The Ultimate Grower Climate Control Guide

BioTherm®

Cultivation Climate Technologies


MAKE YOUR OWN **WEATHER**.

CULTIVATION CLIMATE TECHNOLOGIES FOR OPTIMIZED PLANT GROWTH

Welcome to BioTherm, your trusted provider of advanced cultivation climate technologies since 1980. We specialize in delivering innovative solutions that enable growers to create the perfect ecosystem for their crops. With our comprehensive range of integrated systems, including heating, dissolved oxygen infusion, irrigation tempering, sub-irrigation, AC/Dehu, and CO2 enrichment, we empower you to "make your own weather" and unlock the full potential of your cultivation environment.

Our heating systems offer precise temperature control, ensuring that your plants receive the ideal warmth throughout their growth cycles. By maintaining optimal temperatures, you provide a nurturing environment that promotes healthy development and maximizes yields. With BioTherm's dissolved oxygen infusion systems, you can enhance root development and nutrient uptake. By delivering oxygen-rich water directly to your growing medium, our systems support vigorous growth, increased resilience, and overall plant vitality.

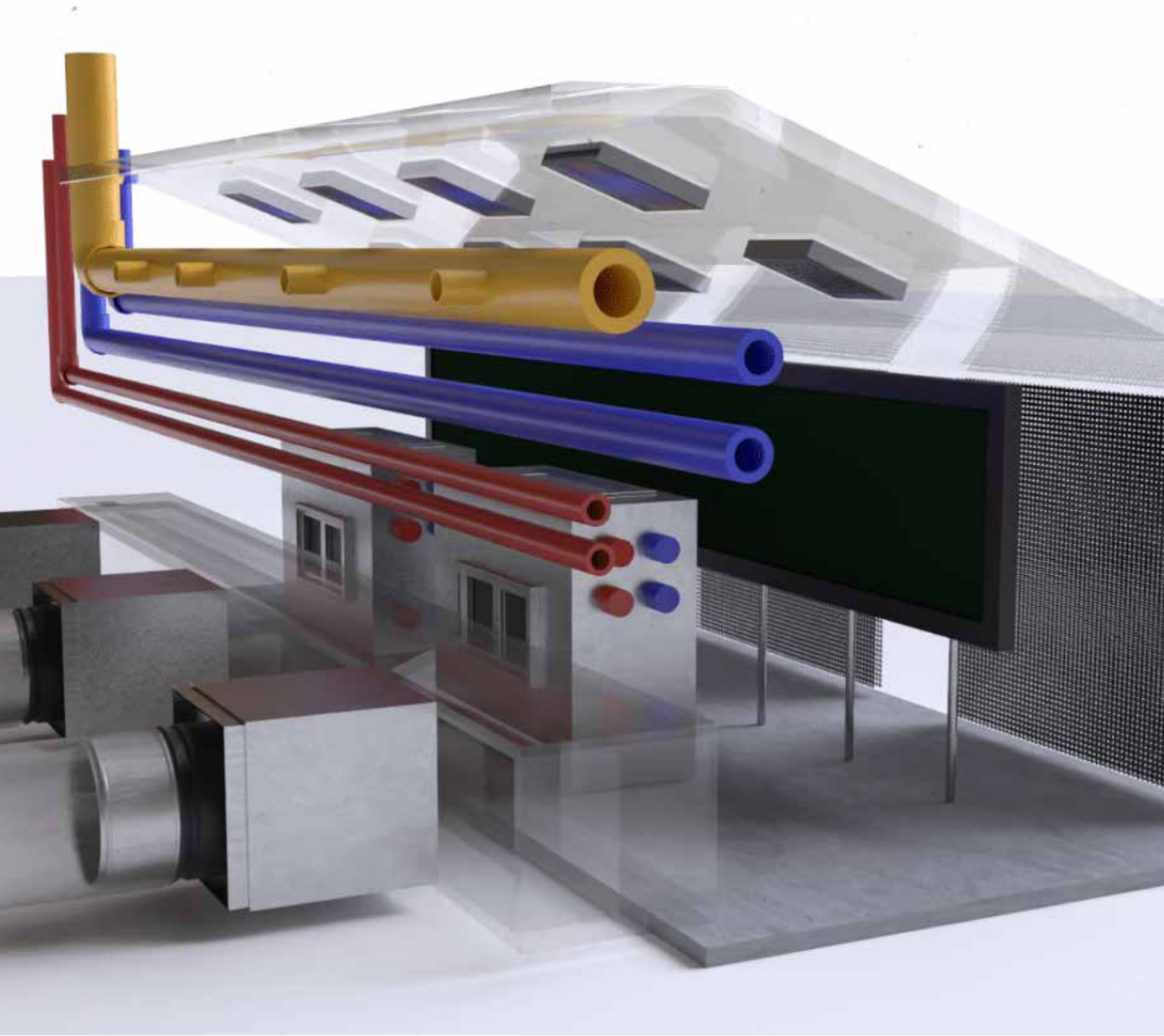
We understand the importance of water management in crop cultivation, which is why our irrigation tempering systems provide precise control over water temperature. By matching the temperature of your irrigation water to your crops' needs, you enhance nutrient absorption, root health, and overall crop growth. Our sub-irrigation systems optimize water delivery by directly targeting the root zone, reducing waste and promoting efficient nutrient uptake. This approach minimizes the risk of disease and maximizes resource utilization, aligning your cultivation practices with sustainability goals.

BioTherm's AC/Dehu systems create comfortable and controlled environments for both plants and growers. By regulating temperature and humidity levels, our systems promote healthy plant growth, reduce the risk of disease, and enhance productivity. We understand that CO2 enrichment plays a vital role in crop growth, which is why our solutions allow you to optimize carbon dioxide levels. By carefully controlling CO2, you fuel growth, accelerate growth rates, and achieve exceptional crop quality.

At BioTherm, we are committed to empowering growers with cultivation climate technologies that maximize their success. Our integrated systems work together seamlessly, ensuring that your crops receive the precise conditions they need for optimal growth. Trust BioTherm to provide innovative solutions that unlock the potential of your crops and cultivate a greener, more productive future.

PLANTCENTRIC®

CONTROLLED ENVIRONMENT ARCADE



GREENHOUSES ARE FOR GROWING

NOT TO BE USED AS EQUIPMENT ROOMS

PLANTCENTRIC®

CREATING COMFORTABLE AND PRODUCTIVE INDOOR ENVIRONMENTS

Commercial growers all over the world have learned the benefits of cultivating in a semi closed greenhouse environment. The Plantcentric CEA system is a modular system that can be applied to new greenhouses or retrofitted to existing ones.

The system provides temperature, humidity, and Co2 control in an integrated package, giving growers many operational modes to support and optimize their cultivation strategy. The system can operate in "Closed mode" and condition recirculated air conserving Co2, but can also operate in other modes to leverage outside conditions when appropriate to reduce operating expense.

Brought to you by BioTherm, the Plantcentric® CEA system is manufactured and supported in North America using world class engineering and components.

OPERATIONAL MODES

- 100% recirculation
- Heating
- Cooling
- Dehumidification
- Fresh air blending
- Air ventilation
- Adiabatic cooling
- Fresh air cooling
- Pest and pollination prevention
- Positive pressure
- Co2 Conservation
- Uniform, stress-free environment

GROWER BENEFITS

- Optimized area of grow space
- Creates a uniform, stress-free environment
- Modular and expandable
- Achieve a better greenhouse climate
- Higher production levels = faster ROI
- CO2 is conserved
- Reduced water consumption
- Fuel savings
- Integrates into all major environmental control systems
- No shade creation from equipment in grow space

GROWER STORY

ERIC BRANDSTAD, GREENHOUSE ADVISORY GROUP

"The Plantcentric is the total package for greenhouse control. Most companies throw around the word "controlled environment agriculture" but they only really work when conditions outside are favorable. They also only offer 1 or 2 options. The Plantcentric gives you every option possible. Plus, the fact that it can be added to any greenhouse structure makes it an option for any greenhouse operator anywhere..."
-Eric Brandstad, Owner, Greenhouse Advisory Group

BioTherm

TOTAL HEAT SOLUTIONS

ROOT ZONE HEATING
SPACE & PERIMETER HEATING
IN-CROP HEATING
RAYPAK BOILER SOLUTIONS

BioTherm's Heating Division is your trusted partner in revolutionizing greenhouse climate control solutions. With our expertise in root zone heating, space/perimeter heating, and in-crop heating, we provide innovative technologies that optimize growing conditions, improve crop yields, and maximize energy efficiency. Whether you are a commercial grower or a passionate hobbyist, our heating solutions are designed to meet your specific greenhouse application needs and propel you towards success.

ROOT ZONE HEATING

NURTURING OPTIMAL ROOT GROWTH FROM THE GROUND (OR BENCH) UP

At BioTherm, we understand that healthy root development is crucial for robust plant growth. Our root zone heating systems provide precise control over soil temperatures, creating an ideal environment for roots to thrive. By delivering heat directly to the root zone, we enhance nutrient uptake, accelerate growth, and promote overall plant health. Experience the transformative power of our root zone heating solutions and witness the remarkable difference it makes in your greenhouse.

ROLL'N GROW™ FLOOR

ROLL'N GROW™ BENCH

DUOFIN™ & DUOFIN LITE™

Roll'n Grow™ is the perfect way to apply Root Zone Heating (RZH) to growing beds or benches! Like a carpet, your growing surfaces can now be covered with growth-enhancing gentle heat in a fraction of the time it used to take. The benefits of this type of heating are well documented, reduce fuel costs, increase production, more compact plants, and reduce disease problems. Roll'N Grow™ can be installed on the floor or on benches for root zone heating.

BioTherm's DuoFin™ heat pipe is constructed of super-conductive aluminum alloy. This product provides low-mass, high-output heating for under-bench, in-crop, and perimeter heat applications.

MICROCLIMATE™ FLOOR

IN-BENCH HEATING

GREENPEX™ IN-SLAB

MicroClimate™ tubing is a heater, a direct delivery system to the crop. It can withstand external temperatures of 250°F without harm and twenty-five years of direct ultra-violet light without cracking. The tubing can be placed on top of wooden benches, below expanded metal benches, on the ground for bedding plants, or buried in media beds for propagating woody ornamentals. It can also be used as a solar collector and for retrofit floor heating applications.

GreenPEX™ tubing is strong, extremely tough and very durable. It is made of an ultra-high molecular weight resin and comes in a distinctive red color so you know you are getting true GreenPEX™ tubing. GreenPEX™ is our most cost effective solution for floor heat tubing.

SPACE & PERIMETER HEATING

ACHIEVING UNIFORM CLIMATE CONTROL THROUGHOUT YOUR SPACE

Creating a uniformly heated environment within a greenhouse is essential for optimal plant growth. Our space/perimeter heating systems are designed to evenly distribute heat throughout the entire greenhouse, eliminating cold spots and ensuring consistent temperatures. By employing advanced heating technologies, we help you maintain the ideal climate for your plants, enabling them to flourish regardless of their location within the greenhouse. With our innovative solutions, you can achieve exceptional crop quality and maximize your yield potential.

STARFIN™ & STARFIN PLUS™

StarFin™ has a tapered aluminum six-fin design that has 3 times the surface area of two-fin designs or 51mm thin-wall steel tubing. This increased surface area produces StarFin's high heat output, allowing lower water temperatures to be used and producing a soft, gentle heat.

SUNFIN™

Aluminum SunFin™ is high-output, finned heat pipe manufactured specifically for various heating applications. They are manufactured with 1-1/4" Schedule 40 tubing to transport hot water quickly, then dissipate it quickly with broad aluminum fins. Will not rust.

StarFin™

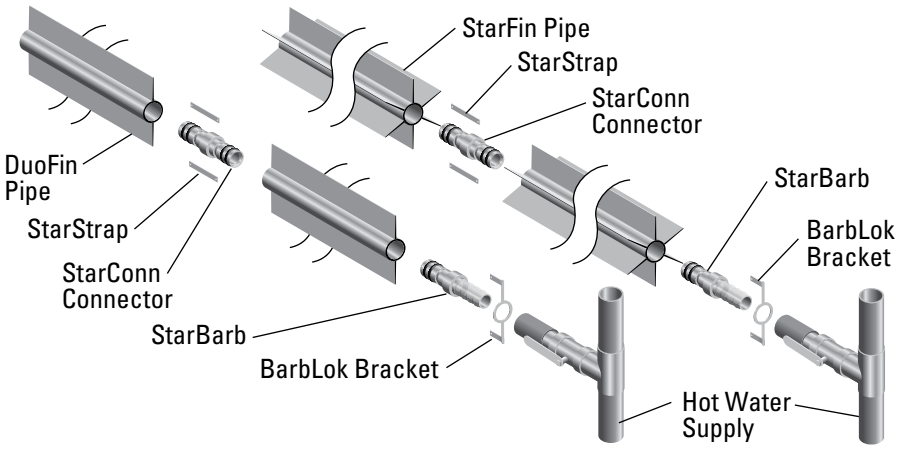
StarFin Plus™

DuoFin™

DuoFin Lite™

HOW IT WORKS

STARFIN™ AND DUOFIN™ NOW HAVE RIDGES ON FINS, INCREASING PERFORMANCE BY 6.7-10.5%!



WHY ALUMINUM FINNED HEAT PIPES ARE SUPERIOR TO ROUND STEEL PIPES

- QUICK INSTALLATION WITH NO LEAKS
- LOW WATER VOLUME, HIGH HEAT TRANSFER FOR QUICK RESPONSE
- NO MAINTENANCE EXTERIOR - NO PAINTING!

Constructed of super-conductive aluminum alloy, these products provide low-mass, high output heating for under-bench, under-gutter, cut-flower, and perimeter applications.

Low-mass, low-water volume heating systems are essential for today's precisely controlled greenhouses. Our finned heat pipes give you systems with high reaction/response to greenhouse temperature changes. Since only a small amount of water needs to be heated, setpoints are easily maintained, and the temperature lead/lag associated with high mass systems is eliminated. Compared to standard hot water pipe systems, like 51mm "Dutch pipes," these systems can have as much as 80% less water volume which means quick startups and less temperature overshoot, and much better energy efficiency.

In addition to aluminum's excellent heat transfer capabilities, it holds up to the harsh elements of the greenhouse environment. These pipes withstand all commonly used fertilizers and typical greenhouse chemicals, meaning they won't rust or corrode.

IN-CROP HEATING

PRECISION HEATING CONTROL FOR SPECIALTY CROPS

Specialty crops often require specific temperature conditions to thrive. Our in-crop heating systems offer precise control over localized temperatures, allowing you to meet the unique requirements of your specialty crops. Whether you are growing delicate herbs, exotic flowers, or high-value crops, our customizable in-crop heating solutions provide the necessary warmth for optimal growth and quality. Experience the precision and versatility of our heating systems and unlock the full potential of your specialty crops.

DUOFIN™ & DUOFIN LITE™

A vertical loop of our innovative DuoFin™ piping can provide as much heat as forced air heating, but concentrated directly around your plants where it's most needed. Plus, this system is ideal for hanging plants in commercial greenhouses where you need to maximize both horizontal and vertical spaces without worry of uneven grow environments.

51 MM

Heat your crops using steel pipe and use a cart to simultaneously manage plant growth. If you are looking to use a cart system in your greenhouse for harvests, enhance it by transforming the rail into a heat source. BioTherm can provide a cart rail solution using 51mm pipe that allows the use of a cart and doubles as heated pipe.

LOOKING TO INCREASE YOUR BOILER EFFICIENCY?

SCAN AND READ THE ARTICLE TO LEARN MORE

RBI BOILERS

THE HEART OF THE GREENHOUSE

BioTherm is the exclusive dealer for RBI boilers in the greenhouse market. RBI continues to contribute to the category with innovations and efficiencies. They added condensing heat exchangers to extract almost every available BTU from the fuel.

RBI's diverse boiler offerings provide capabilities such as: modulating up and down to different heat loads, easily daisy-chaining to combine heat outputs, and cascading boiler systems to follow the seasonal changes for optimal boiler efficiencies.

BioTherm

HYDRO SCIENCES

DISSOLVED OXYGEN
FLOOD & CASCADE FLOORS
IRRIGATION TEMPERING

BioTherm's Hydro Sciences Division is your partner in cultivating a thriving, sustainable greenhouse environment. With our dissolved oxygen infusion, flood and cascade floors, and irrigation tempering solutions, we empower growers to unlock the full potential of their plants and maximize productivity. By harnessing the power of innovative technologies, we help you create an ideal ecosystem where plants can thrive, ensuring healthy growth, increased yields, and a more sustainable approach to cultivation. Join us in shaping the future of greenhouse solutions with BioTherm's Hydro Sciences Division.

DO YOU IRRIGATE LIKE THIS?

DRIP IRRIGATION

OR

FLOOD BENCHES OR FLOORS

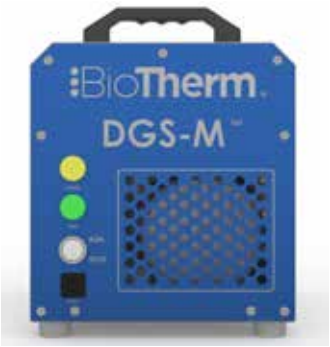
OR

DEEP WATER CULTURE (DWC)

OR

NFT GUTTERS

THEN YOU SHOULD THINK ABOUT ADDING THESE:



DGS-M™ DISSOLVED GAS SYSTEM

- Plug & play
- Flow rates up to 40 gpm
- Stainless steel
- Automation available
- Connects to OGS™ or O2 Tank

OGS™ OXYGEN GENERATION SYSTEM

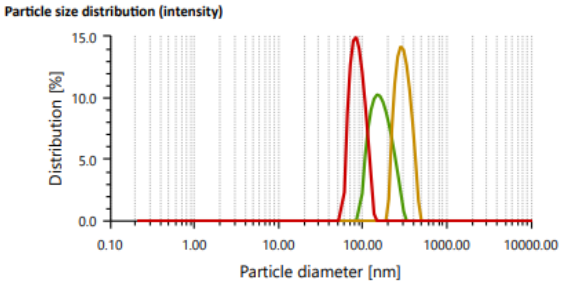
- Plug & play
- Stainless steel
- Connects to DGS-M™ dissolved gas systems.

DO STAT™ DISSOLVED OXYGEN AUTOMATION CONTROLLER

- Automation control
- Optical DO sensor
- Touch screen interface
- Connects to DOS-X™ or DGS™

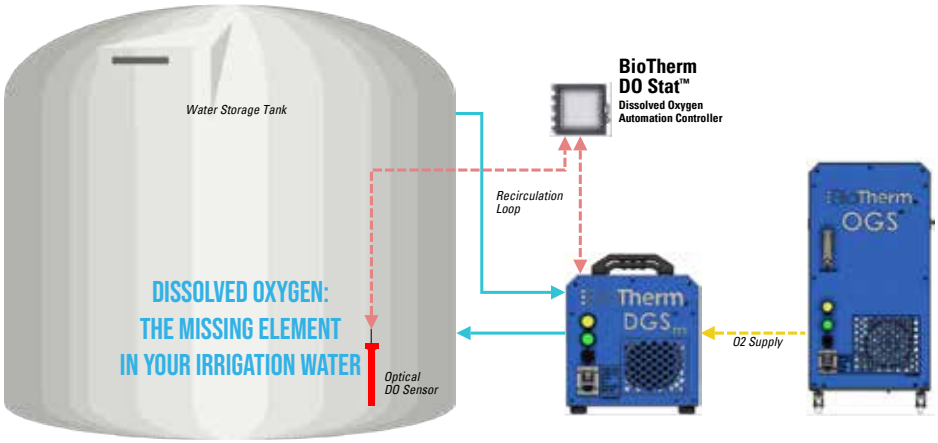
DISSOLVED OXYGEN PARTICLE SIZE ANALYSIS

Particle Size Distribution of Dissolved Oxygen Bubbles in Water measured using Anton Paar Litesizer DLS. Samples Generated through DGS Equipment achieving sub 200nm nanobubbles.



Measurements (intensity)

Name	Color	Hydrodyn. diam. [nm]
›pm 1		199.71
›pm 2		396.7
›pm 3		132.50



MYSTIFIED BY DISSOLVED OXYGEN?

SCAN TO READ OUR DISSOLVED OXYGEN RESOURCE GUIDE!

FLOOD & CASCADE FLOORS

ELEVATING GREENHOUSE EFFICIENCY & FUNCTIONALITY

Most commonly used in a facility with minimal aisles, leaving the entire area for plants. Floor heat is installed to provide rapid drying of the floor surface when the water is drained and to provide an ideal root zone temperature. The finished floor slopes about ½ to ¾ inch from the post line to the center of the bay. A quick responding irrigation cycle time is critical to greater control of nutrient uptake and prevents over-soaking.

BioTherm's Cascade Floor irrigation systems create a thin sheet of water that flows evenly down an imperceptible slope from ridge to drain, uniformly distributing moisture for a homogeneous crop. Our Flood Floor and Cascade Floor systems save water, energy, fertilizer and reduce labor costs by up to 95%.

A win for you and a win for your plants!

Flood Floors are an important production system for many reasons: Growers can automate irrigation and reduce labor substantially, the systems recirculate all the irrigation water to maximize sustainability while having no runoff, and, many diseases related to top watering and splashing are substantially reduced.

GROWER STORY

SCOT FERGUSON, LEN BUSCH ROSES

"I couldn't recommend BioTherm enough. All of their solutions from dehumidification to flood floor irrigation and the hot water system has just been spectacular. They're helping us be at the cutting edge of greenhouse technology." *-Scot Ferguson, Len Busch Roses*

Problem:
Len Busch Roses needed to expand their potted crop production, and they had uneven irrigation tempering for their plants.

Solution:
BioTherm installed a heated Flood Floor system to help expand their potted crop production and increase uniform water tempering.

IRRIGATION TEMPERING

OPTIMIZING PLANT GROWTH THROUGH PRECISION WATER CONTROL

Achieving the perfect balance of water and temperature is crucial for optimal plant growth in greenhouses. Our irrigation tempering solutions provide precise control over the temperature of your irrigation water, helping you create the ideal growing conditions for your crops. Experience improved crop yields, reduced water consumption, and enhanced resource efficiency, all while contributing to a more sustainable future.

Plug & play pre-engineered Irrigation Tempering Skid.

High-capacity Irrigation Tempering System.

WARMING: You might be surprised to find out that it is not only the plant that can experience shock from cold water, but also the medium it is growing within. By implementing a pre-heating system from BioTherm, you will eliminate nutrient waste, improve plant growth, and produce quality harvests time and time again.

COOLING: Depending on your situation, you might also be looking to pre-cool your irrigation water to achieve the optimal temperature for your plants. Not only will a controlled pre-cool system help your plants grow better, it will save you time, energy, and money.

COMBINATION: Get the best of both worlds with a combination pre-heat and pre-cool system.

GROWER STORY

PAULA SIMMONS, BARE ROOTS PRODUCE

"BioTherm's DGS-M system has helped us save a lot of money. We're not spending it on nutrients and pesticides for our crops. There's a lot more demand for our product and we understand that it has to do with the fact that the quality has changed with the help of BioTherm's DGS-M ystem."
-Paula Simmons, Bare Roots Produce

Problem:
Bare Roots was experiencing low DO levels and an increased cost on nutrients.

Solution:
BioTherm installed a DGS-M system to help cut down on nutrient costs and double the size of their lettuce heads. The crop was overall a healthier plant-- sweeter and juicier!

BioTherm

OPTIMIZED AIR

AIR FLOW FANS
DEHUMIDIFICATION
AIR CONDITIONING
CO2 ENRICHMENT

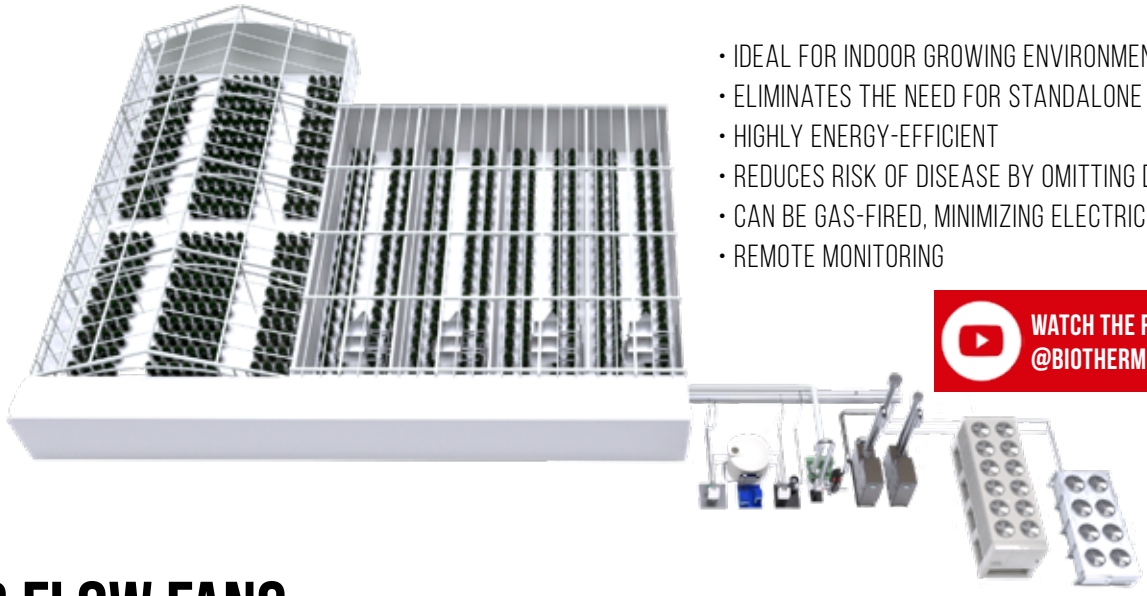
BioTherm's Optimized Air Division is where innovation meets environmental sustainability. We specialize in creating state-of-the-art solutions for air quality optimization in various industries. With a comprehensive range of products, including airflow fans, CO2 enrichment systems, and cutting-edge air conditioning and dehumidification technologies, we strive to revolutionize the way you experience air. Whether you're seeking to improve indoor air quality, enhance crop growth, or create comfortable environments for your plants, BioTherm's is your trusted partner in achieving optimal air conditions for a healthier and more productive future.

ULTIMATE GROWER CLIMATE CONTROL

CONTROLLING CLIMATE CONDITIONS FOR PLANT HEALTH & EFFICIENCY

The Ultimate Grower Climate Control System utilizes 4-pipe/hot water technology to provide perfect temperatures to your indoor environment, reducing the need for ducting, standalone dehumidifiers or RTUs.

Conditioned air and/or CO2 is distributed through Airdentro AHUs or through Plantcentric® into the growing environment.



- IDEAL FOR INDOOR GROWING ENVIRONMENTS
- ELIMINATES THE NEED FOR STANDALONE DEHUMIDIFIERS
- HIGHLY ENERGY-EFFICIENT
- REDUCES RISK OF DISEASE BY OMITTING DUCTING
- CAN BE GAS-FIRED, MINIMIZING ELECTRICAL LOADS
- REMOTE MONITORING

WATCH THE FULL VIDEO!
@BIOTHERMSOLUTIONS3917

AIR FLOW FANS

CREATING COMFORTABLE AND PRODUCTIVE INDOOR ENVIRONMENTS

The first HAF/VAF fans with EC motor technology that offers more precise control and saves you energy! All models come with built-in speed control that integrates with your existing climate control system, eliminating the need for a separate speed control.

HORIZONTAL AIR FLOW 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.

VERTICAL AIR FLOW FANS - 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.

DEHUMIDIFCATION & AIR CONDITIONING

CREATING COMFORTABLE AND PRODUCTIVE INDOOR ENVIRONMENTS

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.

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.

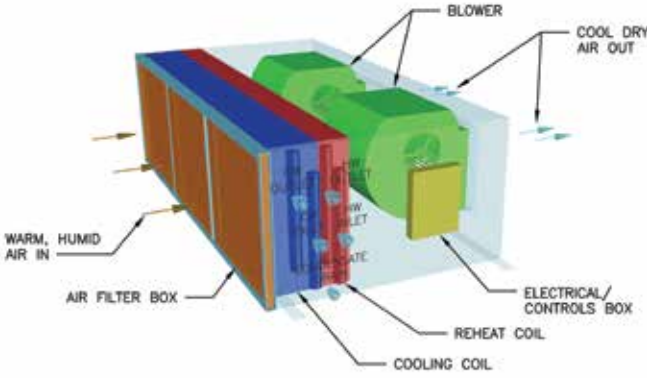
HOW 4-PIPE SYSTEMS WORK

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."

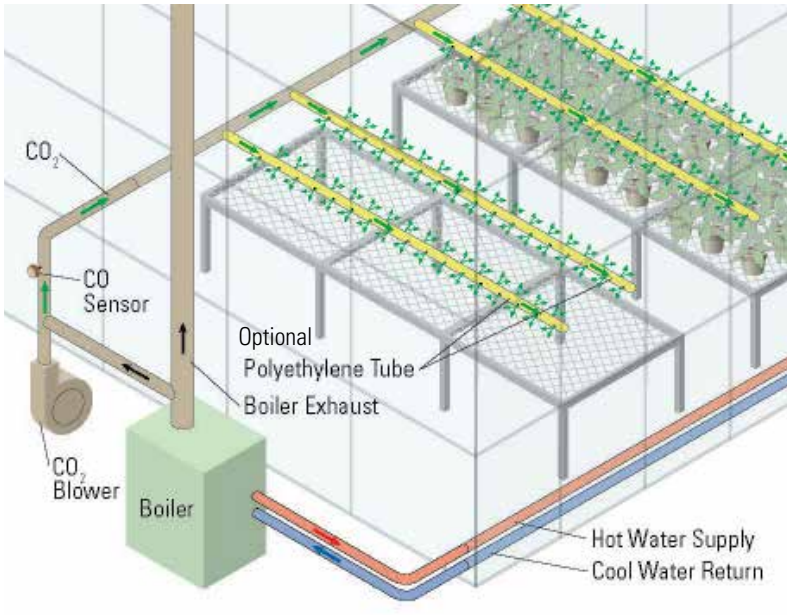
The systems run off hydronic circuits connected to pumps & high efficiency Raypak boilers and chillers- all located remotely.

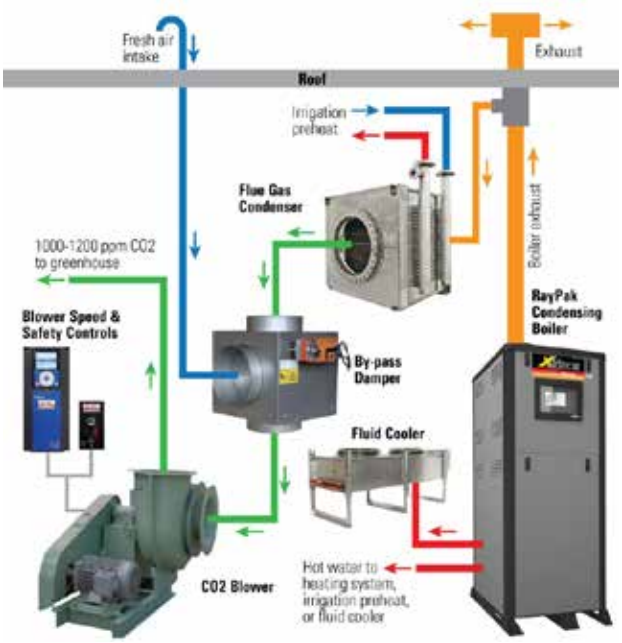


CO2 ENRICHMENT

FUELING GROWTH AND MAXIMIZING YIELD WITH SCALABLE CO2 SYSTEMS

Our CO2 Enrichment Systems deliver clean, safe, and dry CO2 to your growing environment. 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 (135,250 SQ. FT.)

CO2 USAGE 2021	$581,532 REDUCTION IN COST OF CO2 SINCE SYSTEM INSTALLATION	CO2 USAGE 2022
962,207 LBS.		131,446 LBS.

Calculations are from a partial year. Annual savings will be even higher.

ROI CALCULATIONS | MSO CANNABIS OPERATION

FACILITY SQ.FT.	BTUH	CO2 HRS PER DAY	TOTAL BTUH PER DAY	THERMS	$ PER THERM	GAS COST PER DAY	GAS COST PER 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

CO2 ENRICHMENT

C-GEN™ ON-DEMAND CO2 GENERATION

Introducing the C-Gen: On-Demand CO2 Generation for the Controlled Environment Agriculture (CEA) Industry. Revolutionize your greenhouse or indoor farming operation with our innovative solution that transforms boiler exhaust into clean CO2 for your plants. With the C-Gen, you can enjoy the benefits of CO2 enrichment without the need for a large boiler, making it scalable and cost-effective for operations up to 10,000 sq.ft.

Heat generated from boiler can be used for root zone heating, irrigation tempering, heat storage tank or can be expelled through a fluid cooler. Fluid cooler is often required.

The C-Gen is built on a stainless steel frame, making it corrosion-resistant and able to withstand the elements of the growing environment. Easily integrated to existing environmental control systems.

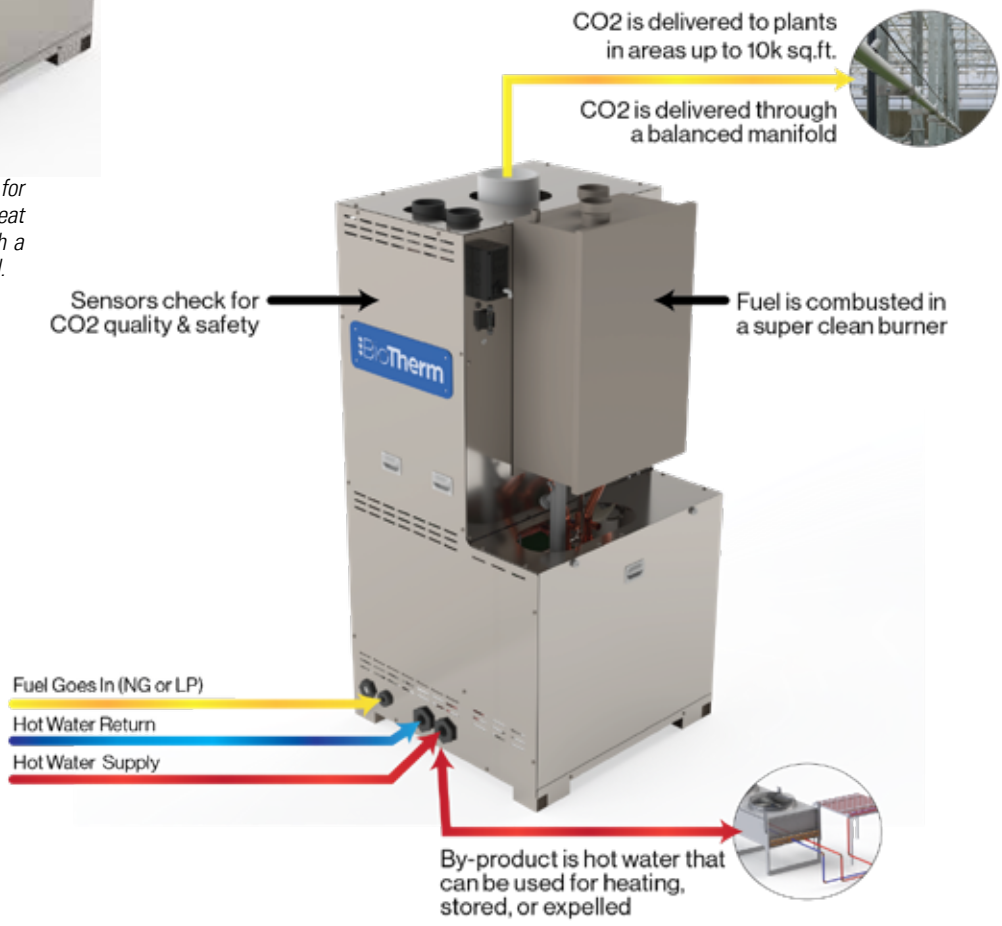
Co2 is safely distributed through nozzles.

WHERE IT WORKS

- Greenhouse or indoor facilities

FEATURES & BENEFITS

- Plug & play system application
- Enhanced photosynthesis
- Increased crop productivity
- Improved nutrient utilization
- Reduced transpiration
- 10,000 sq.ft. capacity



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 CO_2 in the growing environment would increase the efficiency of photosynthesis up to 30%. He considered liquid CO_2, 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 CO_2 is a natural byproduct. BioTherm added a CO_2 system to the boilers, to harvest CO_2 form 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 CO_2 levels."

COGENERATION

TECHNOLOGY THAT FUELS LIFE ITSELF

Unlock the full potential of greenhouse cultivation with the revolutionary power of cogeneration. Cogeneration, also known as combined heat and power (CHP), offers a multitude of benefits that can transform your greenhouse operations. By simultaneously producing electricity and capturing excess heat, cogeneration systems ensure enhanced energy efficiency, significantly lowering operational costs. This surplus heat can be utilized to maintain optimal growing conditions year-round, fostering accelerated crop growth and extending growing seasons. Moreover, cogeneration reduces greenhouse gas emissions, promoting sustainability in agriculture. With cogeneration, you're not just growing plants; you're cultivating a more prosperous and environmentally responsible future for your greenhouse business.

Experience the power of innovation and elevate your greenhouse growing to new heights with cogeneration.

Tecogen®
Clean Energy Solutions

CLEAN, AFFORDABLE COGENERATION POWERED BY TECOGEN

Tecogen's highly efficient and ultra clean combined heat and power (CHP) solutions give indoor growers the ability to reduce operating costs and greenhouse gas emissions all while providing their facilities with consistent and reliable power, heating and cooling services.

CLEAN ENERGY

The core of Tecogen's ultra-efficient solution, is the InVerde® e+ electrical CHP or "cogeneration" module, which offers indoor cultivation facilities low cost electricity produced on site from cheap natural gas, and free recovered engine waste heat that can be used to provide winter space heating or summer dehumidification. This free waste heat stream can be used to provide cooling via an absorption chiller, the combination of this also known as "trigeneration". In addition to operating cost savings and greenhouse gas reductions, an CHP system can also solve the electric capacity constraints that many cultivation facilities face. Obtaining a electrical upgrade from the local utility can be onerous, both in terms of cost and in terms of time, and getting up and growing quickly is often challenging when there is a utility service upgrade pending. By leveraging the benefits of a CHP system, growers can be up and running much more quickly and Tecogen's flagship Inverde e+ product can not only provide power every day, but also provide emergency power in case of grid outage event, giving facility managers peace of mind that their plants will never be left in the dark and mission critical power supply and climate control will be maintained.

Tecogen's air-cooled hybrid chillers powered by a natural gas engine or electricity. Capable of optimizing for operational cost or carbon savings.

Tecogen's TecoChill line of natural gas engine driven chillers with free engine waste heat recovery is a form of mechanical CHP. Pictured above is a 200-ton Tecochill STx series chiller providing chilled glycol and hot water for dehumidification.

EFFICIENT CHILLERS

The leading natural gas engine-driven chiller on the market, a TECOCHILL® cuts costs by as much as 30-60% when compared to conventional electric chillers and helps facilities avoid punitive peak- demand electric charges. As an added bonus, additional savings can be realized by recovering waste heat from engines for heating needs such as dehumidification, either traditional reheat or desiccant regeneration. The true power of the TECOCHILL technology is most evident in the summer-time when electricity rates are at their highest—often incurring peak usage charges for traditional electric chillers—but when natural gas pricing is "off peak" and especially affordable. TECOCHILL customers can rest easy because their chillers will continue running on minimal electric power in case of electric blackout, all while being fed by reliable natural gas - a significant benefit when considering the potential costly impact of downtime for indoor cultivation facilities.

COST EFFECTIVE

Typical equipment payback periods range from 2-4 years and many Tecogen customers qualify for additional incentives. Investment tax credits, accelerated depreciation benefits, clean energy incentives, and demand response subsidies are among many of the benefits that may be available to customers installing Tecogen's equipment.

WHY COGENERATION?

- PROVIDE ELECTRICITY, HEAT, AND COOLING WITH LOW-COST NATURAL GAS
- FREE ENGINE WASTE HEAT AVAILABLE FOR HEATING AND DEHUMIDIFICATION NEEDS
- DRAMATICALLY DECREASE OVERALL ELECTRICAL CAPACITY OF THE FACILITY

BioTherm

INSTITUTIONAL GREENHOUSE EXPERIENCE

COMPLETE CLIMATE SYSTEMS FOR INSTITUTIONAL AND COMMERCIAL GREENHOUSES

BioTherm designs mission-critical heating, cooling, and dehumidification systems for institutional greenhouses. We understand that maintaining a proper environment is crucial to the success of research facilities, botanic gardens, and academic institutions.

Consistency is key, which is why we carefully calibrate all systems beyond the minimum industry standards for ideal performance and energy efficiency.

We work hand in hand with architects and engineers to provide detailed equipment specifications before the bid process even begins.

THE OHIO STATE UNIVERSITY CEFPRC AT WATERMAN FARMS

photos courtesy of LLK Greenhouse Solutions

THE OHIO STATE UNIVERSITY
CONTROLLED ENVIRONMENT AGRICULTURAL RESEARCH COMPLEX AT WATERMAN FARMS COLUMBUS, OHIO

BioTherm's contribution to the Ohio State University research facility greenhouse project at Waterman Farms has been pivotal in establishing a cutting-edge agricultural research center.

SCOPE OF PROJECT: To design a state-of-the-art custom climate ecosystem to increase greenhouse productivity and foster optimal plant growth. System needed to efficiently run year-round and through inclement weather.

PROJECT SIZE: 25,000 sq. ft.

SYSTEMS INSTALLED: In-Crop DuoFin® heating, 51mm Cart Rail heating, Perimeter SunFin® heating, Lennox Hydronic Unit heaters for added redundancy.


PROVIDING CULTIVATION CLIMATE
TECHNOLOGIES TO GROWERS SINCE 1980
BioTherm
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MICHAEL'S GREENHOUSES