.00
						Annual savings using Co2 from Boiler System	\$90,205.50



GROWER STORY BOB LADUE, LEF FARMS

Bob grows leafy greens at Lef Farms in New Hampshire, where he's always looking for ways to control costs and make the greenhouse more productive. "New England has high electric prices," Bob said, "and we want to use every tool at our disposal to control for high production, in an economically feasible way."

With the lights burning all night to support the leafy greens 24/7 growing program, Bob needed to offset those costs with higher yields. He knew that supplementing the CO₂ in the growing environment would increase the efficiency of photosynthesis up to 30%. He considered liquid CO₂, but he knew that price would fluctuate with the cost of transportation and storage, so he turned to a source he could control.

Lef Farms burns natural gas fuel in their BioTherm heating system to maintain warm temperatures during the cold New England winters, and CO₂ is a natural byproduct. BioTherm added a CO₂ system to the boilers, to harvest CO₂ from the exhaust gases and distribute it throughout the greenhouse. "When CO is at 1500 ppm level, we save 50% of supplemental lighting hours," Bob said. "We essentially get 50% more growth vs 375 ppm ambient CO₂ levels."

▲
AIR HANDLING
UNITS

ROLL'N GROW ▶
HEATING MATS



GREENHOUSE SOLUTIONS

UBIGRO GREENHOUSE COVERINGS

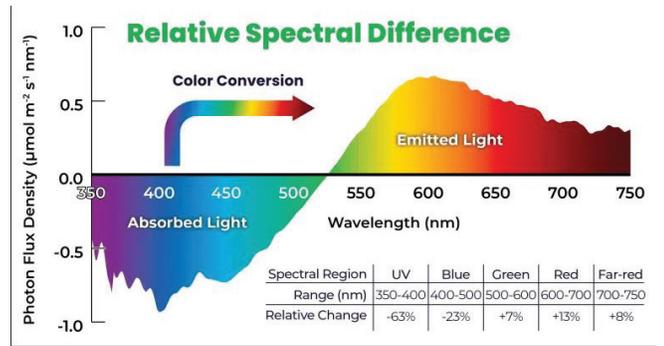


What is it?

All plants depend on Photosynthetic Active Radiation to produce sugars and ultimately grow to their full potential. Sunlight is a mixture of a wide array of light spectrum – not just the blue and red light necessary for plants. Developed at the Los Alamos National Lab down in New Mexico, the UbiGro UbiQD greenhouse covering uses quantum dot technology to convert non-PAR light into light easily utilized by your plant. This allows for increased yields for any-and-all plants.

How to use it

Simply hang strips of the UbiGro over your grow space, allowing for breaks in between strips to allow for natural light to pass through. Doing so will maximize light input while reducing overall cost to the grower.



Umi QD Lantern

If you don't have a greenhouse or big outdoor space but still want to gain the benefits of the QD film, the Umi QD lantern is perfect for you. Simply plug the lantern into the base of your plant's container and start enhancing your crop. Perfect for ornamentals or hanging pots.





ROLL'N GROW MACHINE
AT BIOTHERM HQ

MIKE MUCHOW,
BIOTHERM CO-FOUNDER

Raypak[®]
A Rheem[®] Company

**BIOTHERM IS THE EXCLUSIVE DEALER FOR RAYPAK[®]
BOILERS TO THE CEA AND CANNABIS INDUSTRIES**

RAYPAK PRODUCTS OFFER UP TO 98% EFFICIENCY

GROWER STORY MIKE GOODER, PLANTPEDDLER

BioTherm installed two Raypak boilers, which have run continuously since 1984. Tied to an Argus control system, they serve the greenhouse's needs well, even in the bitterly cold, snowy winter months – Mike says they get 20° F below weather, blizzards with 40 mph winds and dinner plate-sized chunks of ice on the greenhouse roof.

“We have them set about 160 to 175°, and they roll with what we need. The water temperature is always there.”

“The crops we produce are very fragile, needy,” he says. “We make sure we have redundancy, and work with BioTherm who understands the loads greenhouses require, how heat integrates into our short-range plan.”

BioTherm[®]
Elements...Enhanced.

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